STREAM 4B – ASSESSEMENT

Concentration-response Analysis in Aquatic Ecological Risk Assessment

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The objective of this presentation is to focus on approaches for determining whether observed 'effects' in aquatic ecological risk assessments can be attributed to site-related contaminants.

Ecological risk assessments (ERA) for aquatic sites are typically based on several lines of evidence such as sediment chemistry, porewater chemistry, bioassays and benthic invertebrate surveys. Most practitioners plan ERA studies using control-impact designs that emphasize evaluation of the magnitude of exposure and effects relative to environmental quality guidelines, reference sites or lab controls. However, weight-of-evidence conclusions about risks should be based not only on magnitude but also on evidence for causality. Potential for causality can be evaluated to some extent by considering relationships among endpoints, particularly the relationships between exposure and effects endpoints. With this in mind, ERAs should be planned in a way that characterizes concentration gradients and thereby facilitates concentration-response analysis. This presentation will draw on data from several aquatic sites we have worked on, to illustrate the use of plots and quantitative models in evaluating concentration-response for various types of endpoints.

Giant Mine Remediation Project – Site-Specific Water Quality Objectives

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The objective of this presentation is to describe the technical development of site-specific water quality objectives for Baker Creek as required by the environmental assessment, as well as the associated public consultation and engagement requirements.

Following the discovery of gold in the Yellowknife area of the Northwest Territories, Giant Mine officially opened in 1948. After the mine closed in 2004 the care and control of the mine fell to Indigenous and Northern Affairs Canada (INAC), and attention focused on the environmental issues left behind, including the arsenic trioxide stored in underground chambers. The Giant Mine Remediation Project was created in 2005 with the overall goal to protect human health and safety, and the environment.

The site lies within the Mackenzie Valley watershed, and is regulated by the Mackenzie Valley Resource Management Act (MVRMA). The MVRMA is federal legislation aimed at creating an integrated system for protecting the lands and waters within the Mackenzie Valley watershed. Since the site is under the care and custodianship of INAC, it is also subject to other federal acts, such as the Canadian Environmental Protection Act, the Fisheries Act and the Migratory Birds Convention Act, among others. It is also situated within the municipal boundaries of the City of Yellowknife, and so is impacted by the City's bylaws and permitting requirements.

The Project has recently completed a seven-year environmental assessment (EA) process under the MVRMA, which resulted in 26 legally binding measures being incorporated into the project scope.

The Project Team is now proceeding with a clearly defined list of requirements established through the process for the project. Specific components of the project require stakeholder input before being included in the updated consolidated project description. Two such components currently undergoing public consultation are the relocation of the treated effluent outfall and the remediation of Baker Creek.

Baker Creek is a small, intermittent stream that flows through the Giant Mine site and drains the general mine/mill complex area. Treated effluent is discharged into Baker Creek during the open-water season, usually a two to three month period between July and September. Water flow in Baker Creek is seasonal and limited to particular periods during the open water season; flows in the upper portions of the creek cease during the summer months, while the input of treated effluent sustains flows in the lower portions of the creek during the entire period of discharge. As part of the remediation plan, the current treated effluent discharge will be removed from Baker Creek and relocated, likely into Yellowknife Bay of Great Slave Lake.

There are two EA measures directly applicable to the remediation of Baker Creek. One EA measure requires that the water quality at the outlet of the creek channel must meet site-specific water quality objectives. The second EA measure requires that remediation of the creek ensures that water quality changes associated with Baker Creek will not adversely affect benthic

invertebrates, plankton or fish in the vicinity of the creek outlet in Great Slave Lake. In addition, the outflow of Baker Creek must not increase arsenic concentrations in Great Slave Lake, must not affect traditional or recreational users, and must not adversely affect areas used as sources of drinking water. Meeting these EA measures will prove challenging as treatment of the Baker Creek water is not a feasible option.

Typically, water quality objectives are based on the Canadian Council of Ministers of the Environment's (CCME) Canadian Water Quality Guideline (CWQG) for the Projection of Freshwater Aquatic Life. However, the CCME CWQGs are generic and designed to be protective of the most sensitive species on a national scale. Giant Mine is located within the Yellowknife Greenstone Belt and arsenic concentrations within this area are naturally elevated. As such, using the generic CCME CWQG for arsenic is not appropriate. Work is currently underway to develop site-specific water quality objectives for arsenic at the outlet of Baker Creek; additional parameters are also being screened and assessed and site-specific water quality objectives will be developed, as appropriate.

This presentation will describe the technical development of site-specific water quality objectives for Baker Creek. The public consultation and engagement requirements associated with this work will also be discussed.

Strategies for Assessing Ecological Risks at Foreshore/Aquatic Contaminated Sites

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The objective of this presentation is to discuss the assessment of ecological risks in the transition zone from foreshore to aquatic environments at federal sites and the associated challenges.

This presentation will review strategies for assessing ecological risks at foreshore/aquatic sites in a manner that avoids common pitfalls. Frequently, remediation to numeric targets is not feasible for technical and/or cost reasons, so assessment of (residual) risks is necessary. Aquatic ecological risk assessments can involve more time and funding than is initially estimated. Challenges to risk assessment of foreshore/aquatic sites include: converting understanding of groundwater quality into exposure conditions for aquatic receptors; apportioning "cause" of effects to chemical vs. physical stressors; analysis of ecological effects in a spatial context; and, translating risk assessment findings into risk management. For each of these challenges, strategies and examples will be presented in the context of Federal sites. The target audiences for this presentation are project managers and decision-makers who manage foreshore and aquatic sites.