

Statement of Qualifications

Per- and Polyfluoroalkyl Substances The PFAS Conundrum

The latest international research and our site experience indicates that, due to the stability of PFAS, the complex composition of PFAS releases, and current limitations on the understanding of their fate and transport, most sites will require a combination of sorption-based treatment technologies and detailed risk assessment to effectively and cost-efficiently manage PFAS contamination in the short term. Current field-proven technologies (both in-situ and ex-situ) rely on sorption or sequestration of PFAS compounds which results in a waste stream that requires additional management. Development of non-sorption based remediation techniques is slow and may ultimately be limited to a small number of techniques. International risk-based standards for PFAS in soil and water are extremely low, and serious challenges are being encountered in achieving PFAS remediation to these provisional standards. Investigation and management of PFAS sites requires an innovative, adaptable and educated team, involved in (not just aware of) current research, and not tied to a one-size-fits-all approach.



Geosyntec Consultants in Australia brings an internationally supported and broad-based skill set to addressing these PFAS challenges using sound scientific principles to execute informed assessment, remediation design, and project implementation that reflects the complex challenges associated with PFAS contamination.



We have:

Years of international and Australian experience in PFAS investigation and remediation

We understand the full dimensions of PFAS remediation unpredictability and the difficulties of site investigation.

Hands-on project experience

We have addressed some of the most challenging PFAS problems internationally.

A peer-reviewed publications record, investment in research and development, and a stake in the most current PFAS research.

We know the emerging knowledge on PFAS that is relevant to your project.

An owner-based focus on the issues

We believe that often the largest risk lies in stakeholder communication and engagement – not remediation.



What are PFAS?

PFAS, also known by the term “perfluorinated compounds” (PFCs), are emerging compounds of increasing importance for a broad spectrum of industrial sites and waterways. PFAS are a family of organic substances whose molecular structures contain multiple fluorine (F) atoms in place of hydrogen (H) atoms. PFOA and PFOS are the two most widely-recognized, environmentally-relevant PFAS, although there are hundreds of PFAS of potential significance, and little is known about these compounds.

Why are PFAS so Challenging?

The sources of PFAS in the environment (e.g., Aqueous Film Forming Foam or AFFF) are typically comprised of complex mixtures of hundreds of individual PFAS constituents. The majority of PFAS constituents cannot be detected using commercially available analytical techniques and therefore cannot be detected at sites. Progress is being made towards developing analytical techniques to improve the detection of these constituents, including recent research by Geosyntec and partners developing nuclear magnetic resonance (NMR)-based analytical techniques and total fluoride field screening, but it may be years before comprehensive site characterisation is achievable. The behaviour of the PFAS constituents in the environment can also vary widely depending on the composition of the PFAS mixture, the presence of co-contaminants, the introduction of oxidants or reductants into the environment for co-contaminant remediation, etc. For example, recent research by Geosyntec and the University of Guelph has indicated that oxidants may effectively mineralise PFOA to fluoride and carbon dioxide, but under slightly different conditions, may result in the formation of a more recalcitrant, unknown byproduct. Maintaining fluoride mass balance in byproducts of degradation reactions is critical to understanding remedial success, but is nearly impossible to currently achieve. As such, it is essential that knowledgeable practitioners, who fundamentally understand the limitations and challenges associated with PFAS, direct investigation and remediation efforts to achieve successful mitigation of risk at PFAS sites.

Example Project Descriptions



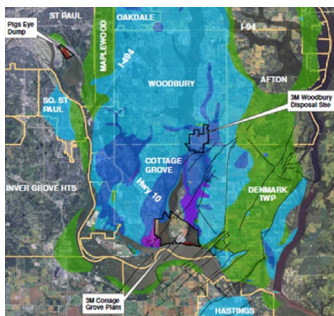
Expert Panel Regarding the Regulation of PFAS Impacts | RAAF Base Williamtown

Lange Jorstad of Geosyntec was invited by the NSW EPA to participate in the Water Working Group, one of two technical committees advising the Expert Panel regarding the regulation of PFAS impacts at RAAF Base Williamtown. His contributions included critical review and gaps analysis of the conceptual site model for PFAS distribution and transport, peer review and advice for the sampling, analytical and quality plan prepared by Department of Defence's lead consultant, peer review and advice for interim and final results of a detailed investigation, advice to Department of Planning for a development application within the PFAS affected area close to the Base, technical support for the Risk Assessment Working Group (the other technical committee advising the Expert Panel) and general advice to the Expert Panel on various matters in relation to the assessment and management of PFAS contamination around the Base.



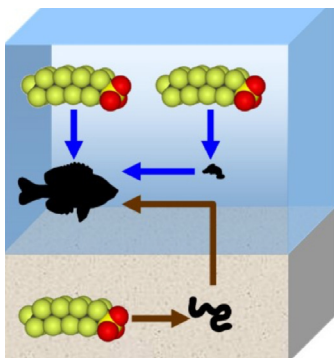
Technical Review and Site-specific Investigation Strategy for Perfluorinated Compounds Confidential Client, Australia

Geosyntec conducted a review of PFAS present in groundwater and soil downgradient of a known source site and assisted in the development of a strategic plan to evaluate and manage risks associated with future construction in the area. The effort included a state-of-the-science review of environmental fate, toxicity, remediation, and regulatory policy of PFAS associated with AFFF uses at airports and other industrial facilities, a review of PFAS treatment technologies, and preparation of guidance for PFAS sampling of groundwater, soil, surface water, and sediment. Additionally, the effort included a chemical fingerprinting evaluation of site-specific data with regards to multiple sources of PFAS in groundwater and surface water.



Human Health Risk, Fate, and Chemical Liability Assessment of PFOS in the Upper Mississippi River, Metropolitan Environmental Services | Minneapolis-St. Paul, Minnesota

Geosyntec staff evaluated human health risks due to bioaccumulation of PFOS in benthic and pelagic fish in the Upper Mississippi River adjacent to and downstream of the Minneapolis-St. Paul metropolitan area. Geosyntec investigated chemical fate and source issues relevant to PFOS in preparation for potential Total Maximum Daily Load (TMDL) assessment, conducted a liability analysis of current and historical PFOS contributions to the aquatic ecosystem, conducted NPDES/303(d) permitting calculations and numerous modelling and empirical data evaluations to characterise PFOS fate in the terrestrial and aquatic environment. Technical work included litigation support and several presentations and reports to state regulators and other stakeholders.



SETAC 2016 PFAS Reprise

Geosyntec recently presented on the risk assessment of PFAS at the Society of Environmental Toxicology and Chemistry (SETAC) North America Meeting in Orlando, Florida, November 6-10, 2016. Geosyntec's PFAS risk assessment team (Jason Conder, Emily Larson, and Jenn Arblaster) is using data and modelling evaluations to quantify ecological and human health risks at sites impacted by AFFF. The overall goal is to identify which PFAS are likely to drive risk-based decision making at these sites, advance sampling and investigation approaches for best understanding PFAS risks, and develop preliminary risk-based screening approaches to interpret chemical measurements at sites, such as screening levels for soil, sediment, and water. Potential risk-based screening levels for PFAS in water that are protective of aquatic ecosystems and fishermen can be below (i.e., more conservative than) levels protective of human drinking water uses. This suggests that PFAS are not just a drinking water contaminant at sites, but that additional investigations beyond groundwater resources may be needed.

Key Staff

Direct PFAS-Related Experience

Name	Title	Years Experience	Site Investigation and Remediation	Auditing or Expert Support	Human Health and Ecological Risk Assessment	Contaminant Hydrogeology	Regulatory Engagement	Community Engagement	Research and Development
<u>Lange Jorstad</u>	Senior Hydrogeologist	20	•	•		•	•	•	
<u>David Reynolds</u>	Senior Principal	20	•	•		•	•		•
<u>Jason Conder</u>	Senior Scientist	12	•		•		•		•
<u>Julie Konzuk</u>	Principal	23	•						•
<u>Rula Deeb</u> <u>YouTube link</u>	Senior Principal	20	•	•			•		•
<u>Sarah Schiess</u>	Principal	30	•			•			•
<u>Garry Smith</u>	Senior Consultant	30			•		•	•	

Lange Jorstad



David Reynolds



Jason Conder



Julie Konzuk



Rula Deeb



Sarah Schiess



Garry Smith



We are
engineers, scientists
and innovators.



Geosyntec is a specialised consulting and engineering firm that works with private and public sector clients to address their new ventures and complex problems involving the environment, our natural resources, and our civil infrastructure. Geosyntec has a staff of over 1,200 engineers, scientists, and related technical and project support staff located in more than 85 offices throughout Australia, Southeast Asia, the United States, Canada, and the United Kingdom.

CONTACT INFORMATION

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