PFAS Investigations: A Site Investigation Framework Based on Lessons Learned

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**Background/Objectives.** Per- and polyfluoroalkyl substances (PFAS) have become one of the main emerging contaminant classes of focus in the public domain, mainly due to their widespread presence, persistence, bioaccumulative potential and toxicity. Their use has been documented in most sectors of the economy including infrastructure, manufacturing, oil and gas, and mining. The approach to PFAS investigation is unique in view of their different properties compared to most conventional contaminants and considering the large number of perfluoroalkyl acids (PFAAs), precursors and breakdown products, the evolving regulatory environment, complex source compositions, fate and transport as well as the potential effect of historical site remediation. Based on widespread usage and occurrence, it is expected that many sites may need to be investigated or re-opened to address potential risks associated with PFAS impacts and that this class of contaminants may become the critical path to achieve numerous site closures. The objective is to develop a guide or best practice for PFAS site investigation based on regulatory framework, knowledge on fate and transport, sampling and analytical considerations. The goal is to identify robust but practical methods, and a flexible framework that can be updated based on new science.

**Approach/Activities.** A site investigation framework was developed that sequentially leads site assessors through site identification, conceptual site model development, identification of PFAS chemicals of concern, site investigation methods and data interpretation. Literature and guidance from multiple regulatory jurisdictions including Africa, Asia, Australia, Europe, and The Americas was surveyed for issue identification, and a comparison of PFAS chemicals and guidelines are presented. Studies on fate and transport are summarized with respect to unique aspects associated with PFAS including role of precursors, breakdown products, flowpath dependent concentration changes, sorption and co-occurrence of PFAS with non-aqueous phase liquids. Analytical approaches are summarized within a tiered framework to enable project goals and regulatory requirements to be met, while providing guidance on sites with more in-depth analyses using innovative methods.

**Results/Lessons Learned.** Lessons learned and critical aspects to consider are highlighted from the early stages of the investigation process (site identification, review of existing conceptual site models) to investigation planning (selection of analytes, prioritization of investigation locations, regulatory framework) and execution (standard operating procedures and quality assurance / quality control program). Select case studies are reviewed with a discussion of the suite of conventional analytical methods available as well as new innovative methods. These considerations and information and planning tools developed will assist site managers, assessors and regulators in the application of a robust yet practical approach to PFAS investigations.