

Eco-Toxicity of Sulphate Relative to Chloride

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Management of salts in the top 1.5 m of Alberta soils is currently achieved based on soil electrical conductivity (EC). Deeper soils may be managed either using EC, or based on the concentration of chloride ion, using the subsoil salinity tool (SST).

Alberta Environment (AENV, 2010) soil EC guidelines are based primarily on various research databases of plant salt tolerance including the United States Department of Agriculture (USDA) salinity databases and Howatt (2000). Plant salt tolerance studies commonly use sodium chloride as the source of salt (Howatt, 2000; Maas, 1990). However, research reported in Howatt (2000) suggests that some plants may be less sensitive to sulphate than to chloride.

Numerically the most frequent occurrences of salinity releases at oilfield sites in Alberta are related to chloride, since that is typically the anion that predominates in saline produced water. However, there are a significant number of oilfield sites in Alberta that, historically or currently, store elemental sulphur produced from sour gas sweetening operations. When these sulphur storage sites are decommissioned,

environmental assessment activities may reveal areas of soil with elevated sulphate. Given the large footprint of some sulphur storage facilities, the potential size of any plume of elevated sulphate can be correspondingly large.

Objective

The overall objective of this project is to determine whether sulphate has a significantly different toxicity to chloride for a representative selection of Alberta plants, and if so, to identify what further work might be needed to support a potential future sulphate-specific soil remediation guideline and/or a sulphate eco-toxicity reference value to be used with the SST.

Policy Issue

Natural versus anthropogenic Impacts. Natural concentrations of certain elements exceeding or contribute to an exceeding parameter identified in current regulatory guidelines can cause elevated remediation and reclamation costs that, with proper evaluation, could be reduced if they can be differentiated from anthropogenic impacts

Knowledge Gap

Development of sulphate soil quality and remediation guidelines – evaluation of natural salt distribution, fate and transport (f&t) after redistribution, sulphate, transport modeling, toxicity evaluation for the derivation of criteria for the protection of

potable water, FAL, human health (ingestion), wildlife/livestock ingestion and eco-soil contact exposure pathways, including harmonization of rooting zone electrical conductivity (SCARG) criteria.

2013 Exova_Ecotoxicity of Sulphate Relative to Chloride

2013 MEMS and Exova_Sulphate Relative to Chloride Presentation

2013 MEMS_Ecotoxicity of Sulphate Relative to Chloride Report

2014 MEMS and Exova_Sulphate to Chloride Presentation