

Risk Assessment and Phytoremediation: Multipronged Approach to Evaluate and Address Potential Macronutrient Impact on Rivers

Karen Bechard and Ashkan Arefi, Geosyntec Consultants
Tawnya Anderson, Nichols Environmental (Canada) Ltd.

A multi-disciplinary approach was applied to a ~90 hectare Site near Edmonton Alberta consisting of a series of six lagoon cells that were previously used for wastewater treatment as well as a naturalized hiking trail, the River Valley Alliance Trail (managed by Strathcona County), which runs along the northern edge of the property. A human health and ecological risk assessment (RA) was performed to evaluate the potential risk from contaminants of concern (COC) in groundwater (dissolved metals, nitrate, nitrite, ammonia and sulphate) migrating to the North Saskatchewan River which bounds the northern edge of the Site. Many of the COCs in groundwater are used as indicators within the North Saskatchewan Region Surface Water Quality Management Framework under which there are median and peak trigger levels for the North Saskatchewan River. An assimilation analysis was also completed to evaluate potential risks to aquatic receptors and food web modeling was conducted to evaluate risks to terrestrial receptors. The RA concluded that there were no unacceptable risks to human receptors, nor to aquatic life, although it did identify the potential for ecological risks isolated to two lagoon cells due to direct contact with soil or via consumption of earthworms or other invertebrates. Current plans include phytoremediation combined with the application of cover material in a manner that will provide additional environmental benefit to the Site beyond those required by risk management measures to address RA concerns. This approach will maintain contaminant isolation from potential risk receptors in the interim, fully addressing the remaining residual impacts to soil and groundwater so that unrestricted use of the property is available in the future.

This presentation will provide an overview of the site conditions and discussion of the North Saskatchewan River as well as the systematic method used to evaluate the potential risk; the conceptual site model and risk assessment approach; findings of the risk assessment; focused remediation strategy and conceptual design for phytoremediation. The applicability of this site approach to other sites with similar potential for macronutrient impact on riverine settings will be explored.

Ashkan Arefi

Ashkan Arefi is a project manager and risk assessment (RA) specialist with over 16 years of experience in the assessment and management of contaminated sites across Canada. Ashkan's experience includes human health and

ecological RA, soil vapour intrusion assessment, contaminant fate and transport modelling, phased environmental site assessment, and remediation. He has been project manager and/or technical lead on hundreds of Phase I and II Environmental Site Assessments (ESAs), remediation, and RAs in accordance with provincial regulations for variety of clients in the oil & gas, commercial, real estate, and power & energy sectors, in addition to federal regulations in support of a number of governmental agencies. Ashkan's RA experience includes projects of varying scale and complexity in relation to contaminated lands (residential, commercial, industrial, recreational, agricultural, and remote/low access), water bodies (freshwater and marine), and air emissions from industrial facilities. He is involved routinely in using the outcomes of ESA and RA studies to guide the development of remedial, environmental monitoring, and/or risk management plans to mitigate, track or manage identified human health and/or ecological risks and environmental liabilities. He has also completed human health RAs in support of community based environmental impact studies for major transportation and oil & gas clients. Ashkan is recognized by the MECP as both a Qualified Person for RA (QPRA) and Environmental Site Assessment (QPESA).

Karen Bechard

Karen Bechard is a Risk Assessor (QPRA Ontario) and toxicologist based in Ontario with more than 13 years of experience in the environmental consulting industry. Her areas of expertise include human health and ecological RA and toxicological review, evaluation of risk management measures (RMM) and data quality assessments. Her RA portfolio includes many projects under Ontario Regulation (O.Reg.153/04), as well as RA projects in other jurisdictions (United States [CERCLA/RCRA], Australia, Alberta, elsewhere in Canada). Ms Bechard is regularly consulted on in the capacity of toxicologist when reviewing potential impacts to environmental receptors at points of compliance. Ms. Bechard is also involved in many research and development projects focused on treatability options of groundwater/wastewater/pit water contaminants. Participation in the conceptual design of many treatability studies for water, sediments, and mine tailings through to pilot and full-scale systems has provided a solid understanding of data collection and data quality needs. Ms. Bechard is also an integral team member in the characterization of natural carbon sources and selenium and nitrate reduction in mining bioremediation treatment systems.