

18NZ043 - Historic Mine Sites – Not Your Average Contaminated Site

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Session Theme relevant to: Contaminated Site Investigation

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Background/Objectives. In some regions of New Zealand, such as Northland and the Coromandel, historic mine sites can be significant sources of contamination. Many of these sites were abandoned when the ore was found to be of low grade, ore prices fell or fire destroyed machinery and buildings. Little if any remediation was undertaken, and mine workings, tailings and associated processing equipment typically remain as they were left by the miners. Investigations of these sites bring many challenges often not encountered in more routine contaminated land work. Problems such as complex mineralogy and geochemistry and difficult and remote access are important factors to consider when investigating such sites. Examples from Coromandel and Northland will be given to illustrate some of these challenges.

Approach/Activities. Development of a robust conceptual site model is paramount and requires an understanding of the mineralogy and geochemistry of the site. Things to consider that may be a little ‘out of the ordinary’ include contaminants that are not part of the usual “heavy metal suite” of analytes. Inorganic elements such as antimony (Sb), mercury (Hg), thallium (Th) and selenium (Se), as well as more familiar elements such as arsenic (As) lead (Pb) and zinc (Zn) are often present as trace elements in ore bearing minerals. At mine sites containing Hg and Se, consideration must be given to their bioaccumulative effects. This may require “ultra-trace” sampling of multiple media (e.g. water, sediment and biota) coupled with development of site-specific risk assessments to determine if human and ecological receptors are at risk. The formation and dissolution of secondary minerals and weathering products may also need to be considered, as these may become important sources or sinks of contaminants if future site conditions change.

By their very nature, mine sites are located in geologically anomalous areas. Consequently determining background concentrations is important, especially if remediation is planned. This may require considerable amounts of additional sampling to gain a representative result. Pre-screening samples with a hand held XRF prior to sending select samples to the laboratory is an effective method for gathering a larger more targeted data set.

Results/Lessons Learned. Results of ultra-trace sampling for Hg in surface water, sediment and biota associated with the historic Puhipuhi mercury mine will be presented, as well as comparison of hand held XRF data with laboratory analysis of shallow soils from the Puhipuhi region. Water, sediment and soil samples from a number of historic Coromandel mine sites will be compared and contrasted to those results found at Puhipuhi.

Speaker Biography

James is a Senior Environmental Geologist at PDP, Auckland. He has a background in geochemistry and primarily works on environmental site investigations and contaminated land assessments. James has worked at a number of mine sites including Martha Mine where he conducted research for his MSc.