

## ABSTRACT OF THESIS

### EVALUATION OF WORKER PROTECTION IN A MIXED WASTE ENVIRONMENTAL LABORATORY

An analytical laboratory specializing in the identification of chemically toxic and radioactive materials in environmental matrices was evaluated to determine the level of protection afforded to the chemists and technicians from the hazardous components of their jobs.

A review of historical laboratory data allowed for the creation of a model profile of potential sample constituents that may be found in environmental samples delivered to the laboratory. This model profile gave estimates of maximum concentrations, at a 95 % confidence interval, of various contaminants. For liquid samples, the profile contains 114 chemical and 57 radiological constituents. The solid sample profile contains 98 chemical and 55 radiological constituents. Concentrations of these various constituents were evaluated to determine that incoming sample material should be classified as potentially hazardous, and that employees should be provided with adequate handling instructions to protect their health and safety. Characteristic hazards, such as corrosivity and flammability were not evaluated.

A review of the laboratory's methods was conducted to prioritize the potential risks associated with performing those methods. The type, volume, and application of reagents was considered, as well as the physical processes used and the amount of bulk sample material handled. The following seven methods were identified as the most potentially hazardous and observational surveys were conducted for each one. Sample receipt, gross soils preparations, and sample disposal activities require the handling of liter and kilogram quantities of bulk sample material. Organic extraction involves the use of large quantities of methylene chloride. The preparation of organic standards involves the use of a vast array of concentrated carcinogenic compounds. Actinide separations use large volumes of inorganic acids and pyrosulfate fusion exposes the employee to high heat, and hazardous fluorine and sulfur fumes.

One hundred eighteen observational surveys were performed, which included a total of 35 employees and 3,190 individual observations. The survey materials were developed to be specific to each of the seven methods being observed. The results of the surveys fail to support the hypothesis that these employees are adequately protected from the hazards associated with their positions, with 27% of the survey items being termed "deficient". Behavioral modification, in the form of education of health risks and enforcement of existing safety guidelines, as well as more comprehensive safety protocols and personal sampling is recommended.

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