Bioremediation and Sustainable Environmental Technologies—2017. Fourth International Symposium on Bioremediation and Sustainable Environmental Technologies (Miami, FL; May 2017). ©2017 Battelle Memorial Institute, Columbus, OH, www.battelle.org/biosymp. A. Barton and S. Rosansky (Chairs)

Investigation and Treatment of Perfluoroalkyl Substances at a Rurally-Located Naval Airfield

Laura Cook (laura.cook@ch2m.com) and Juliana Dean (CH2M, Virginia Beach, VA, USA)
Angela Jones (NAVFAC, Norfolk, VA, USA)
Jim Hatton (CH2M HILL, Denver, CO, USA)

Background/Objectives. In 2015, two closed environmental sites (a former firefighter training area and a former landfill) at a rurally located airfield were identified as having the potential to be contaminated with perfluoroalkyl substances (PFAS). Interviews of base personnel identified additional fire-fighting equipment testing and storage areas as well as the locations of previous plane crashes at which aqueous film-forming foam (AFFF), which contained PFAS, was used. The US Navy determined a Site Investigation was warranted and initiated an investigation.

Approach/Activities. Sampling was completed in December 2015 to determine if six PFAS (perfluorooctane sulfonate [PFOS], perfluorooctanoic acid [PFOA], perfluorobutane sulfonic acid [PFBS], perfluoroheptanoic acid [PFHpA], perfluorohexanesulfonic acid [PFHxS], and perfluorononanoic acid [PFNA]) were present in the base drinking water and in groundwater in potential source areas. Concentrations of PFOS and PFOA exceeded their respective United States Environmental Protection Agency (USEPA) provisional screening values of 0.2 micrograms per liter (µg/L) and 0.4 µg/L and base employees were provided with bottled drinking water. Additional sampling was completed to evaluate other potentially impacted users of groundwater offbase and to determine the extent of the PFAS plume. To date, 47 groundwater monitoring wells, the on-base water supply, and 56 off-base properties have been sampled. After screening against USEPA's May 2016 lifetime health advisories for PFOA and PFOS of 0.070 µg/L, all base employees and off-base residents on six properties were provided with bottled water. Granular activated carbon (GAC) was tested and GAC systems were subsequently designed and constructed to treat contaminated drinking water on- and off-base. Additionally, an on-base GAC system was installed to treat wastewater prior to spray irrigation. Surface and subsurface soil samples were also collected, confirming primary and secondary source areas. Secondary source areas were noted in irrigation spray fields where contaminated wastewater was applied.

Results/Lessons Learned. This presentation will summarize the sampling completed at the airfield, actions taken to inform and protect the community and base personnel, interim measures, and challenges associated with future site management decisions as both science and policy evolve. The presentation will also provide a summary of data collected to date and fate and transport observations. Concentrations were found to be highest in shallow wells in a former petroleum site close to an AFFF storage area (highest concentration of PFOS at 49.3 µg/L). This area was not initially identified as having a high likelihood of release and was sampled to improve data resolution. This highlights the need to evaluate areas where handling occurred but where no releases were documented. Analytical data support the presence of multiple source areas, with the ratios of the six PFAS varying between source areas. The resultant plume is approximately 1,200 acres, with approximately 340 acres exceeding the health advisory. The areal extents of the plumes for each of the six contaminants are generally related to the length of the carbon chain of each PFAS (with shorter chained contaminants having migrated further), with the exception of PFBS, which has the most limited plume area despite the shorter chain length. Soil results indicated soil data were dominated by PFOS, in contrast to the variety of compounds detected in groundwater.