

Soil Washing: Sustainable Cost-Effective Treatment for PFAS Source Zones

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Background/Objectives. Increasing regulatory pressure and limitations on disposal of PFAS-impacted soils has put stakeholders in a difficult position when determining options for treating and managing PFAS sources. Arcadis led an ESTCP demonstration at Eielson Air Force Base to provide the U.S. Department of Defense a cost-effective and sustainable approach to PFAS source treatment as it initiated programmatic remedial investigations across the US.

Approach/Activities. Soil washing has been applied since the 1990s to treat petroleum, metals, and pesticides impacted soils. The common thread behind these methods is to use a combination of physical separation (size and gravity) and leaching with high liquid-to-solids ratios to desorb the contaminants into a liquid phase where the contaminants can be concentrated and treated. The “concentrate and treat” approach is also key for PFAS, as soil cleanup standards for PFOA and PFOS range from low parts per million for human health criteria to single digit or fractional parts per billion for soil-to-groundwater protection values. The ESTCP demonstration built on experience in soil washing for Defense Australia and applied advanced treatment to target two- to three orders of magnitude reduction in clean up goals during the bench treatment. The approach is tunable to site conditions, with optimization steps determined through systematic bench testing. The demonstration applied mobile equipment which will enable on-site treatment of soils associated with investigation derived waste, time- and non-time critical removal actions, and source remediation in the future. Testing was conducted in late summer 2021.

Results/Lessons Learned. Advanced methods in soil washing enabled reductions in total PFAS, PFOS, and PFOA of greater than 99.99% to meet Alaska Department of Conservation’s (ADEC’s) soil to groundwater standards during bench testing. Application of Australian synthetic leachate procedure (ASLP) methods to benchmark leaching showed greater than 99.9% reductions with results of PFBS, PFOS and PFOA all less than 40 ng/L, which was at or below USEPA screening levels at the time. Total PFAS ASLP results were < 35 ng/L. Results of pilot-scale treatment will be discussed and compared with bench testing. The goal was to verify that soil washing could be completed cost-competitively with landfilling and 40 to 50 percent less cost than thermal desorption methods.