In-situ Laser Induced Fluorescence – Novel Applications for Contaminated Sediments Characterization

Ben Sweet, SCG Industries Limited

Kirklyn Davidson and Craig Lake, Dalhousie University

The advent of "High-Resolution Site Characterization (HRSC)" technologies has lead to a paradigm shift in contaminated site management. HRSC technologies are diagnostic field tools that leverage sophisticated analytical methods in the field to rapidly produce scale appropriate data in real-time. The speed of assessment and high density of representative data empower the implementation of strategic, cost-effective site management plans.

One such technique relies on the use of in-situ Laser Induced Fluorescence (LIF) spectroscopy for the assessment of petroleum hydrocarbons in soils and groundwater. This application involves driving a fluorometric probe into the subsurface while gathering real-time, continuous data on the spatial distribution, speciation, and relative concentration of hydrocarbons at the centimetre scale. This technique reduces the uncertainty associated with site characterization leading to significant cost and time savings.

Given the strengths of this approach, expanding the capacity of this technology to address additional environmental challenges is of critical importance. While designed for detection of hydrocarbons in unconsolidated materials, this analytical technique can potentially be adapted for a wider range of environmental assessment applications.

Recent research has been undertaken to explore the potential for this technique to spatially delineate organic-rich industrial sediments contaminated with dioxins and furans. This work is predicated on the ability of this approach to collect unique optical "signatures" of materials based on their physiochemical properties. To test this hypothesis, lab and field work has been carried out at a stabilization basin which has received industrial wastewater over the past 50 plus years in Nova Scotia, Canada.

Preliminary lab and field testing on sediments within the basin are presented as proof of concept for this application. Comparative analysis of system performance to standard gravity cores is presented. This system appears to have significant potential to vertically delineate the presence or absence of contaminated sediments. This will assist in producing more accurate volume estimates for remedial dredging operations with implications for similarly contaminated environments undergoing assessment and/or remediation.

Ben Sweet

Ben is the technical lead for SCG Industry's high-resolution site characterization tools and services. He has completed his Bachelor of Science in Environmental Science from Acadia University and a Masters in Chemical Engineering from the University of New Brunswick. Ben is a key member of SCG team playing a major role in research & development, remedial action planning, pilot testing, technical design, and contaminated site data interpretation.

In these roles he has completed numerous projects across North America, conducting both large and small scale remediation projects and high resolution site characterization investigations. Ben strives to ensure SCG's clients are equipped with the latest innovative technologies and strategies to help cost-effectively address their environmental liabilities. Ben has presented at numerous conferences and been involved in technical workshops for both government and private organizations.