# Implementation, Operation and Adaptation of a Large-scale, Long-term ISCO Remediation Project

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In situ chemical oxidation (ISCO) is a commonly used remediation technique. However, it is rarely implemented in a large-scale, long-term context. This presentation addresses the implications and challenges experienced throughout the design, implementation and operation of a 20-year environmental rehabilitation strategy for a 200,000m$^2$ industrial mining site located in Eastern Canada. .

The project, currently in its seventh year of operation, addresses legacy petroleum hydrocarbon contamination, inherited from seventy years of industrial operation, through a multidisciplinary remediation plan that integrates chemical, biological, and hydraulic containment technologies. Adding to its complexity, the rehabilitation is being carried out on an operational industrial site with a dense, aging and deficiently documented network of underground infrastructure—including fire mains, electrical lines, sewer systems, and decommissioned fuel lines—requiring careful coordination and risk mitigation using GISdata and a thorough approval process. The project is further distinguished by its rigorous environmental monitoring and robust health and safety framework.

With a continuous improvement philosophy at the core of the remediation plan, many changes were made over time to the approach once scaled up from the extensive laboratory and pilot testing phases to on-site implementation. The ISCO injection technique was adapted after one year of testing to improve productivity and efficiency with a more cost-effective approach. Furthermore, after observing diminished mass removal during the second of two ISCO injections, the remediation approach was dynamically adapted to include a biotreatment polishing phase following the first ISCO injection. This chemical-biological treatment technology chain reflects a responsive, performance-based design philosophy.

This presentation underscores the importance of a dynamic strategy and a continuous improvement approach to rehabilitation design and the challenges of large scale-long term projects. By adapting to field conditions and integrating feedback loops into the remediation process, the project offers valuable insights for long-term environmental restoration in similarly constrained and complex industrial environments.


## Annalisa Gallinari

Annalisa Gallinari is an Environmental Engineer based in Montreal, Quebec with over seven years of experience in soil remediation. She holds a Bachelor's degree in Bioresource Engineering from McGill University and is a member of the Ordre des Ingénieurs du Québec since 2022. Since joining WSP in 2018, she has worked on a wide range of large-scale contaminated site projects, experience which has provided her with a strong understanding of the logistical, technical, and regulatory implications of executing remediation at scale.

## Neil Marchand

With over 12 years of experience in environmental remediation, Neil Marchand leads complex construction projects focused on the in-situ and ex-situ rehabilitation of contaminated soils and groundwater. At Golder (now part of WSP Applied Solutions), she has implemented techniques such as chemical oxidation, hydraulic barrier systems, industrial effluent treatment, and the operation of water filtration units. Neil plays a strategic role as both site manager and client liaison, ensuring projects are technically sound, sustainable, safe and well-coordinated. Her academic background includes a PhD in Geographical Sciences from Université Laval—where her thesis explored forest disturbance and climate effects on tree growth—and a comprehensive geography education from Université Paris 1 Panthéon-Sorbonne. Certified as a Project Management Professional (PMP®), Neil blends scientific insight, operational excellence, and a deep commitment to environmental stewardship.