

## Entries for March 1-15, 2025

### Market/Commercialization Information

#### SCOTT AFB ORC SATOC (SOL)

U.S. Army Corps of Engineers, Engineer Division, Great Lakes and Ohio, Louisville, KY  
Contract Opportunities on SAM.gov W9120R25R0017, 2025

This is a total small business set-aside under NAICS code 562910. The U.S. Army Corps of Engineers requires a contractor to execute a full range of environmental services for the Air Force Civil Engineer Center (AFCEC) Optimized Remediation Contract (ORC) at Scott Air Force Base in St. Clair County, Illinois. The primary objective is the remediation of soil and groundwater contaminated with a variety of contaminants, including but not limited to Per- and Polyfluoroalkyl Substances (PFAS), chlorinated solvents, petroleum products, and explosive constituents. The range of activities includes investigation, design, construction of remedial systems, operation and maintenance of established remedies, optimization at applicable sites, and achievement of site-specific objectives. The Contractor shall undertake environmental remediation activities to achieve Performance Objectives (POs) at thirteen (13) Installation Restoration Program (IRP) sites. The award will be a Single Award Task Order Contract with a 10-year period of performance. Offers are due by 1:00 PM EDT on May 2, 2025.  
<https://sam.gov/opp/0a6727207f69549e986824d084a492670/view>

#### R7 CHEROKEE COUNTY SUPERFUND SITE OU#4 TREECE SUBSITE CHEROKEE COUNTY, KANSAS (PRESOL)

U.S. Environmental Protection Agency, Region 7, Topeka, KS  
Contract Opportunities on SAM.gov 69H40725R0021, 2025

When this solicitation is released on or about May 10, 2025, it will be competed as a service-disabled veteran-owned small business set-aside under NAICS code 562910. EPA intends to issue an RFP for a non-residential, site-specific contract for Remedial Actions for mine waste located within Operable Unit 4 (OU4) of the Cherokee County Superfund site, Cherokee County, Kansas. The selected remedy for OU4 consists of excavation, consolidation, and disposal of mine waste and associated soil/sediments contaminated with heavy metals. The primary activities associated with the remedial action involve excavation, consolidation, and disposal of mine waste and associated contaminated soil/sediments, property restoration, and revegetation. EPA anticipates an indefinite delivery/indefinite quantity with fixed unit prices contract consisting of a base period and one 12-month option period. There is no solicitation at this time.  
<https://sam.gov/opp/0b3110b3e1748478757d6e39e294463e/view>

#### REMEDATE CONTAMINATED SEDIMENT IN GOOSE COVE TO SUPPORT THE CALLAHAN MINE SUPERFUND SITE IN BROOKSVILLE, MAINE (PRESOL)

U.S. Army Corps of Engineers, Engineer Division North Atlantic, New England District, Concord, MA  
Contract Opportunities on SAM.gov W9121WJ25B0005, 2025

When this solicitation is released on or about April 15, 2025, it will be competed as a total small business set-aside under NAICS code 562910. The U.S. Army Corps of Engineers, New England District requires Environmental Dredging Services to remediate contaminated sediment associated with the Callahan Mine Superfund Site in Brooksville, Maine. The work consists of providing Environmental Remediation Services for dredging to an approximate maximum removal depth of 2-3 feet within an existing Goose Cove covering approximately 1 acre. The Goose Cove sediment removal area is located on the Penobscot Bay side of the former Goose Falls Dam with a tidal range of approximately 10 feet and a Mean Lower Low Water (MLLW) depth of ~5 to 10 feet. Tidal surface elevations in this area will provide unimpeded barge access; however, mobilization to this area presents several challenges. Obstructions within the proposed sediment removal area, such as a steel pipe, chains, and moorings, will be removed by the Contractor prior to dredging, and active moorings will be replaced after remediation is complete. Unauthorized boat access to Goose Cove will be controlled during remediation activities. There is no solicitation at this time. <https://sam.gov/opp/d6f0e3b543d6464945f11bedf0e81771/view>

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## Cleanup News

### LESSONS LEARNED FROM EIGHT YEARS OF PHYTOREMEDIATION SYSTEM OPERATION AT A CHALLENGING SITE

Duffey J., E. Pearson, C. Serlin, and D. Rowe. 134th Annual International Conference on Soil, Water, Energy, and Air, 17-20 March, San Diego, CA, 18 slides, 2025

The Area E phytoremediation installation at the Norco, CA site was installed to degrade TCE in the groundwater to contain and reduce the size of the existing TCE plume and enhance natural attenuation that occurs near the ephemeral stream. This site presented several significant challenges including hot and dry weather, shallow granite bedrock, and high natural salinity in the groundwater. In the first few years, the trees were generally healthy. However, extended drought, irrigation system issues, pest problems, and other issues began to plague the plantation, and many trees were lost over the following years. Learning from the adverse conditions and successfully implementing necessary changes, the plantation's health improved. The trees are now larger than ever, and there is strong evidence that TCE phytoremediation is successfully occurring. Challenges that were encountered and overcome include system design considerations, system O&M requirements and unexpected issues, progress monitoring considerations, tree health maintenance, and lines of evidence that phytoremediation is occurring. The presentation provides a better understanding of the challenges that can arise with a phytoremediation system and discuss possible solutions to address these challenges.  
[https://3c3.amazonscience.com/amz-vcrdystem.com/AS110805-FA7F-796D-01D9ACE470CFE3B\\_abstract\\_File%2569/PresentationPDF\\_151\\_03160402733.pdf](https://3c3.amazonscience.com/amz-vcrdystem.com/AS110805-FA7F-796D-01D9ACE470CFE3B_abstract_File%2569/PresentationPDF_151_03160402733.pdf)

See [First Five Years Review Report of Area E Phytoremediation Installation at the Norco, CA Site](https://www.researchgate.net/publication/392555844545099/Area%20E%20Hydro%20EPR%20Report%202021.pdf)

### USING GROUNDWATER RECIRCULATION FOR SUSTAINABLE CHLORINATED SOLVENT REMEDIATION AND WATER REUSE

Buellet, E. and R.W. Simmons. 134th Annual International Conference on Soil, Water, Energy, and Air, 17-20 March, San Diego, CA, 38 slides, 2025

A groundwater recirculation system was implemented to remediate a chlorinated solvent-contaminated site in Connecticut while emphasizing sustainability and water conservation. Over 16 months, the system achieved a 99% reduction in chlorinated ethenes by recirculating soluble substrates mixed with over 2 million gallons of water. The method maintained hydraulic control over the contaminant plume, preventing its migration toward an adjacent river and protecting the local water body. The strategic placement of injection and extraction points throughout the site ensured effective contaminant plume remediation and eliminated water waste by continuously recycling the treated groundwater. The equipment design allowed for uninterrupted operation through the treatment period, shortening the treatment timeframe to a minimum and enhancing the overall sustainability of the remediation process. The project demonstrates the effectiveness of groundwater recirculation in achieving significant contaminant reduction while conserving water resources, highlighting its potential as a sustainable remediation approach for similar environmental challenges. [https://3c3.amazonscience.com/amz-vcrdystem.com/AS110805-FA7F-796D-01D9ACE470CFE3B\\_abstract\\_File%2569/PresentationPDF\\_151\\_03160402733.pdf](https://3c3.amazonscience.com/amz-vcrdystem.com/AS110805-FA7F-796D-01D9ACE470CFE3B_abstract_File%2569/PresentationPDF_151_03160402733.pdf)

### THE GAME-CHANGING IMPACT OF ENDOPHYTE-ASSISTED PHYTOREMEDIATION ON A FORMER PETROLEUM TRANSFER STATION IN CALIFORNIA

Murphy, R., G. Otolole, J. Freeman, and B. Searcy. 134th Annual International Conference on Soil, Water, Energy, and Air, 17-20 March, San Diego, CA, 22 slides, 2025

A former petroleum transfer terminal was contaminated with hydrocarbons from leaky pipes and surface spills. The site's brackish groundwater and high salinity sodic soil complicated remediation efforts. Endophyte-assisted phytoremediation utilizing PD1 endophyte-inoculated poplar and willow trees effectively and economically remediated the site when standard phytoremediation was failing. Goals included rescuing distressed trees, establishing a healthy tree population capable of sustaining phytoremediation, creating hydrological control to prevent contaminant migration, and enhancing hydrocarbon biodegradation in the rhizosphere. The remediation strategy had three phases: 1) initial rescue of existing poplar trees by inoculating them with PD1 endophyte, 2) planting 494 salt and boron-tolerant hybrid poplar and salt-resistant willow trees, inoculated with PD1 endophyte, and 3) planting an additional 434 poplar and willow trees inoculated with PD1 endophyte. Over 1,000 trees were planted across 3.5 acres, with tree health, growth, and survival rates closely monitored. Groundwater and soil vapor samples were regularly taken to measure the impact on contaminant levels. Results showed

- PD1 inoculation significantly increased tree survival rates from 30% to > 95% inoculated trees showed 100% greater growth and extensive new shoot development
- Trees established hydrological control within one year, mitigating off-site contaminant migration;
- Hydrocarbon biodegradation rates in high-concentration zones were 2.7 to 4.5 times greater than in non-planted areas.

Discontinuing traditional remediation systems and applying endophyte-assisted phytoremediation resulted in \$1.1 million in annual operations and maintenance cost savings.  
[https://3c3.amazonscience.com/amz-vcrdystem.com/AS110805-FA7F-796D-01D9ACE470CFE3B\\_abstract\\_File%2569/PresentationPDF\\_153\\_0324023300.pdf](https://3c3.amazonscience.com/amz-vcrdystem.com/AS110805-FA7F-796D-01D9ACE470CFE3B_abstract_File%2569/PresentationPDF_153_0324023300.pdf)

### SINGLE APPLICATION OF BOS 200® IN FINE-GRAINED GEOLOGY REDUCED TPH CONCENTRATION IN SOILS & GROUNDWATER LEADING TO NFA

Winner, E. and B. Brab. 134th Annual International Conference on Soil, Water, Energy, and Air, 17-20 March, San Diego, CA, 24 slides, 2025

A former retail petroleum site was challenging to remediate due to contaminant entrapment and a long-term diffusion-controlled release. The mean initial benzene concentration was 383 µg/kg and m,p-xylene was 20 mg/kg. A single in situ BOS 200 injection of activated carbon slurry enhanced permeability, altered the diffusion gradient, and increased the advection-dispersion of the clays and silt, leading to regulatory closure. Injection was by positive displacement pump at a flow rate of 35 gal/min. Vertical injection intervals were completed at specific depths top-down. Site remedial progress was characterized by post-injection water samples collected from 42 monitoring wells installed in a grid pattern and distributed within ~18,000 ft<sup>2</sup>. At 40 months, the site was again extensively cored, and soil and aquifer samples were analyzed for contaminants. BOS 200 was present in each boring, indicating carbon distribution throughout the injection field. Lab analysis confirmed activated carbon inclusions. Mass and probability calculations support the distributional models. No generalized distribution failures were noted. All contaminants in soils and aquifer materials significantly decreased. [https://3c3.amazonscience.com/amz-vcrdystem.com/AS110805-FA7F-796D-01D9ACE470CFE3B\\_abstract\\_File%2569/PresentationPDF\\_162\\_0317054545.pdf](https://3c3.amazonscience.com/amz-vcrdystem.com/AS110805-FA7F-796D-01D9ACE470CFE3B_abstract_File%2569/PresentationPDF_162_0317054545.pdf)

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## Demonstrations / Feasibility Studies

### INTERIM MEASURES PLUMESTOP® INJECTION PILOT STUDY COMPLETION REPORT BASE SUPPORT BUILDING SOLID WASTE MANAGEMENT UNIT 014 KENNEDY SPACE CENTER, FLORIDA

AECOM Technical Services, Inc. for NASA's Environmental Assurance Branch, 1,506 pp, 2025

This report documents the PlumeStop injection pilot study completed at the Base Support Building, Solid Waste Management Unit 014, formerly known as the Maintenance and Operations Building at Kennedy Space Center (KSC). The objectives of the pilot study were to provide information on permeable reactive barrier (PRB) design characteristics at the KSC and to aid in future modeling and remedial designs to mitigate downgradient groundwater PFAS concentrations using PlumeStop. The specific goals of the pilot study were to 1) observe changes in PFAS mass flux in groundwater downgradient of the PRB; 2) determine whether groundwater flow is being diverted around or under the PRB; and 3) acquire design parameters necessary for future remedial design activities, specifically injection rate, volume, spacing, pressure, carbon concentration, and any prevalence of daylighting. During baseline groundwater sampling, PFOS, PFOA, PFHxS, and PFNA concentrations exceeded the Florida DEP Provisional Groundwater Cleanup Target Levels or EPA Regional Screening Level (RSL) in at least one monitoring well. The injection event utilized 12 injection locations to inject 40 gals of a 22,000 mg/L PlumeStop solution per vertical foot between 3 and 13 feet bgs. Results of pre-injection and two post-injection soil cores confirmed CAC dispersion and adhesion, and PRB continuity. Monitoring wells were sampled during six monthly performance monitoring events for PFAS and TOC analyses. Results from the pilot study may be used in the development of full-scale carbon in situ PRBs at KSC.  
<https://www.nasa.gov/pdf/20250707main-plumestop-injection-pilot-completion-report-spalled.pdf>

### ASSESSMENT OF THE HYDRAULIC PROFILING TOOL FOR LOWER PERMEABILITY CHARACTERIZATION

Liu, G. and S. Knobbe. 1 Groundwater Monitoring & Remediation 45(1):88-97(2025)

A low-flow injection system was added to a standard hydraulic profiling tool (HPT) along with a modified field profiling procedure to allow it to be used more effectively in lower-K settings. The modified lower-K HPT was tested and evaluated against direct-push slug tests at a field site in the Kansas River floodplain. When the injection rate was reduced, injection pressure decreased, reducing the potential of injection-induced formation alteration. A challenge of applying HPT in lower-K zones is the large pressure generated by probe advancement, which can significantly affect the pressure signal measured at the injection screen. Results showed that the impacts of advancement-generated pressure could be mitigated by reducing the speed of probe advancement. Compared to K estimates by slug tests, the vertical variability in HPT K was much lower. The reduced variability of HPT K was likely due to formation alteration during probe advancement, as well as pressure interference from injections at previous depths and probe advancement at the bottom. Additional work, such as the use of a smaller-diameter probe, is needed to further improve the performance of HPT in lower permeability zones.

### QUANTIFICATION OF CONTAMINANT MASS DISCHARGE AND UNCERTAINTIES: METHOD AND CHALLENGES IN APPLICATION AT CONTAMINATED SITES

Bollingtoft, A., P.L. Bjerg, V. Ronde, N. Tuxen, W. Nowak, and M. Trolborg.  
Journal of Contaminant Hydrology 268:104453(2025)

A contaminant mass discharge (CMD) estimation method based on Bayesian geostatistics was developed and tested to quantify CMD uncertainties using data from a control plane perpendicular to the contaminant plume. An ensemble of CMD realizations is generated by combining geostatistical conditional simulations of the spatial concentration distribution with the flow to derive a cumulative distribution function. A key element of this approach is the use of a macrodispersive transport model to simulate the spatial concentration trend. This ensures that the estimated concentration reflects the expected physical behavior of the contaminant plume, while also allowing the integration of site-specific conceptual information. The method is applicable to plumes with dissolved contaminants, such as chlorinated solvents, petroleum hydrocarbons, PFAS, and pesticides. Site-specific conceptual understanding is used to inform the prior probability density functions of the structural model parameters and to define acceptable simulated concentration limits. The method was applied at three chlorinated ethene-contaminated sites, demonstrating its robustness across varying information levels and data availability. Strong site-specific conceptual knowledge and high sampling density constrain the CMD uncertainty (CV=21%) and result in estimated model parameters and a spatial concentration distribution that agrees well with the conceptual model. For a site with less data and limited conceptual knowledge, CMD and concentration distribution estimates are still feasible, though with higher uncertainty (CV=41%). Extending the method to account for multiple source zones and complex plume migration improved parameter identification and reduced the 95% CMD confidence interval by 1.1% ([4950-8750] to [5090-8480] g/yr) and provided a spatial concentration distribution in better agreement with the plume conceptualization. The method can assist in identifying remediation targets, evaluating remedial effectiveness, and optimizing sampling strategies.  
<https://www.sciencedirect.com/science/article/pii/S0169772224001578/pdf?md5=70714301f651aa55f13a8dd2b8649b0e1d1&pid=1-s2.0-S0169772224001578-main.pdf>

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## Research

### DEVELOPMENT OF A NOVEL PCB-DEGRADING BIOFILM ENRICHED BIOCHAR ENCAPSULATED WITH SOL-GEL: A PROTECTIVE LAYER TO SUSTAIN BIODEGRADATION ACTIVITY

Dong, Q., T. Mattes T and G. Lefevre. 1 ACS ES&T Engineering 5(4):883-898(2025)

A study systematically tuned multiple sol-gel recipes to coat biofilms and measured the impact of the coating on cell survival and pollutant degradation. The sol-gel completely encapsulated biofilm-enriched black carbons and produced both high porosity and appropriate pore size, allowing pollutants to diffuse into the biofilms. The sol-gel maintained physical integrity under saline conditions and reduced shear force. The encapsulated biofilms degraded benzene, a proof-of-concept model pollutant, and extended biofilm attachment and cell viability for over three months without a carbon and energy source. The study demonstrates that sol-gel helps sustain PCB-degrading biofilms under environmentally relevant conditions. The sol-gel application can potentially improve the bioaugmentation effectiveness and enhance the degradation of environmental contaminants.

### SIMULTANEOUS REMOVAL OF Cr(VI), As(III), AND SULFANILAMIDE VIA AN E-BARRIER ELECTROCHEMICAL SYSTEM: A PILOT STUDY

Kim, J., M. Ehsani, A. Alshawabkeh, and S. Baek.  
Journal of Hazardous Materials 490:137730(2025)

An electrochemical system is proposed that combines an e-barrier with pyrite, a sulfide mineral capable of continuously and completely removing As(III), Cr(VI), and sulfanilamide for one year. The sandbox, comprising an e-barrier and pyrite as a flow-through electrochemical reactor, was evaluated in a lab-scale small sandbox with sulfanilamide as a model contaminant to assess degradation performance, and a pilot-scale large sandbox designed for the simultaneous removal of As(III), Cr(VI), and sulfanilamide. The small sandbox achieved 100% removal of sulfanilamide, demonstrating the effectiveness of the combined system. The large sandbox demonstrated 100% removal efficiency against the contaminant mixture for up to one year, with effluent maintaining a neutral pH without an external neutralizing process. This remarkable performance was attributed to the activation of pyrite by anodic oxygen (O<sub>2</sub>), producing dissolved iron that leads to iron hydroxide formation, which serves both as an adsorbent and precipitant for contaminants. Findings indicate that the combination of electrochemical reactions and pyrite is an effective approach for the simultaneous removal of organic and inorganic contaminants.

### ENHANCED P-NITROPHENOL REMOVAL VIA ELECTROCHEMICAL ACTIVATION OF PEROXYMONOSULFATE (PMS) WITH BIOCHAR IN A FLOW-THROUGH REACTOR: MECHANISTIC INSIGHTS AND OPTIMIZATION

Jeong, W.G., J.G. Kim, A.N. Alshawabkeh, P. Larese-Casanova, J. Lim and K.J. Baek  
Journal of Water Process Engineering 71:107276(2025)

A study introduced a combined electrolysis (E) and biochar (BC) system for peroxymonosulfate (PMS) activation in a flow-through reactor to remediate dissolved p-nitrophenol (p-NP) as a model contaminant. The study tested the hypothesis

that the E-BC-PMS system enhances degradation through: (1) simultaneous activation of PMS by biochar and electrochemical reactions; (2) adsorption of contaminants onto biochar; and (3) formation of diverse reactive species. The E-BC-PMS system removed 99.9% of p-NP and showed the highest removal rate constant (0.497/min), suggesting a synergistic effect compared to individual PMS (1.1%), BC (1.6%), or E (48.8%) systems. Moreover, the E-BC system utilizing PMS exhibited 3.7 and 4.5 times higher p-NP degradation rate constants than peroxodisulfate or hydrogen peroxide, respectively. Mechanistic investigations using scavenger tests, electron paramagnetic resonance, and x-ray photoelectron spectroscopy revealed that non-radical (electron transfer and  $^1\text{O}_2$ ) and radical ( $\text{O}_2^{\cdot-}$  and  $\cdot\text{OH}$ ) pathways contributed to p-NP degradation. Overall, the E-BC-PMS system activated PMS through the electrochemical, functional groups, and alkaline activation. These findings suggest that the E-BC-PMS system is highly effective for p-NP removal and presents a promising strategy for groundwater remediation applications.

#### LABORATORY DEVELOPMENT AND VALIDATION OF VAPOR PHASE PFAS METHODS FOR SOIL GAS, SEWER GAS, AND INDOOR AIR

Hayes, H., C. Lutes, N. Watson, D. Benton, D.J. Hanigan, S. McCoy, C. Holton, K.E. Bronstein, B. Schumacher, J. Zimmerman, and A. Williams. Environmental Science: Atmospheres 5:94-109(2024)

A thermal desorption GC/MS/MS method was validated to measure a set of fluorotelomer alcohols and perfluorooctanesulfonamides collected on multi-bed sorbent tubes. Applications to perfluorocarboxylic acids (PFCA) were also evaluated since there is debate regarding under what circumstances these compounds could be observed moving into the gas phase. PFOA met Method TO-17 calibration requirements when calibrated using NIST traceable standard solutions introduced through the thermal desorption system and using multiple reaction monitoring transitions based on precursor mass ions identified in the PFOA spectra. However, subsequent detailed studies suggested that PFOA was decomposing during the thermal desorption sample introduction step when comparing two alternative GC/MS sample introduction techniques. The primary peak resulting from the thermal desorption of PFOA standard had spectra consistent with perfluoro-1-heptene (PFHp-1), suggesting that a degradation reaction was occurring. Therefore, the identification of the PFCA compounds using this method is subject to a potential positive interference from the corresponding perfluoroalkene and other thermally labile PFAS. Thus, it may be beneficial to limit the application of the method to fluorotelomer alcohols and perfluorooctanesulfonamides and use a parallel solvent extraction approach to quantify the PFCA-related compounds. Method validation including desorption efficiency, second source verification, storage stability and method detection limit tests were successfully completed for the fluorotelomer alcohols and perfluorooctanesulfonamides target analytes. <https://pubs.rsc.org/en/content/articlepdf/d2025/ea4d46aa00084>

#### OPTIMIZING LACCASE PRODUCTION FROM HALOTOLERANT ENTEROBACTER SP. GR18 FOR HYDROCARBON BIOREMEDIATION

Hosseini, S.M., A.A. Sepahi, M.R. Razavi, and P. Saifarian. I Remediation 35(2):e70006(2024)

A study focused on optimizing laccase production from *Enterobacter* sp. GR18 isolated from the Grawan mineral spring near Sardasht, West Azerbaijan Province, Iran. The bacterium was identified through comprehensive biochemical tests and 16S rRNA sequencing. Advanced methodologies were used to optimize laccase production conditions. The purified laccase enzyme was characterized using SDS-PAGE. The study investigated the effects of various carbon and nitrogen sources, metal ions, and inducers on enzymatic activity. Structural changes in crude oil samples treated with laccase were analyzed using NMR spectroscopy. *Enterobacter* sp. GR18 showed exceptional laccase activity among 33 isolated strains. Glucose and yeast extract were the most effective carbon and nitrogen sources, respectively. Copper and iron ions significantly enhanced enzyme activity. NMR spectroscopy indicated substantial breakdown of complex hydrocarbons in crude oil samples posttreatment, demonstrating the enzyme's effectiveness in hydrocarbon degradation. The study revealed the potential of *Enterobacter* sp. GR18 for high laccase production and efficient hydrocarbon degradation under extreme environmental conditions. Findings can catalyze the development of robust and sustainable bioremediation technologies to address hydrocarbon contamination.

#### ADAPTING TO PFAS CONTAMINATION OF PRIVATE DRINKING WATER WELLS NEAR A PFAS PRODUCTION FACILITY IN THE US ATLANTIC COASTAL PLAIN OF NORTH CAROLINA

VanDerwerker, T.J., D.R.U. Knappe, and D.P. Genevux.

Water Environment Research 96:e11091(2024)

PFAS are present in over 7,000 drinking water wells near the Chemours PFAS plant in North Carolina. To understand options for affected residents, new and previously existing water quality data were used to investigate deeper aquifers as alternate drinking water supplies and compare the regulatory responses near Chemours and three other PFAS production facilities with nearby contaminated wells. Data from >100 wells show that GenX concentrations decrease with increasing depth through the four aquifers in the surficial, Black Creek, Upper Cape Fear, and bedrock areas. This illustrates the extent of vertical PFAS penetration through the aquifer sequence following >40 years of atmospheric emissions. Detailed data on 143 water quality parameters in nine deep wells (two Upper Cape Fear, seven bedrock) revealed only eight exceedances of drinking water standards (one each for arsenic, PFOA, iron, chloride, and gross alpha, and three for manganese) and nine exceedances of health advisories (all sodium). Regulatory responses to PFAS contamination of wells in four states included mention of deeper wells as an alternate water source only for nonresidential users in North Carolina and residential users in Vermont. The bedrock aquifer is currently used by some residents and may be a viable alternative to shallower groundwater, though arsenic treatment may be beneficial at some deep wells and long-term sustainability of the aquifer should be evaluated. <https://onlinelibrary.wiley.com/doi/epdf/10.1002/wat.1484>

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### General News

#### CLEAN OR REPLACE? REMEDIATION PFAS IN FIREFIGHTING EQUIPMENT AND HANGARS

Magnuson, M. | ESTCP 2025 ER March In Progress Review Meeting, 4-7 March, Washington DC, 30 slides, 2025

A project aimed to provide data and information to refine existing cleanup guidelines for firefighting systems, specifically PFAS-impacted hangar systems, and Aircraft Rescue and Firefighting (ARFF) vehicles. The project developed a toolbox of options and information utilized across the DoD and civilian aviation firefighting community, which may lead to substantial cost savings. Many ARFF delivery systems in aircraft hangars and firefighting vehicles may require thorough cleaning to avoid ongoing environmental impacts from residual PFAS within those systems. Though replacement ARFF formulations are being introduced, existing residuals and legacy contamination within the ARFF delivery systems are likely to continue discharging PFAS. Cleaning methods exist, but may not be effective for the ultra-trace levels of concern. Current operational parameters may need to be adjusted to meet the challenges presented by PFAS. Currently, no framework is available for evaluating the cost and environmental impact of cleanup compared to the costs of replacing components and systems. [https://cfpub.epa.gov/sis/public\\_record\\_report.cfm?id=2019EntryId=36549481&ab=CFSE8&simplesearch=0&showcriteria=2&sortby=pubDate&firsttype=8&datebeginpublished=06/15/2019&searchall=cleanup](https://cfpub.epa.gov/sis/public_record_report.cfm?id=2019EntryId=36549481&ab=CFSE8&simplesearch=0&showcriteria=2&sortby=pubDate&firsttype=8&datebeginpublished=06/15/2019&searchall=cleanup)

#### COMPREHENSIVE COMPILATION OF CONGENER PROFILES TO SUPPORT HEALTH ASSESSMENT OF ENVIRONMENTAL EXPOSURES TO POLYCHLORINATED BIPHENYL MIXTURES

Schulz, B., L. Carlson, C. Christensen, C. Welekamp, R. Marek, A. Martinez, K. Hornbuckle, and G. Lehmann. I Environmental Research 263(Part 1):120081(2024)

This work represents the most extensive effort to date to compile and make publicly available the PCB congener profiles for mixtures with toxicological data, providing a foundation for understanding the toxicological potency of PCB mixtures in the environment. Published congener profiles across 29 commercial and simulated environmental PCB mixtures were searched, including various Aroclors, Phenoclor, Clophens, and Kanechlor. A total of 117 references containing 401 distinct complete or partial tabularized profiles were found. Aroclor 1254 had the most published profiles, with 78 unique datasets characterizing multiple mixture lots. No congener-specific composition data were identified for Fenclors, Clophen C, or Pyralenes. Eighty-seven of the most complete and reported profiles underwent a detailed congener data, PCB mixture source, and analytical method extraction. Challenges encountered during data extraction included congener coelutions, incomplete method reporting, and inconsistencies in PCB nomenclature. These factors complicate data visualization, comparisons across datasets, and use of the data in subsequent analyses. Where possible, profiles were converted to the same units and congener numbering convention to allow for easier comparison. The extracted data are publicly available online as interactive visuals and as a downloadable Microsoft Excel® workbook. It provides an overview of the current PCB mixture profile landscape to support efforts to minimize the health impacts of environmental PCB exposure, including the exploration of links between mixture composition and toxicity and the identification of the most efficient and effective remediation strategies at contaminated sites.

#### NOVEL FLAME RETARDANTS (NFRS) IN E-WASTE: ENVIRONMENTAL BURDENS, HEALTH IMPLICATIONS, AND RECOMMENDATIONS FOR SAFETY ASSESSMENT AND SUSTAINABLE MANAGEMENT

Oluchukwu Eze, O., E.B. Ogbuene, O. Ibraheem, E. Kuster, and C. ThankGod Eze.

Toxicology 511:15403(2024)

This article presents the occurrence of novel brominated flame retardants (NBRs) near and surrounding e-waste recycling sites. It highlights important knowledge gaps and prospects for a more integrated, harmonized, and mechanistically positioned risk assessment strategy for N(B)FRs and possible economically feasible and environmentally sustainable approaches for removal from complex matrices. Data in the ng to  $\mu\text{g}$ -ranges of N(B)FR in soil, dust, sediment, water and fish were identified. Dust and soil sample concentrations ranged from the low ng to low  $\mu\text{g}/\text{g}$  range, while water concentrations were in the low ng/L range. Fish concentration was typically 3--300 ng/g with 2 substances in the low to medium-high  $\mu\text{g}/\text{g}$  range. Of 20 N(B)FR analyzed, only 10 were above the detection limit, with most chemicals found in a low ng/g range.

#### USING SUCTION LYSIMETERS FOR DETERMINING THE POTENTIAL OF PER- AND POLYFLUOROALKYL SUBSTANCES TO LEACH FROM SOIL TO GROUNDWATER: A REVIEW

Costanza, J., C.D. Clabaugh, C. Leibel, J. Ferreira, and R.T. Wilkin.

Environmental Science & Technology 59(9):4215-4229(2025)

This review covers the installation and sampling methods for suction lysimeters and provides suggestions to improve the utility and reduce the variability of results. Many suction lysimeters may be required to accurately represent soil heterogeneity, as the volume of soil represented by the porewater sample varies significantly depending on the soil-water content, which is spatially and temporally variable. A similar limitation applies to soil or leaching protocol samples. Suction lysimeters may not provide a representative sample for all PFAS due to interactions with lysimeter materials, air-water interfaces, and the use of vacuum. Lysimeter data are best combined with soil-leaching protocols, groundwater transects, and soil analysis when making remedial decisions.

#### REGENERATION OF BIOCHARS (PRISTINE AND MODIFIED/ENGINEERED) AND ECONOMIC ANALYSIS OF THEIR USE IN THE REMOVAL OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) FROM WATER/WASTEWATER

Jafarinasab, S., J. He, and D. Wang.

Frontiers of Environmental Science & Engineering 19(20)(2025)

This article compiles current knowledge on applying pristine and modified/engineered biochars for the sorptive removal of PFAS from aqueous samples; regeneration/reuse techniques for spent biochars; and economic analysis of their use in PFAS removal from water/wastewater. Further investigations on better modifying/engineering biochars to remove short-chain PFAS species in real environmental water samples due to the challenging nature of their removal using conventional treatment technologies; feasible, low-energy, environmentally friendly, and cost-effective strategies to regenerate/reuse spent biochars; and managing their end-of-life; and large-scale and continuous column sorption operation for the real water/wastewater samples, are recommended to apply biochars for PFAS removal at full-scale in the future.

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

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