Entries for September 16-30, 2024

Market/Commercialization Information

F -- CRISTEX DRUM SUPERFUND SITE, OXFORD, GRANSVILLE COUNTY, NC (SRCSGT)

U.S. Army Corps of Engineers, Savannah District, Savannah, GA
Contract Opportunities on SAM.gov W912HN25S1000, 2024

This is a sources sought notices for marketing research purposes only under NAICS code 562910. The U.S. Army Corps of Engineers, Savannah District, seeks to further identify potential parties capable of performing Electrokinetics Enhanced In Situ Chemical Oxidation at the Cristex Drum Superfund Site in Oxford, Granville County, North Carolina. The Government needs a contractor with the knowledge, skills, and abilities to implement components of the remedy specifically limited to the implementation of Alternative Saturated Source Zone #3: Electrokinetics Enhanced In Situ Chemical Oxidation (EK-ISCO) of the Selected Remedy (i.e., Part 2, Phase 3) and groundwater monitoring following remedy implementation to evaluate the effectiveness of the remedy. The general remedial strategy at the site is driven by the need to restore and protect the drinking water resource that exists under the Site. Based on the responses to this request for information, this requirement may be set aside for small businesses (in full or in part) or procured through full and open competition. Responses to the survey in the request for information notice are due by 5:00 PM EST on November 12, 2024. https://sam.gov/opp/105ec021c50a4ab4989d700c18efadc9/view

F -- TECHNICAL ASSESSMENT & RESPONSE TEAM (TART) (SRCSGT)

U.S. Environmental Protection Agency, Region 9 Contracting Office, San Francisco, CA
Contract Opportunities on SAM.gov 68HE0925Q0002, 2024

This is a sources sought notices for industry information and feedback only under NAICS code 541620. EPA Region 9 is conducting market research to understand capabilities related to providing EPA with support for water emergencies for the Technical Assessment and Response Team (TART). EPA's role under Emergency Support Function 3 (ESF-3) under the national response framework is to respond to emergencies by supporting assessment, emergency response, and restoration of water infrastructure systems, including drinking water and wastewater utilities. The purpose of the TART contract is to provide technical services to the U.S. Environmental Protection Agency (EPA) and other federal officials implementing EPA's responsibilities. The technical requirements include response, preparedness and prevention, assessment and inspection, technical support, data management, and training. Capability statements are due by 8:00 PM EST on November 27, 2024. https://sam.gov/opp/55b43668e9704204b46a8057e6c4a2bc/view

F -- WATER EMERGENCY AND RAPID RESPONSE SERVICES (WERRS) (SRCSGT)

U.S. Environmental Protection Agency, Region 9 Contracting Office, San Francisco, CA
Contract Opportunities on SAM.gov 68HE0925Q0003, 2024

This is a sources sought notices for industry information and feedback only under NAICS code 562910. EPA Region 9 is conducting market research to understand capabilities related to providing EPA with support under its Water Emergency and Response Services (WERRS) contract. The purpose of the WERSS contract is to provide consistent services to the U.S. Environmental Protection Agency (EPA) and other federal officials implementing EPA's responsibilities, and fast support to drinking water and wastewater utilities located in EPA Region 9 during emergencies resulting from natural and manmade disasters, terrorist activities, weapons of mass destruction, and nuclear, biological or chemical incidents. The contractor shall fulfill these responsibilities within the region as well as outside the region on a backup regional response, cross-regional response, and national response. Technical requirements under this contract include emergency response, sampling, monitoring, site stabilization, controlling spilled material, waste treatment, restoration, removal actions, transportation, treatment, and disposal. Capability statements are due by 8:00 PM EST on November 27, 2024. https://sam.gov/opp/ba5c9a98842f4ebbaba39430c1838c2c/view

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Cleanup News

TARGETED REMEDIATION IN FRACTURED BEDROCK ON A REMOTE SUPERFUND SITE USING ELECTRICAL HYDROGEOLOGY

Spears, K., S. McDonald, and S. Frandsen. I RemTech 2024: Remediation Technologies Symposium, 16-18 October, Banff, Alberta, Canada, 32 slides, 2024

Electrical hydrogeology was successfully utilized at a DNAPL site with fractured volcanic rock to track preferential contaminant flow paths related to underlying geologic structures. Identifying the deformation zone, faults, and fractures allowed these high-flow zones where most contaminant migration was occurring to be targeted for remediation more effectively. A process to successfully manage these big data projects included 2D/3D data integration and visualization of multiple lines of evidence (including historical site data and follow-up ground truthing confirmation drilling data) to allow robust virtual and/or in-person collaboration by the project team and stakeholders. 3D electrical imaging data integrated with targeted 1D point confirmation drilling and monitoring well data provided insight into the complex contaminant distribution, subsurface microbial activity, and varying effects from previous remediation attempts at the Tutu Wellfield Superfund site. The remedial design characterization approach yielded a conceptual site model built on thousands of field data points and successfully located fractures, faults, and a deformation zone where most groundwater flow and contaminant migration is occurring. This site knowledge allowed the team to place extraction wells in confirmed high-flow pathways with the intent to remediate the chlorinated solvent plume more effectively and at lower cost.
Slides: https://esaa.org/wp-content/uploads/2024/10/RT2024-Speakrs.pdf
Longer Abstract: https://esaa.org/wp-content/uploads/2024/09/RT2024-program-Abstracts-15.pdf

HAZARDOUS WASTE PCB SEDIMENT REMEDIATION, PORT HOPE, ON

Kruska, A. I RemTech 2024: Remediation Technologies Symposium, 16-18 October, Banff, Alberta, Canada, 28 slides, 2024

The Port Hope Area Initiative includes the remediation of five former industrial waste sites, including the Chemetron Lagoon site. The Port Hope facility used 5,800 m^2 of the site as an artificial lagoon to manage the plant's wastewater. The onsite contamination was contained within the wastewater, sludge at the bottom of the lagoon, soil in contact with lagoon sludge or water, and subsurface infrastructure. Approximately 14,500 m^3 of contaminated wastewater was treated via an onsite portable water treatment system (PWTS), along with ~3,500 m^3 of PCB-contaminated sludge at the bottom of the lagoon. The PWTS featured holding tanks, clarifiers, pH adjustment tanks, sand filters, organoclay and granular active carbon vessels to treat the water for discharge to the adjacent marsh. The system was regularly sampled to ensure sustainable practices and to minimize environmental impacts. Following dewatering of the lagoon, the solidification, excavation, and disposal of the hazardous PCB material removal began. The sludge was extremely saturated and required stabilization and solidification using a solidifying polymer agent to allow for safe loading and transporting of material to the disposal facility. In addition, associated inlet and outlet pipes containing hazardous PCB concentrations were removed. The final park-like restoration includes a dog park, an observation deck to the adjacent marsh, a picnic structure, and plantings.
Slides: https://esaa.org/wp-content/uploads/2024/10/RT2024-KRUSKA.pdf
Longer Abstract: https://esaa.org/wp-content/uploads/2024/09/RT2024-program-Abstracts-23.pdf

TRANSITION TO MONITORED NATURAL ATTENUATION AFTER 30 YEARS OF PUMP AND TREAT AT THE FORMER UNIROYAL SITE IN EDMONTON, ALBERTA

Ricker, J.A. and H. Stamm. I RemTech 2024: Remediation Technologies Symposium, 16-18 October, Banff, Alberta, Canada, 50 slides, 2024

This case study highlights the transition from active pump and treat to monitored natural attenuation (MNA) at the former Uniroyal Chemical Site in Edmonton, Alberta. A groundwater remediation system, including two onsite and six offsite extraction wells operated from 1984 to 2015. In 2014, a pilot study was conducted to evaluate the efficacy of MNA as a remedy for the site. The pilot study was implemented because a plume stability analysis indicated that the site plume mass was decreasing at a greater rate than what was being recovered from the P&T system. Groundwater Plume Analytics® (GPA) tools were used to evaluate site data leading to the shutdown of the P&T system and to demonstrate plume stability after shutdown. GPA tools are innovative, data-driven evaluation techniques to identify and effectively communicate meaningful patterns in groundwater data. Since the shutdown, GPA tools were used to demonstrate that not only has the site plume remained stable, but it has also continued to decrease at a greater rate than during active remediation. Site data show that natural processes are responsible for the majority of the mass reductions occurring, and it appears that the active pumping system was impeding these natural processes. Using GPA tools to demonstrate that MNA is the optimal remedial option for this site has resulted in great project success, including improved performance and significant reductions in remediation cost, the carbon footprint, and other sustainable remediation metrics.
Slides: https://esaa.org/wp-content/uploads/2024/10/RT2024-Ricker.pdf
Longer Abstract: https://esaa.org/wp-content/uploads/2024/09/RT2024-program-Abstracts-38.pdf

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Demonstrations / Feasibility Studies

ENHANCED IN SITU BIODEGRADATION EVALUATION OF CHLORINATED ETHENES IN LOW PERMEABILITY GROUNDWATER

Hoagland, B., L. LaPat-Polasko, J. Gniffke, G. Waters, H. Cox, and A. Nagle. I 19th Annual Environmental Professionals of Arizona Conference, 26-27 February, Tempe, AZ, 44 slides, 2024

An in situ bioremediation (ISB) evaluation of cVOCs (PCE and, to a lesser extent, TCE) was performed using in situ microcosms (ISMs) to determine the efficacy of using ISB to remediate cVOCs in groundwater. The evaluation tested biostimulation and bioaugmentation options in shallow and intermediate monitor wells. After the ISM evaluation, a clean water injection was performed in the wells to determine potential injection rates in the aquifer. Groundwater samples were analyzed for electron acceptors, TOC, major nutrients, key microbial populations, and genes. Based on the results, 7 ISM units (EOS PRO; EOS PRO+SDC-9®; EOS PRO+KB-1®; Wilclear Plus+SDC-9; Wilclear Plus; Wilclear Plus+SDC-9; and Wilclear Plus +KB-1) were deployed in 2 wells. After 78 days, ISMs were evaluated for cVOCs, volatile fatty acids, anions, and key microbial groups and genes, including *Dehalococcoides*, *Dehalobacter*, *Desulfitobacterium*, and *Desulfuromonas* and tceA and VC reductase genes. Methane, ethane, and ethene were non-detect at https://www.epaz.org/assets/docs/Conference/2024/Day1_1c_LaPat%20ADEQ%20MVR%20EPAZ%20Presentation%202024.pdf

WETLAND TECHNOLOGY FOR THE TREATMENT OF HCH-CONTAMINATED WATER — CASE STUDY AT HAJEK SITE

Cernik, M., J. Nemecek, M. Strojsova, P. Svermova, T. Sazavska, and P. Brucek.
Science of The Total Environment 930:172660(2024)

The Wetland technology treats hexachlorocyclohexanes (HCH)-contaminated water by employing oxidation-reduction, biosorption, biodegradation, and phytoremediation processes that are inherently natural and require no supplementary chemicals or energy. A prototype with a capacity of 3 L/s was installed at the Hajek quarry spoil heap to optimize the technology to full scale. The system is fed by drainage water with an average concentration of HCH 129 µg/L, ClB 640 µg/L, and chlorophenols (ClPh) 16 µg/L. The system operated for two years, regularly monitored for HCH, ClB, and ClPh concentrations, and maintained to improve efficiency. The study also assessed socio and economic indicators. Depending on the flow rate, HCH removal efficiency ranged from 53.5% to 96.9% (83.9% on average). Removal efficiency was not uniform for individual HCH isomers but exhibited the trend: α= γ= δ> β= ε. The improved water quality was reflected in a biodiversity increase expressed by a number of phytobenthos species, a common biomarker of aquatic environment quality. The Wetland outranked the conventional WWTP in 10 of the 15 general categories and is the most relevant scenario from socio, environmental, and economic aspects.

EFFECTS OF TEMPERATURE ON PLANT GROWTH AND ARSENIC REMOVAL EFFICIENCY OF *PTERIS VITTATA* IN PURIFYING ARSENIC-CONTAMINATED WATER IN WINTER: A TWO-YEAR YEAR-ROUND FIELD STUDY

Kohda, Y. H.-T., K. Miyauchi, F. Rahman, H. Naruse, M. Mito, N. Kitajima, M.-F. Chien, G. Endo, and C. Inoue. I Chemosphere 362:142902(2024)

A two-year field study (cycle1 and cycle2) was conducted in Sendai, Japan, using small As-hyperaccumulator *Pteris vittata* seedlings to reduce pre-cultivation time and associated costs to treat As-contaminated water. The number of seedlings was reduced from 256 in cycle 1 to 165 in cycle 2 to evaluate the removal efficiency of *P. vittata* in As-contaminated water with different plant densities. With continuously increasing fronds, rhizomes, and root growth before the winter season, this reduction did not affect the plant's removal efficiency in decreasing the As concentration from 30 µg/L to 10 µg/L (Japan environmental quality standard). During winter, cold weather caused *P. vittata* to wither and release the accumulated As into water without a greenhouse (cycle 1). The bioaccumulation factor (BAF) and the translocation factor (TF) values for fronds decreased (BAF from 66,089 to 8,460; TF from 13.4 to 3.4). With greenhouse protection (cycle 2), *P. vittata* did not severely wither and kept accumulating As. BAF and TF values for fronds increased (BAF for fronds: from 24,372 to 36,740; TF for fronds: from 5.2 to 17.2). Maintaining the air temperature inside the greenhouse, particularly around the rhizomes, above 0°C may explain why *P. vittata* remained alive and functional during the cold winter. Results indicate that a single-layer polyethylene greenhouse was sufficient for *P. vittata* to survive the cold winter and snow in the temperate area, enabling year-round phytoremediation treatment of As-contaminated water.

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Research

NATURAL ATTENUATION POTENTIAL OF VINYL CHLORIDE AND BUTYL ACRYLATE RELEASED IN THE EAST PALESTINE, OHIO TRAIN DERAILMENT ACCIDENT

Chen, G., S. Rosolina, E. Padilla-Crespo, G. He, Q. Chen, A. Arosemena, B.E. Rosado-Maldonado, C.M. Swift, P.B. Coelho, A.J. Whelton, D. Taggart and F.E. Loffler.
Environmental Science & Technology 58(40):17743-17755(2024)

The East Palestine, Ohio train derailment released VC and butyl acrylate (BA), which entered the watershed. The natural attenuation potential of VC and BA was assessed by quantifying biodegradation biomarker genes and conducting microcosm treatability studies on streambed sediment, surface water, and private well water samples collected 128 and 276 days post-accident. qPCR detected the aerobic VC degradation biomarkers *etnC* in ~40% and *etnE* in ~27% of sediments collected in both sampling campaigns in abundances reaching 105 gene copies/g. The 16S rRNA genes of *Dehalococcoides* and *Dehalogenimonas* were detected in 50 and 64% of sediment samples collected 128 days post-accident and in 63 and 88% of sediment samples collected 276 days post-accident, respectively, in abundances reaching 107 cells/g. Elevated detection frequencies of VC degradation biomarker genes were measured immediately downstream of the accident site in Sulphur Run. Aerobic VC degradation occurred in all sediment microcosms and coincided with increases of *etnC/etnE* genes and *Mycobacterium*, a genus comprising aerobic VC degraders. The conversion of VC to ethene and an increased abundance of VC reductive dechlorination biomarker genes were observed in microcosms established with sediments collected from Sulphur Run. All anoxic microcosms rapidly degraded BA to innocuous products with intermediate formation of n-butanol and acrylate. Results indicate that microbiomes in the East Palestine watershed have natural attenuation capacity for VC and BA.

ENGINEERING ELECTRODE POLARITY FOR ENHANCING IN SITU GENERATION OF HYDROXYL RADICALS USING GRANULAR ACTIVATED CARBON

Sarrouf, S., A. Tagieddin, M.F. Ehsan, and A.N. Alshawabkeh.
Catalysts 14(1):52(2024)

A study presents an electrochemically modified granular activated carbon (GAC) cathode using electrode polarity reversal (PR) approach to enhance H_2O_2 decomposition via 2-electron oxygen reduction reaction (2e-ORR). The successful GAC modification using PR necessitates tuning of the operational parameters such as frequency, current, and time intervals between the PR cycles. This modification enhances the GAC hydrophilicity by increasing the density of surface oxygen functionalities. After optimization of the electrode polarity, using the 20 (No PR)-2 (PR) interval and 140 mA current intensity, the •OH concentration reaches 38.9 µM compared to the control (No PR) (28.14 µM). Subsequently, the enhanced •OH generation for the removal of glyphosate, a persistent pesticide used as a model contaminant, was evaluated. The modified GAC using PR removed 67.6% of glyphosate compared to 40.6% by the unmodified GAC without PR, respectively. Findings will advance the utilization of GAC for in situ reactive oxygen species synthesis, which may have direct implications on increasing the effectiveness of electrochemical water treatment systems. *This article is* ***Open Access*** *at*https://www.mdpi.com/2073-4344/14/1/52

CARBON ADSORBENT PROPERTIES IMPACT HYDRATED ELECTRON ACTIVITY AND PERFLUOROCARBOXYLIC ACID (PFCA) DESTRUCTION

Santiago-Cruz, H., Z. Lou, J. Xu, R. Sullivan, B. Bowers, R. Mole, W. Zhang, J. Li, J. Yuan, S. Dai, and G. Lowry. CS ES&T Engineering 4(9):2220-2233(2024)

A study explored mechanisms for sorbent regeneration using hydrated electrons (e_{aq}) from sulfite ultraviolet photolysis (UV/sulfite) in water. The study tested UV/sulfite treatment on granular activated carbon (GAC), carbon nanotubes (CNTs), and polyethylenimine-modified lignin (lignin). Reaction rates and defluorination of dissolved and adsorbed PFOA and PFBA were measured. Monochloroacetic acid was employed to empirically quantify e_{aq} formation rates in heterogeneous suspensions. Dissolved PFCAs reacted rapidly compared to adsorbed ones. Carbon particles in solution decreased aqueous reaction rates by inducing light attenuation, e_{aq} scavenging, and sulfite consumption. The magnitude of these effects depended on adsorbent properties and surface chemistry. GAC lowered PFOA destruction due to strong adsorption. CNT and lignin suspensions decreased e_{aq} formation rates by attenuating light. Lignin showed high e_{aq} quenching, likely due to its oxygenated functional groups. These results indicate that desorbing PFAS and separating the adsorbent before initiating PFAS degradation reactions will be the best engineering approach for adsorbent regeneration using UV/sulfite.

CHLORINATED VOLATILE ORGANIC COMPOUNDS (CVOCS) AND 1,4-DIOXANE KINETICS AND EQUILIBRIUM ADSORPTION STUDIES ON SELECTIVE MACROCYCLIC ADSORBENTS

Abaie, E., M. Kumar, U. Garza-Rubalcava, B. Rao, Y. Sun, Y. Shen, and D. Reible. Environmental Advances 16:100520(2024)

Two macrocyclic absorbents, β-CD-TFN and Res-TFN were examined for selective adsorption of chlorinated ethenes in the presence of 1,4-dioxane. Both rapidly adsorbed the CVOCs and minimally adsorbed 1,4-dioxane. Res-TFN had a higher adsorption capacity for CVOCs than β-CD-TFN (K_d 2140 -9750 L/kg versus 192-918 L/kg for 1,1, DCE, cis-1,2-DCE and TCE, respectively) and was highly selective for CVOCs (TCE K_d ~117 K_d for 1,4-dioxane). By comparison, TCE and 1,4-dioxane adsorption on AC was ~100 µg/L and ~1/3 of the adsorption of TCE on the Res-TFN. The greater adsorption and selectivity of Res-TFN suggest that it can be used as a selective adsorbent to separate CVOCs from 1,4-dioxane to allow separate biodegradation.

MECHANISTIC IMPLICATIONS OF THE VARYING SUSCEPTIBILITY OF PAHS TO PYRO-CATALYTIC TREATMENT AS A FUNCTION OF THEIR IONIZATION POTENTIAL AND HYDROPHOBICITY

Denison, S., P. Jin, K. Zygourakis, T. Senftle and P. Alvarez.
Environmental Science & Technology 58(30):13521-13528(2024)

Four PAHs with decreasing ionization potential (IP) (naphthalene > pyrene > benz(a)anthracene > benzo(g,h,i)perylene) were used to show that pyro-catalytic treatment more easily removes PAHs when deposited onto Fe-enriched bentonite (1.8% wt. ion-exchanged content). Density functional theory (DFT) calculations showed that lower IP results in stronger PAH adsorption to Fe(III) sites and easier transfer of pi-bond electrons from the aromatic ring to Fe(III) at the onset of pyrolysis. The authors postulate that the formation of aromatic radicals via this direct electron transfer (DET) mechanism initiates a cascade of aromatic polymerization reactions that eventually convert PAHs to a non-toxic, fertility-preserving char. However, IP is inversely correlated with PAH hydrophobicity (log K_{OW}), which may limit access to the Fe(III) catalytic sites (and thus DET) if it increases PAH sorption to soil OM. Ensuring adequate contact between sorbed PAHs and the catalytic reaction centers represents an engineering challenge to achieve faster remediation with a lower carbon footprint via pyro-catalytic treatment.

DC ELECTRIC FIELDS PROMOTE BIODEGRADATION OF WATERBORNE NAPHTHALENE IN BIOFILTER SYSTEMS

HeJose, J., C. Castilla-Alcantara, J.J. Ortega-Calvo, H. Harms, and L.Y. Wick.
Environmental Science & Technology 58(41):18234-18243(2024)

A study assessed the effects of a weak direct current (DC) electric field (E = 0.5 V/cm) on the biodegradation of waterborne naphthalene (NAH) by surface-attached *Pseudomonas fluorescens* LP6a in lab percolation columns. Different NAH concentrations (C_0 = 2.7, 5.1, or 7.8 × 10^{-5} mol/L) and Darcy velocities typical for biofiltration (&*Umacr;* = 0.2-1.2 × 10^{-4} m/s) were used to vary NAH bioavailability. In DC-free controls, higher specific degradation rates (q_C) at higher NAH concentrations were observed. The q_C depended on &*Umacr;*, suggesting bioavailability restrictions depending on the hydraulic residence times. DC fields consistently increased q_C, resulting in linearly increasing benefits up to 55% with rising hydraulic loadings relative to controls. EOF-altered microscale flow profiles benefit biodegradation, allowing for better NAH provision to bacteria attached to the collectors even though the electroosmotic water flow was calculated to be 100-800 times smaller than bulk water flow. Data suggests that electrokinetic approaches may give rise to future technical applications that allow regulating biodegradation, for example, in response to fluctuating hydraulic loadings.

DEVELOPMENT AND EVALUATION OF AQUATIC AND TERRESTRIAL FOOD WEB BIOACCUMULATION MODELS FOR PER- AND POLYFLUOROALKYL SUBSTANCES

Kelly, B.C., J.M. Sun, M.R.R. McDougall, E.M. Sunderland, and F.A.P.C. Gobas.
Environmental Science & Technology 58(40):17828-17837(2024)

This study presents (i) the development of novel mechanistic aquatic and terrestrial food web bioaccumulation models for PFAS and (ii) an evaluation of model performance using available lab and field data. Model predictions of lab-measured bioconcentration factors and field-based PFAS bioaccumulation factors in fish were in good agreement with observed data as measured by the mean model bias (MB), representing systematic over- or under-estimation and the standard deviation of the MB, representing general uncertainty. The models provide a mechanistic framework for evaluating the combined effect of simultaneously occurring uptake and elimination processes and indicate food web-specific magnification of PFAS, with the highest degree of biomagnification occurring in food webs composed of air-breathing wildlife. Albumin-water, structural protein-water, membrane-water distribution coefficients, and renal clearance rate are among the most important model parameters. With further development and testing, these models may be useful for future PFAS screening and risk assessment initiatives and advance bioaccumulation studies of PFAS by providing a mechanistic framework for PFAS bioaccumulation.

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General News

GUIDANCE ON NATURAL SOURCE ZONE DEPLETION

CL:AIRE (Contaminated Land: Applications in Real Environments), Reading. ISBN 978-1905046-44-7, 98 pp, 2024

This document captures recent advances in natural source zone depletion (NSZD) alongside a decision-making framework to provide technical guidance for practitioners, regulators, and liability owners on the science and practical considerations for applying NSZD-based risk management strategies in the UK. The framework is a three-stage procedure designed to mesh with existing risk management procedures. The stepwise framework includes 1) Screening NSZD feasibility by confirming that LNAPL and NSZD processes do not pose risks to receptors and evaluating technical, practical, economic, sustainability, and regulatory constraints; 2) Demonstrating that the NSZD rate can achieve remediation objectives through good quality data collection supporting defensible conceptualization of NSZD processes; and 3) Implementing a long-term performance monitoring program to confirm that NSZD continues to be protective of receptors and capable of achieving remediation objectives, resulting in eventual closure of risk-management measures for LNAPL.
https://claire.co.uk/component/phocadownload/category/22-important-industry-documents?download=992:nszd-guidance

A REVIEW OF ADVANCED BIOREMEDIATION TECHNOLOGIES FOR DIOXIN-CONTAMINATED SOIL TREATMENT: CURRENT AND FUTURE OUTLOOK

Tran, H.-T., H.G. Hoang, W.E. Chacha, S. Mukherjee, T.V.H. Duong, N.S.H. Nguyen, K.N. Nguyen, and R. Naidu. | Chemosphere 366:143400(2024)

A meta-analysis strategy was employed to provide an up-to-date assessment of the global situation of dioxin-contaminated soil. Dioxin concentrations are commonly higher in industrial and urban areas than in rural areas, primarily due to anthropogenic activities such as chemical manufacturing and waste incineration. Several advanced bioremediation technologies for dioxin treatment, including biosurfactants, composting, and phytoremediation are highlighted and discussed. Aerobic composting is robust in removing dioxins, achieving treatment efficiencies ranging from 65% to 85%. Phytoremediation, particularly when involving crops like zucchini, cucumber, and wheat, shows great promise in dioxin removal through various mechanisms, including root uptake and transpiration. Biosurfactants such as rhamnolipids and sophorolipids have been effectively used to remediate dioxin-contaminated soil due to their significantly enhanced bioavailability of dioxins and their interaction with microbes.
https://www.sciencedirect.com/science/article/pii/S0045653524022987/pdfft?md5=c7329b61fe76adff651cb3423911b000&pid=1-s2.0-S0045653524022987-main.pdf

ALTERNATIVE APPROACH TO PUMP AND TREAT/MCLS AND MEETING THE NEW EPA ACCELERATED CLOSURE DIRECTIVES: A SUSTAINABLE PLUME MANAGEMENT APPROACH USING THE ARIZONA WQARF MODEL AND ADAPTIVE MANAGEMENT

Zachary, S.P. | Battelle 2024 Chlorinated Conference, 2-6 June, Denver, CO, 17 slides, 2024

Faced with numerous large-scale "orphan" groundwater impact sites and escalating cleanup costs, the State of Arizona understood the cost and time implications of using conventional maximum contaminant level (MCL)-based remedial goals and cleanup management models. Regulators worked with EPA, local agencies, and community members to develop an alternative resource-focused protective, cost-effective, and sustainable statute under the Water Quality Assurance Revolving Fund, focusing on human health protection primarily through groundwater management instead of conventional groundwater restoration "throughout the plume." This innovative approach replaces the pseudo-default of complete groundwater restoration to MCLs with a three-pronged approach that ensures protection of human health and the environment by managing impacted groundwater using a "restoration, replacement, or otherwise provide for" approach. A traditional feasibility study is used to evaluate the most reasonable and practicable approach that may include both remedial "strategies" (traditional approaches such as source area remediation, groundwater restoration, and hydraulic control) and/or remedial "measures" (groundwater management approaches addressing the needs of impacted water providers that include wellhead treatment, well deepening or replacement, and water replacement) to address the needs of impacted water providers efficiently. This model provides an excellent opportunity for EPA to meet new expedited closure goals more quickly and cost-effectively. https://xcdacademy.s3.amazonaws.com/battelle/2024_Chlorinated/C2_1555_975_Zachary.pdf

RETHINKING PUMP-AND-TREAT REMEDIATION AS MAXIMIZING CONTAMINATED GROUNDWATER

Carroll, K.C., M.L Brusseau, G.R. Tick, and M.R. Soltanian.
Science of The Total Environment 918:170600(2024)

'Pump-and-treat" techniques have been the most widely used method to remediate groundwater contamination since the 1980s. By 1982, pump-and-treat was included in 100% of Superfund groundwater remedy decisions; applications decreased continuously after 1992, likely associated with the documented limitations of pump-and-treat to achieve complete remediation with site closure. Several factors can limit pump-and-treat effectiveness, leading to extended cleanup times and the generation of enormous volumes of extracted groundwater, creating conditions for maximizing the amount of contaminated groundwater needing treatment. This article highlights a means by which to reassess our approach to remediation by recognizing that pump-and-treat, due to its well-documented limitations, often maximizes the generation of contaminated groundwater.

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.

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