PFAS Composition Observed in Surface Water Ecologies as a Result of AFFF Use

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Background/Objectives. The Australian Department of Defence is undertaking a nationwide investigation program to assess the nature, extent and impact of PFAS contamination from legacy AFFF use on Defence sites. The investigations are being undertaken concurrently at 26 sites across the country and involve an accelerated tiered process that responds to community and regulator expectations to rapidly assess the extent and associated risks from contamination by PFAS compounds. Investigations have focused on migration and exposure pathways, and as a result have collected information about soils, waters and biota under different environmental conditions and distant from the point of release. Surface water systems represent significant pathways for off-site migration of PFAS and are a visible and accessible point of exposure for humans and ecology. This presentation reviews the available data from multiple Australian Department of Defence site investigations, and considers the relevance and connection between different media associated with surface water networks.

Approach/Activities. Site investigations in 2017 and 2018 have involved direct investigation of suspected PFAS source areas and associated pathways to identified receptors. Samples were predominantly soils and groundwater, with collection of sediments and surface waters in drainage networks, creeks, rivers and lakes linked to the sites. All samples were analyzed for a PFAS compound suite which includes quantitation of 28 compounds including n:2 fluorotelomer sulfonic acids, perfluoroalkyl carboxylic acids, perfluoroalkyl sulfonic acids and perfluoroalkyl sulfonamido substances. Biota, such as riparian or aquatic vegetation, fish or crustaceans, were sampled and analyzed for both ecological and human health risk assessment at sites where a likely exposure pathway was identified. Concentrations of key PFAS compounds and relative composition of total PFAS were considered.

Results/Lessons Learned. Using the large data set from the site investigations, bioaccumulation factors were calculated for key PFAS in sampled biota for a range of environments. Variability in these factors showed the need for PFAS investigations to develop a well-considered conceptual site model to ensure that fate and transport processes are understood before sampling. Weather and seasonal effects and surface water / groundwater interaction impact the mass and concentration of PFAS in surface water bodies and some biota, which in turn influences the representativeness of discrete samples. This highlights the value of repeated monitoring of relevant environmental media, including biota, through different seasons.