Entries for January 1-15, 2026

Market/Commercialization Information

ENVIRONMENTAL SECURITY TECHNOLOGY CERTIFICATION PROGRAM (ESTCP) - INSTALLATION ENERGY AND WATER TECHNOLOGIES (EW) SUPPLEMENTAL (PRESOL)
U.S. Army Corps of Engineers, Humphreys Engineer Center Support Activity, Alexandria, VA
Contract Opportunities on SAM.gov W912HQ26S0030, 2026

This is a pre-solicitation notice for planning and informational purposes only. The Environmental Security Technology Certification Program (ESTCP), in coordination with the U.S. Army Corps of Engineers, seeks pre-proposals from qualified private sector organizations under a Broad Agency Announcement for Fiscal Year 2027 to demonstrate and validate innovative, cost-effective Installation Energy and Water technologies that enhance DoD installation resilience, energy security, water efficiency, and infrastructure sustainment. ESTCP is soliciting mature, non commercial technologies that have completed proof-of-concept and are ready for operational demonstration at DoD facilities to generate defensible cost and performance data, support regulatory and end-user acceptance, and accelerate technology transition and implementation across DoD. Selected projects will involve structured demonstrations under real-world conditions, development of guidance and reporting deliverables, engagement with DoD users and regulators, and participation in a multi-stage competitive evaluation process beginning with a mandatory pre-proposal submission. To be eligible for consideration, parties wishing to respond to this announcement must submit a pre proposal in accordance with the instructions on the website, no later than 2:00 PM EDT on March 26, 2026. https://sam.gov/workspace/contract/opp/6cc929c10917425 4b8fbd1a72d736267/view

INDEFINITE DELIVERY/ INDEFINITE QUANTITY (IDIQ) CONTRACT FOR ENVIRONMENTAL SAMPLING SERVICES
Naval Facilities Engineering Command, NAVFAC Mid-Atlantic
Contract Opportunities on SAM.gov N4008526R0010, 2026

This Indefinite Delivery/ Indefinite Quantity (IDIQ) contract with recurring and non-recurring Environmental Sampling Services will be issed under NAICS code 541380 at the Naval Weapons Station Crane, Crane, IN and Lake Glendora Test Facility, Sullivan, Indiana. The contractor shall have the ability to provide environmental sampling services including building and equipment surveys, consultation and program management support related to asbestos, lead, PCBs, soil and water, environmental condition of property assessments, and testing and laboratory analysis services. Additional services required include library, database file, and program support related to these environmental programs. This acquisition will result in the award of a contract for a term of one 12-month base period and four 12-month option periods. The term of the contract will not exceed 60 months or the total value of the contract, whichever comes first. The options may be exercised within the time frame specified in the resultant contract at the sole discretion of the Government subject to workload and/or satisfaction of the contractor?s performance under this contract. https://sam.gov/workspace/contract/opp/c400de0d9d16442c9ea370ef084f6a56/view

NAVAJO AREA - ABANDONED MINES RESPONSE AND CONSTRUCTION SERVICES (SNOTE)
U.S. Environmental Protection Agency, Region 9 Contracting Office, San Francisco, CA
Contract Opportunities on SAM.gov 68HE0926R0006, 2026

This is a special notice under NAICS code 562910. EPA requires a contractor to provide cleanup, response, and construction services, primarily at former uranium mining-related sites located within or near the Navajo Nation and the Grants Mining District in New Mexico in U.S. EPA Regions 6 and 9. The U.S. EPA expects to make an award for this requirement by September 1, 2026. A pre-proposal Industry Day/Conference amongst the U.S. EPA and Potential Offerors is anticipated to occur approximately one week after the Request For Proposals Solicitation is posted on FEDCONNECT and SAM.gov. https://sam.gov/workspace/contract/opp/5c44292dbf1d4217951d5659bc2cd9f4/view

PRE-SOLICITATION NOTICE AND DRAFT RFP FOR ENVIRONMENTAL REMEDIATION SERVICES (ERS) SINGLE AWARD TASK ORDER CONTRACT (SATOC) FOR THE SHAW AIR FORCE BASE OPTIMIZED REMEDIATION CONTRACT (ORC) (PRESOL)
U.S. Army Corps of Engineers, South Atlantic Engineer Division, Savannah District, Savannah, GA
Contract Opportunities on SAM.gov W912HN26RA009, 2026

When this solicitation is released on or about March 12, 2026, it will be competed as a total small business set aside under NAICS code 562910. The U.S. Army Corps of Engineers plans to issue a solicitation for Environmental Remediation Services under a Single Award Task Order Contract (SATOC). This contract will enable USACE to provide a full range of environmental remediation services in support of the Air Force Civil Engineer Center's Optimized Remediation Contract at Shaw Air Force Base in South Carolina. The primary objective is the remediation of soil and groundwater contaminated with a variety of substances, including PFAS, chlorinated solvents, petroleum products, and explosive constituents. The contractor must have the capability to perform these services at Hazardous, Toxic, and Radioactive Waste sites funded through the Department of Defense Installation Restoration Program or the Defense Logistics Agency at Shaw AFB. The base period for the SATOC will be seven years, with a total contract ceiling of $40,000,000. The pricing structure will be firm-fixed-price. A site visit is scheduled for March 5, 2026; attendee lists are due no later than February 23, 2025. There is no solicitation at this time. https://sam.gov/workspace/contract/opp/ee08eada59df46efac16bfc794141226/view

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Cleanup News

CASE STUDIES IN REMEDIATION OF EMERGING CONTAMINANTS AND CONTAMINATED SITES
Vidyasagar, G.V. and P. Keerthi. Chapter of Emerging Contaminants in the Environment, p 403-413, 2026

This chapter explores a range of real-world case studies that demonstrate effective remediation techniques contaminants, including PFAS, across global contexts. It focuses on examples such as arsenic removal in West Benga to advanced solutions like foam fractionation for PFAS treatment in Australia, the use of constructed wetlands for eliminating pharmaceutical residues in Spain, and the application of nanotechnology for chromium cleanup in the U.S. A comparative analysis sheds light on the performance, scalability, and limitations of each method. The chapter wraps up with key takeaways and forward-looking suggestions for improving future remediation practices.

DEMONSTRATION STUDY OF OZONE/ACTIVATED CARBON ENHANCED GROUNDWATER CIRCULATION WELL FOR REMEDIATION OF A PETROLEUM CONTAMINATED SITE
Zhu, X., Y. Wang, Y. Lai, Q. Shan, X. Tian, D. Zhao, R. Zhang, B. Yu, Z. Qu, and W. Chen. Water Resources 53:191-200(2026)

The improvement of traditional groundwater circulation wells by utilizing ozone for aeration while filling the upper planar hole with activated carbon, was used to determine the treatment effect of total petroleum hydrocarbons, benzene and toluene. After 192 h of groundwater ozone aeration at 30 L/min, the removal rates of total petroleum hydrocarbons, benzene and toluene in ZJ1, a circulation well in the area closer to the pollution source, reached 97.46, 99.54 and 90%. Removal rates of total petroleum hydrocarbons, benzene and toluene in ZJ2, located in the area farther away from the source of contamination, reached 99.76, 99.42 and 99.1%. The ozone/activated carbon enhanced groundwater circulation well had an impact radius of 5 m. Among the three monitoring wells, GW1, GW2 and GW3, the highest removal rate of each pollutant was found in GW3, followed by GW2, and the lowest was found in GW1. Compared to the existing groundwater circulation well, the remediation efficiency was improved in the ozone/activated carbon enhanced groundwater circulation well.

ASSESSING PLUME STABILITY TO SUPPORT TRANSITION FROM ACTIVE REMEDIATION TO MONITORED NATURAL ATTENUATION
Malkemus, D., T. Roth, and P. Zawislanski. | Northwest Remediation Conference, 20 October, Tacoma, WA, 29 slides, 2025

A scientific framework is presented for evaluating groundwater plume stability to determine when it is appropriate to transition from active remedial actions to monitored natural attenuation (MNA). The presentation describes how contaminant plumes evolve over time through natural processes such as dispersion, dilution, sorption, and biodegradation, and emphasizes the importance of understanding both concentration trends and mass-based metrics in plume assessment. Traditional concentration-based trend analysis was contrasted with mass and mass discharge approaches, noting that statistical methods alone often fail to quantify actual rates of change and plume behavior. The presentation also illustrates methods for calculating plume decay rates, bulk attenuation, mass flux, and mass discharge, and highlights their value in objectively characterizing plume stability. A detailed case study is presented, demonstrating how data on contaminant concentrations, mass removal, and trend analyses can be integrated to show decreases in plume area and discharge over time, supporting a defensible shift toward MNA. The conclusions emphasize the need for multiple lines of evidence, including trend statistics, attenuation rates, plume footprint evolution, mass discharge trends, and supporting geochemical and biological data, to establish a scientifically robust basis for transitioning to MNA while ensuring long-term protectiveness. https://nwremediation.com/wp-content/uploads/B3MALK1.pdf

LESSONS LEARNED FROM IN-SITU ACTIVATED CARBON AMENDMENT APPLICATIONS TO TREAT DIOXIN/FURAN CONTAMINATION IN THE SCANLON AND THOMSON RESERVOIRS, ST. LOUIS RIVER AREA OF CONCERN

Lehto, L., B. Leick, C. Nigrelli and M. Kern. | SETAC North America 46th Annual Meeting, 16-20 November, Portland, OR, abstract only, 2025

The Minnesota Pollution Control Agency partnered with EPA's Great Lakes National Program Office on two Great Lakes Legacy Act projects to remediate dioxin/furan contaminated sediments in the Scanlon and Thomson Reservoirs. Due to the geologic and hydrodynamic constraints of the reservoirs, remedial capping and dredging/removal were not viable remedial alternatives. The selected remedy was application of a pelletized form of powdered activated carbon (PAC) amendment to minimize uptake of contaminants from the sediment to benthic invertebrates. Approximately 238 tons of pelletized PAC were placed over a 13.7-acre area at the Scanlon Reservoir. Upon completion, the Thomson Reservoir project is projected to place 18,600 tons of pelletized PAC over ~66 acres. Pelletized activated carbon placement at this scale is a new and novel way of mitigating the bioavailability of contaminants, leading to design and implementation unknowns. Dust mitigation strategies during transfer and placement of the amendment were developed during full-scale placement at both sites. Quality assurance and quality control procedures to verify PAC placement thicknesses were independently developed for each site and modified during placement to achieve the best possible data. Accessing and placing pellets in shallow and variable water depths were also overcome with varying degrees of success. Robust plans were developed to monitor the activated carbon and in situ porewater concentrations post-placement to track remedy effectiveness. *More information on the site:* https://www.pca.state.mn.us/air-water-land-climate/area-of-concern-projects-and-progress

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Demonstrations / Feasibility Studies

WELCOME TO THE VADOSE ZONE: THE USE OF LYSIMETERS IN THE EVALUATION OF PFAS SOURCES AT THREE SITES IN NORTHERN NEW ENGLAND
Duncan, J. | AEHS Foundation 41st Annual International Conference on Soils, Sediments, Water and Energy 20-23 October, Amherst, MA, 28 slides, 2025

Multiple lysimeters were installed at three sites in New Hampshire to evaluate potential PFAS sources, which had previously been detected in groundwater. The sampling devices provided site-specific and potentially more representative data to evaluate PFAS leaching from soil and biosolids-amended soil. The installation and use of lysimeters, along with related technical challenges, are presented. Data obtained from lysimeter-collected pore water, compared with results from co-located soil, groundwater, and/or Synthetic Precipitation Leaching Procedure (SPLP) leachate, are discussed, along with lessons learned from data analysis, particularly as they regard the development of future sampling plans. The subject sites include a school, a landfill, and a former industrial waste processing site. In each case, groundwater was suspected of being impacted by PFAS present in applied biosolids and/or soil that had been disturbed through previous remedial efforts. Results confirmed the subject soil and biosolids-amended soil as potential sources of PFAS to groundwater. These investigations have shown lysimeters to be useful sampling devices for site investigations potentially involving the transport of PFAS from soil to groundwater, while also providing valuable lessons learned for future projects.
https://s3.amazonaws.com/amz.xcdsystem.com/A51108D5-EA2E-2B6D-01D92AC0E42DCE3B_abstract_File26129/PDFofPresentation_89_1020022350.pdf

IMPLICATIONS FOR MODELING ANION EXCHANGE TREATMENT OF PERFLUOROALKYL SUBSTANCES IN DRINKING WATER AND RELATED NATURAL ORGANIC IMPACTS: A PILOT STUDY
Smith, S., D. Wahman, E. Kleiner, B. Gray, T. Sanan, E. Stebel, C. Gastaldo, E. Hughes, S. Pedigo, B. Datsov, M. Lathrop-Allen, I. Bass, J. Quinn, G. Abulikemu, J. Pressman, G. Sorial, and L. Haupert. | Water Research 288(Part B):124685(2026)

To better understand natural organic matter (NOM) impacts on PFAS removal in drinking water, this study investigated PFAS breakthrough from pilot-scale fixed-bed anion exchange columns fed a stable water quality influent with and without addition of reconstituted Ohio River water NOM at four empty bed contact times (EBCTs; 0.5-, 1.0-, 1.5-, and 2.5-min). PFAS elution order was mostly consistent with previously reported batch-derived selectivity with respect to chloride ($K_{X/Cl}$), with deviations in bed volumes to early breakthrough (BV10) attributed to molecular size-exclusion kinetic limitations. Earlier breakthroughs were observed with NOM compared to without NOM. NOM impacts on BV10 were greater for larger, later-eluting PFAS. An ion exchange column model (IEX-CM; https://github.com/USEPA/Water_Treatment_Models) was applied to evaluate correlations for estimating film mass transfer coefficient (k_L) and to estimate PFAS intraparticle diffusion coefficient (D_S) and $K_{X/Cl}$ by fitting PFAS effluent data to IEX-CM simulated concentrations, resulting in most PFAS breakthrough curves being well-described by IEX-CM simulations. Some deviations from the IEX-CM were noted, including unexplained chromatographic effects on PFHxA and apparent non-adsorption hexafluoropropylene oxide dimer acid (HFPO-DA or GenX chemicals) removal, which was enhanced by increasing EBCT and the absence of NOM.

A METHOD FOR EVALUATING THE EFFECTS OF GENTLE REMEDIATION OPTIONS (GRO) ON SOIL HEALTH: DEMONSTRATION AT A DDX-CONTAMINATED TREE NURSERY IN SWEDEN

Drenning, P., Y. Volchko, A. Enell, D.B. Kleja, M. Larsson, and J. Norrman.
Science of The Total Environment 948:174869(2025)

An accessible, scientific method for soil health assessment was developed and demonstrated for a field experiment at a DDX-contaminated tree nursery site in Sweden to evaluate the relative effects of gentle remediation options (GRO) on soil health (i.e., the 'current capacity' to provide ecosystem services [ES]). For the set of relevant soil quality indicators (SQI) selected using a simplified logical sieve, GRO treatment was observed to have highly significant effects on many SQI according to statistical analysis due to the strong influence of biochar amendment on the sandy soil and positive effects of nitrogen-fixing leguminous plants. The SQI were grouped within five soil functions (SF), and the relative effects on soil health were evaluated compared to a reference state (experimental control) by calculating quantitative treated-SF indices. Multiple GRO treatments had statistically significant positive effects on many SF, including pollutant attenuation and degradation, water cycling and storage, nutrient cycling and provisioning, and soil structure and maintenance. The SF were in turn linked to soil-based ES to calculate treated-ES indices and an overall soil health index, which can provide valuable information to decision-makers regarding the effectiveness of GRO. The experimental GRO treatment of the legume mix with biochar amendment and grass mix with biochar amendment resulted in statistically significant improvements to soil health, with overall SHI values of 141% and 128%, respectively, compared to the reference state of the grass mix without biochar (set to 100%).
https://www.sciencedirect.com/science/article/pii/S0048969724050186/pdfft?md5=dc1008ed9288e834cf8e71454e49da6f&pid=1-s2.0-S0048969724050186-main.pdf

ARRAY OPTIMIZATION AND PILOT VERIFICATION OF ELECTROKINETIC-ENHANCED BIODECHLORINATION SYSTEM

Yu, S.-T., Z.-T. Li, S.-Y. Yang, Q. Cai, S. Yuan, X. Song, A. Tiehm, and H.-P. Zhao.
Environmental Science & Technology 60(3):2566-2577(2026)

A comprehensive electrokinetic bioremediation (EK-BIO) lab-to-field framework was established that included lab batch experiments, array optimization, pilot-scale field validation, and life cycle assessment was established. Primarily, batch and column experiments optimized both the additive dosage strategy and electrode array configuration, favoring a 6-day preinoculation of the niche-preparing culture and a unidirectional one-dimensional electrode setup. Guided by the results, the 98-day EK-BIO pilot experiment achieved >90.0% TCE removal, with a 74.0% chloroethylene-to-ethylene conversion efficiency. Microbial community analyses further revealed a notable increase in the relative abundance of putative organohalide-respiring bacteria in the EK-BIO, ~25.6% and 34.3% higher than in bioaugmentation and electrokinetic treatments, respectively. Additionally, life cycle assessment results underscored the advantages of EK-BIO over conventional thermal remediation alternatives, with reductions in carbon emissions, energy consumption, and remediation costs. The study validated the feasibility and reliability of EK-BIO technology, supporting its advancement for the in situ remediation of organochlorine-contaminated sites.

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Research

PATHWAYS FOR THE MINERALIZATION OF PERFLUOROOCTANESULFONIC ACID UNDER A SMOLDERING REDUCTIVE ATMOSPHERE

Zhan, M., Z. Zhang, Y. Shan, J. Fu, P. Cai, and W. Jiao.
Environmental Science & Technology 60(4):3668-3680(2026)

In this study, PFOS smoldering degradation pathways and relative bond cleavage mechanisms were deduced from lab-scale byproduct profiles and supported by reactive force field simulations and quantum-chemical calculations. Smoldering self-sustained at a 0.79 MJ/kg calorific value and 1.5-2.5 cm/s air Darcy velocity. The removal rate of PFOS reached 98.1%, with only ~50% energy consumption compared with that of conventional incineration under equivalent degradation conditions. Investigations revealed distinct degradation pathways in smoldering compared with traditional approaches: in a CO atmosphere, early C-C bond scission and CO-coupled sulfur transformation were predicted (potentially evolving toward COS). This pathway played a dominant role in PFOS degradation, providing more efficient sulfur-group transformation, less toxic byproducts, and better compatibility with oxygen-limited conditions. Pilot-scale experiments further validated the feasibility for field applications, achieving 98.6% PFOS removal. Findings provide mechanistic insights into improved smoldering-based PFAS remediation under reductive conditions and optimization of treatment strategies toward higher efficiency and environmental safety.

DECONVOLUTING AND INTERPRETING NONTARGETED CHEMICAL DATA: A DATA-DRIVEN FORENSIC WORKFLOW FOR IDENTIFYING THE MOST PROMINENT CHEMICAL SOURCES IN RECEIVING WATERS

Shi, C., C.M.G. Carpenter, D.E. Helbling, and G.D. Jones.
Environmental Science & Technology 59(36):19307-19317(2025)

This article presents a data-driven workflow that reduces bias on existing workflows that often rely on predefined targets and known sources, by applying an unsupervised machine learning technique. Both nonmetric multidimensional scaling (NMDS) and non-negative matrix factorization (NMF) were applied on the same nontargeted chemical data set to compare their different interpretations of environmental sources. Weekly nontargeted data were collected from the Fall Creek Monitoring Station (Ithaca, NY), where daily samples were previously analyzed using source-defined models. NMF was first used to decompose the full nontargeted chemical data set into a small set of chemical factors representing distinct composition profiles. Each factor was then interpreted through (1) Spearman correlations with watershed characteristics and (2) suspect screening of high-weighted nontargeted features. In addition to confirming known anthropogenic inputs, analysis revealed potential novel sources associated with snowmelt, groundwater seepage, and seasonal hydrological dynamics. An annual shift in the chemical composition was also detected, highlighting the evolving influence of these sources. This workflow enables watershed managers to move beyond predefined sources, detect both known and emerging chemical contributors, and apply adaptive, evidence-based strategies to protect water quality under changing conditions.

ELECTROKINETIC MOBILIZATION OF PFAS IN SOILS: LINKING HEAD GROUP AND CHAIN LENGTH TO REMEDIATION EFFICIENCY

Dhulia, A., C. Abou-Khalil, K. Mustafa, D. Sarkar, M.C. Boufadel.
Chemosphere 396:144837(2026)

Five PFAS compounds (PFBA, PFOA, PFDA, PFOS, and FOSA) were selected to investigate the influence of molecular structure, representing variations in chain length and head group, on remediation efficiency. Electrokinetic (EK) remediation and hydraulic gradient (HG) treatments were applied to soil with organic matter contents of 5%, 30%, and 50%. PFAS removal was highly influenced by the molecular structure of the species. Both EK and HG were effective at mobilizing short-chain PFAS, which are more mobile in porewater. However, moving longer-chain or more strongly sorbing PFAS was more challenging. The compounds responded better to HG due to the stronger advective forces and may require a combination of HG and EK to achieve significant mobilization. Overall, PFOS, FOSA, and PFDA showed limited mobilization under either treatment due to their stronger sorption to soil organic matter, which restricts both electrokinetic and hydraulic transport. Findings highlight the need to align remediation strategies with PFAS physicochemical properties and soil composition to improve field-scale treatment efficiency.

ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) IN CONSUMER FOOD PACKAGING

Stroski, K. and Y. Sapozhnikova. | Chemosphere 395:144824(2026)

A new method was developed and validated to analyze 73 PFAS from 15 different classes in paper and plastic food contact materials (FCMs) based on methanolic extraction and liquid chromatography-mass spectrometry (LC-MS/MS) analysis. The method was validated at three spiking levels with five replicates per level. Acceptable recoveries and repeatability were achieved for 96-100% of analytes between various spiking levels and food packaging materials. The validated method was used to test 66 paper and plastic food packaging materials in direct contact with the previously tested food samples of chicken, pork, beef, and catfish purchased from grocery stores in the U.S. Nine PFAS were detected in the samples: 8:2 FTSA, 6:2 diPAP, 8:2 diPAP, diSAmPAP, PFBA, PFHxA, PFOA, PFBS, and PFOS with ΣPFAS concentrations ranging from 0.11 to 16.3 ng/g. At least one PFAS was detected in 64% of the samples. The most frequently detected PFAS was 6:2 diPAP found in 61% of samples, across all material types in concentrations of 0.09-10.3 ng/g. Results suggest no evidence of PFAS transfer from FCMs tested in this study to packaged food tested in a previous study.

IMPACT OF MULTIPLE HVAC SYSTEMS ON INDOOR AIR VOC AND RADON CONCENTRATIONS FROM VAPOR INTRUSION DURING SEASONAL USAGE

Zimmerman, J.H., A. Williams, B. Schumacher, C. Lutes, R. Warrier, B. Cosky, B. Thompson, C.W. Holton, and K. Bronstein. | Atmosphere 16(4):378(2025)

Samples were collected between December 2020 and April 2022 at six commercial buildings in Fairbanks, Alaska, to evaluate VI risks and estimate the reasonable maximum exposure (RME) to the occupants. The types of samples collected included indoor air (IA); outdoor air; subslab soil gas; soil gas; indoor radon; differential pressure; indoor and outdoor temperature; heating, ventilation, and air conditioning (HVAC) parameters; and other environmental factors. The buildings near the VOC source/release points showed less variability in indoor air concentrations of TCE and PCE compared to buildings located farther downgradient from the contaminated groundwater plume. The VOC data pattern for the source area buildings shows an outdoor air temperature-dominated behavior for indoor air concentrations in the summer season. HVAC system operations had less influence on long-term indoor air concentration trends than environmental factors, which was supported by similar indoor air concentration patterns independent of location within the plume. Using soil temperature and indoor/outdoor temperatures as indicators and tracers (I&Ts) across the plume as predictors of the sampling period could produce a good estimation of the reasonable maximum exposure for the building occupants. Results, which show the use of soil temperature and indoor/outdoor temperatures as I&Ts, will help advance investigative methods to evaluate vapor intrusion in similar settings and thereby improve the protection of human health in indoor environments. *This article is* ***Open Access*** *at* https://www.mdpi.com/2073-4433/16/4/378.

EFFECT OF LOW-TEMPERATURE THERMAL DECHLORINATION ON POLYCHLORINATED NAPHTHALENES IN MUNICIPAL SOLID WASTE INCINERATION FLY ASH: CONCENTRATIONS, CONGENER PROFILES, AND DIOXIN-LIKE TOXICITY

Ito, K., S. Mizutani, and Y. Yabuki. | Chemosphere 395:144834(2026)

The concentrations, congener profiles, and dioxin-like toxicities of polychlorinated naphthalenes (PCNs) and PCDD/Fs were evaluated in municipal solid waste incineration (MSWI) fly ash before and after low-temperature thermal dechlorination (LTD) at five full-scale facilities. LTD consistently induced stepwise dechlorination, reducing the average chlorination degree of PCNs by 1.1-1.5 points. However, total PCN concentrations exhibited facility-dependent behavior: decreases of 98-99% were observed at some facilities, whereas others showed increases of 230-370% relative to pre-LTD levels. The mass increase is plausibly attributed to the reformation of low-chlorinated PCNs on the fly ash carbon surfaces during the cooling phase. Despite these contrasting changes in mass concentrations, PCN-derived dioxin-like toxicity (PCN-TEQ) decreased substantially at all facilities (35-99% reduction). This robust detoxification occurred because LTD preferentially degrades the highly chlorinated congeners (e.g., 1,2,3,6,7,8-hexaCN and 1,2,3,4,6,7-hexaCN) that dominate PCN-TEQ. The PCN contribution to total toxicity consequently declined from 0.18 to 0.45% before LTD to 0.03-0.30% afterward. For PCDD/Fs, LTD generally lowered mass concentrations, although PCDD/F-TEQ reductions varied among facilities due to differences in residual high-TEF congeners. Findings unequivocally demonstrate that LTD is a highly effective strategy for mitigating the dioxin-like toxicity associated with PCNs in MSWI fly ash. Results enhance understanding of chlorinated pollutant transformation during full-scale LTD operation and support its optimization for safer MSWI fly ash management.

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General News

BIOENGINEERED ENDOPHYTE-INTEGRATED BIOSENSORS: A NEW FRONTIER IN ENVIRONMENTAL MONITORING AND REMEDIATION

Dhar, I., A. Sharma, A. Kumawat, A. Dadhich, H. Priyadarshi, L. Sharma, and M.M. Sharma. Experimental and Computational Advances in Materials p 339-382, 2026

This book chapter examines integrated approaches that combine biological materials, such as plant endophytes and enzyme systems, with nanomaterial-based biosensors for real-time environmental monitoring. Endophytes, known for their metal chelation, enzymatic activity, and stress tolerance, serve dual roles in contaminant detection and remediation. Coupled with green synthesis of nanoparticles and phytoremediation, these biological systems contribute to low-impact, resource-efficient cleanup processes. Advances in material characterization, nanostructure design, and surface engineering have improved biosensor sensitivity and selectivity across complex environmental matrices. In addition, computational tools such as life cycle assessment, predictive modeling, and machine learning aid in optimizing biosensor performance and assessing long-term environmental impacts. The chapter highlights how the convergence of experimental innovations and computational methodologies in materials science enables the design of smart, multifunctional systems for pollution management. Emphasis is placed on sustainability, adaptability, and real-world applicability, aligning with the broader goals of circular economy and green engineering. The interdisciplinary perspective supports the ongoing transition toward environmentally responsible technologies within the framework of materials science and engineering.

A CRITICAL REVIEW OF SURFACTANT-ENHANCED AQUIFER REMEDIATION FOR DNAPLS: RESIDUAL MORPHOLOGY, GOVERNING FACTORS, AND REMOVAL MECHANISMS Huang, C., B. He, Z. Liu, Z. Zhou, and Y. Li. Environmental Geochemistry and Health 48:134(2026) This review analyzes DNAPL migration and retention, identifying the residual phase as the critical barrier to successful remediation. Surfactant-enhanced aquifer remediation (SEAR) performance critically depends on surfactant properties, aquifer media, and hydrodynamic conditions, leading to variable outcomes. A comprehensive analysis of residual phase DNAPL migration mechanisms reveals that DNAPL movement is predominantly controlled by the interplay of gravitational, capillary, and viscous forces. The article presents a force-balance analytical framework connecting DNAPL displacement to key remediation parameters. Remediation success relies on identifying and regulating dominant forces under site-specific conditions, while aquifer heterogeneity and coupled parameters add complexity in three-dimensional field settings. Thus, multi-parameter interactions need systematic evaluation. Large-scale research on multi-parameter coupling mechanisms is currently lacking, and future efforts should address this to advance precise DNAPL remediation strategies.

Huang, C., B. He, Z. Liu, Z. Zhou, and Y. Li.
Environmental Geochemistry and Health 48:134(2026)

This review analyzes DNAPL migration and retention, identifying the residual phase as the critical barrier to successful remediation. Surfactant-enhanced aquifer remediation (SEAR) performance critically depends on surfactant properties, aquifer media, and hydrodynamic conditions, leading to variable outcomes. A comprehensive analysis of residual phase DNAPL migration mechanisms reveals that DNAPL movement is predominantly controlled by the interplay of gravitational, capillary, and viscous forces. The article presents a force-balance analytical framework connecting DNAPL displacement to key remediation parameters. Remediation success relies on identifying and regulating dominant forces under site-specific conditions, while aquifer heterogeneity and coupled parameters add complexity in three-dimensional field settings. Thus, multi-parameter interactions need systematic evaluation. Large-scale research on multi-parameter coupling mechanisms is currently lacking, and future efforts should address this to advance precise DNAPL remediation strategies.

BIODEGRADATION OF PER- AND POLYFLUOROALKYL SUBSTANCES: MECHANISMS, CHALLENGES, AND EMERGING STRATEGIES FOR SUSTAINABLE REMEDIATION

Nasrollahpour, S., S. Purewal, R. Kumar Das, and S. Kaur Brar.
Environmental Science Water Research & Technology 12:397(2026)

This review provides a comprehensive synthesis of current knowledge and outlines strategic directions to advance PFAS biodegradation research and its practical implementation. Innovative strategies, including enzyme immobilization, phytoremediation, hybrid chemical-biological systems, and machine learning-based predictive modeling, are evaluated for their potential to enhance treatment efficiency. Remaining challenges include an incomplete understanding of metabolic pathways and limited scalability. A future research roadmap is proposed to integrate metabolic engineering, system optimization, and field-scale validation toward effective, sustainable PFAS biodegradation. https://pubs.rsc.org/en/content/articlepdf/2026/ew/d5ew00888c

EVALUATION ON THE BIOLOGICAL ASPECT OF PLANT, CONTAMINANT TYPES AND APPLICATION OF PHYTOREMEDIATION FOR ENVIRONMENTAL AND ECONOMICAL SUSTAINABILITY

Ghadge, S.A., P. Trivedi, B. Kumar. M, V. Singh, R. Mondal, A. Krishna V, and D.S. Painkra.
Journal of Advances in Biology & Biotechnology 29(1):75-95(2026)

The phytoremediation potential of hyperaccumulators, grasses, woody trees, aquatic plants, and food crops against heavy metals (Pb, Cd, As, Cr, Ni, Zn), organic pollutants (PAHs, PCBs, pesticides), radionuclides, pharmaceuticals, microplastics, and nutrient-induced eutrophication is systematically assessed in this review. It explains key physiological and molecular processes, including metal uptake via ZIP and HMA transporters, detoxification through phytochelatins, metallothioneins, vacuolar sequestration, root exudate-mediated mobilization, and microbial degradation. Technological advances such as CRISPR/Cas-based genetic modification, nano-enabled phytoremediation, synthetic plant-microbiome consortia, remote sensing, GIS-driven monitoring, and phytomining for metal recovery are emphasized. Field-based applications in mining zones, agricultural soils, wetlands, oil-spill areas, and industrial sites demonstrate significant remediation efficiency and ecological restoration. Although challenges persist, including slow remediation rate, pollutant toxicity to plants, biomass disposal, seasonal variability, lack of awareness, and limited policy incentives, economic assessments indicate phytoremediation is 5-10 times more cost-effective than conventional technologies. Future priorities involve deploying climate-resilient species, conducting long-term field trials, promoting circular economy-based biomass utilization, integrating phytoremediation with agroforestry, digital monitoring, and fostering interdisciplinary and international collaborations. https://journaljabb.com/index.php/JABB/article/view/3508/9284

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