

2006 Ecotoxicity Evaluation of Amines, Glycols and Methanol to Soil Organisms

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Axiom Environmental Inc. (Axiom), on behalf of the Petroleum Technology Alliance Canada (PTAC), contracted Stantec Consulting Ltd. (Stantec) to conduct chronic ecotoxicity assessments of a negative control soil freshly amended with alkanolamines, glycols and methanol in order to generate chemical-specific toxicity data for soil dwelling organisms and these compounds. The five compounds were monoethanolamine (MEA), diethanolamine (DEA), diethylene glycol (DEG), triethylene glycol (TEG) and methanol (MetOH). All five compounds are used extensively in the petroleum industry in Alberta or are by-products of the industry. The ecotoxicity assessment was conducted in order to generate terrestrial toxicity data that will be used, in part, to derive new soil quality criteria for the five compounds listed above.

The ecotoxicity assessment consisted of range-finding and definitive tests with three plant and two invertebrate species. The range-finding tests served

to establish the toxicity response curves for each test species and compound, whereas the definitive tests were conducted to generate the data for use in the development of the soil quality guidelines. The definitive plant tests were early seedling emergence and growth tests and the definitive (chronic) invertebrate tests were chronic survival, growth and reproduction tests with one earthworm and one collembola species. The results from the definitive plant and earthworm tests are reported herein. All testing was conducted using a standardized negative control soil and was conducted according to the Environment Canada published or draft methods for earthworms, plants and collembola (EC 2004, 2005a and b, respectively).

In addition to toxicity testing, the soil concentrations of amines, glycols, and methanol to which test organisms were exposed were also measured by chemical analyses. Subsamples of the amended test soils were collected for all compounds and submitted for analyses at the beginning, middle and end of selected toxicity tests. Quantitative measurements of the compounds in amended soils were possible for glycols and methanol; however, concentrations of amines in soil could not be measured successfully despite numerous attempts. This lack of success during this project supported the claim that there currently are no standard methods that can quantitatively and reliably measure the concentrations of amines in soil. It also illuminates the need to develop analytical

methods for this group of chemicals.

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