I. Introduction to Environmental Site Assessment (ESA) in Canada

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Introduction:

Soil and groundwater contamination is a growing problem in Canada and worldwide. As population and economy grows, commercial and industrial land is being redeveloped and expanded to satisfy increasing needs of services. The new needs and demands meant that Canadians had to deal with past contaminants that have been dormant for many years. A continuing challenge, in addition to past contaminants, is the ability to control contamination of the commercial and industrial sites despite well developed and implemented environmental regulations in Canada.

Figure 1 : Underground Storage Tank

This article briefly presents the problem of properties contamination in Canada and the Canadian Environmental Site Assessment (ESA) approach. The current article is a part of a series of articles related to this topic and will be followed by another three articles in the future issues of ETMA newsletter. These four articles are intended to provide an overview of the ESA approach, report contents and application methodologies. The main objective of the series of articles is to share best environmental practices with environmental specialists in the Kingdom of Saudi Arabia.

Contamination Extent

Contaminant is a substance that, when existing in a concentration above a specific threshold could be harmful to both humans and environment. The consequences of contamination can be very serious; causing both acute and long term human health effects and has alarming safety concerns and detrimental effects on our precious ecosystem. Contaminants enter the soil and groundwater in several ways and from different sources includes. These include but are not limited to:

- Accidental spills and careless waste disposal in industrial and commercial facilities. Chemicals spilled years ago, linger in the soil and groundwater and still may be a problem today.

- Leakage of petrochemical products from underground storage tanks is common especially in gasoline stations.
- Landfill leachate leakage to surrounding environment
- Past usage of pesticides and fertilizers or illegal dumping of hazardous wastes in agricultural lands

Figure 2 Landfill Leachate

In Canada, about 10,000 spills are reported each year. Petrochemical products comprise about two thirds of the reported spills. Environmental officials estimate that the total number of unreported spills could be as high a 40,000. It is estimated that between 7,500 to 20,000 underground storage tanks across Canada are leaking. There are at least 10,000 landfill sites across Canada. Contaminants may be seeping out of many of these.

Why Conduct ESA?

There are currently no legal requirements in Canada to conduct ESA, however organizations and individuals who provide mortgages (home purchasing loans) or invest in real estate's insist on conducting an ESA before completing the transaction. Conducting an ESA is requested for many reasons fall into three categories: environmental, legal and financial.

It may help reduce the environmental damage inflicted by contamination and can alert the official to the need for a cleanup or management of contamination. A demonstration of due diligence (the care that a reasonable person exercises to avoid harm to other persons or their property) has been used successfully as a defense strategy in legal cases dealing with environmental problems. ESA report may help support a claim of due diligence from a lender or a landlord in legal proceedings. The costs associated with cleanup or contaminated site management can be substantial. The lender or landlord should ensure that the site does not carry with it an unmanaged risk of contamination.

ESA Components:

A comprehensive ESA should determine whether or not a site is contaminated and determine the nature, location, extent, and depth of any contaminations if exist. It should provide information about possible corrective action and any constraints that may worsen or complicate the cleanup. The ESA process consists of up to three distinct phases: *Phase I: Environmental Site Assessment; Phase II: Contaminants characterization and Delineation; and Phase III: Site Remediation.* Many private sector organizations and public agencies have adopted a well defined and tailored ESA Process System that fits their *management setup.* For example; Figure 3 shows the Newfoundland and

Figure 1: Newfoundland and Labrador Hydro company ESA Process Flow Diagram

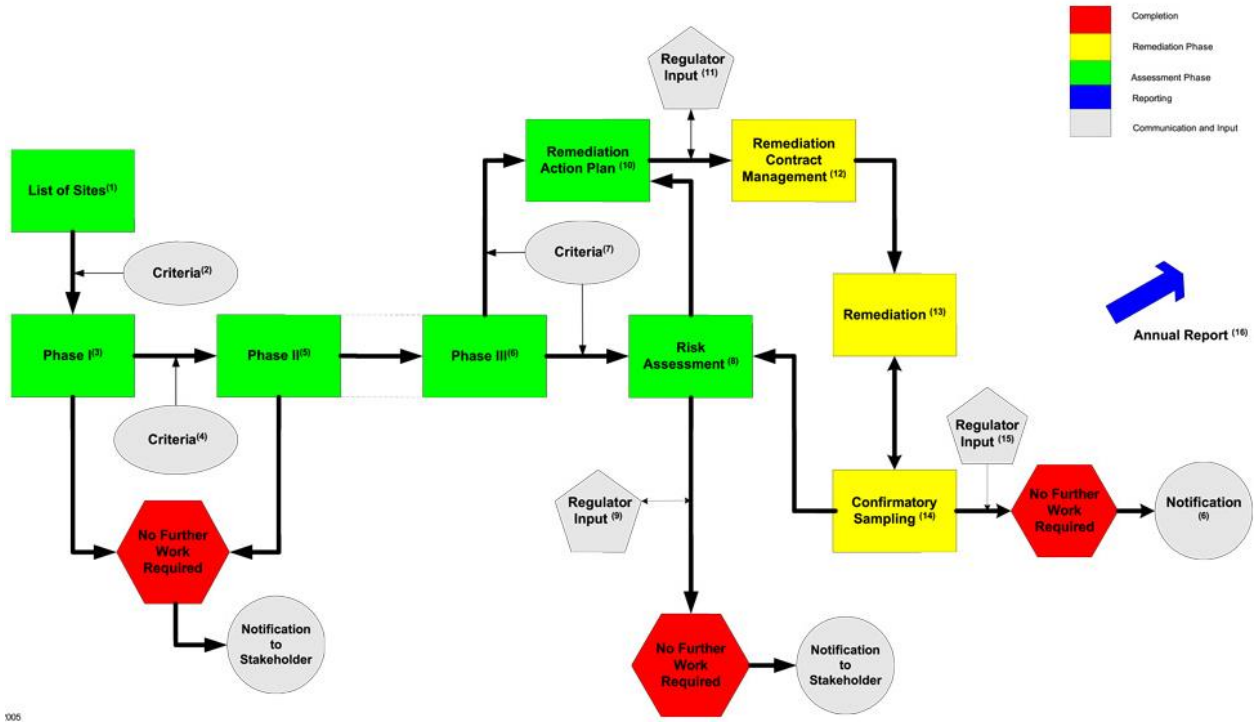
Labrador Hydro Company ESA process system

Phase I: Environmental Site Assessment

This phase is intended to help in determining the potential environmental liabilities and in establishing the basis for further investigation works. It is an information collection process which includes records review; site visits; interviews; and evaluation of information and reporting. This Phase takes one to three weeks to complete. The cost ranges from $3000 to $5000.

Phase II: Contaminants characterization and Delineation

This phase is only conducted if the report from phase I show evidence of contamination or possible contamination. The objective of this phase is to characterize and delineate environmental conditions related to the site. The environmental Engineer or Scientist is responsible to carry out a detailed thorough



investigation to identify, characterize, and delineate the nature and extent of contamination both above and below grade. This phase may include soil, groundwater, and ambient air sampling, testing and monitoring. This phase takes one to three months to complete. The cost ranges from $10,000 to $50,000 or sometimes even much more.

Phase III: Site Remediation

The result of Phase II assessment should provide a representative description of the contamination, including nature, quantity, area, vertical distribution and location. The objective of this phase is either to return an impacted site to the intended reusable conditions or to secure the site in a manner that mitigates future adverse impacts. The Ontario Ministry of Environment sets three main approaches for site remediation:

1- *Clean up to background condition:* it is essentially a remedial strategy that restores the site to an environmental condition consistent with the ambient or background conditions. This approach is rarely adopted

2- *Clean up for compliance with generic criteria:* The clean up criteria have been developed by several provincial government agencies that are protective of human health and environment. Generic criteria has been developed for such media such as soil, groundwater, surface water, air, and sediment. This is approach is the most common.

3- *Clean up to criteria developed using site-specific risk assessment techniques:* a site management or remedial approach based on site-specific risk assessment may be used to optimize the remediation for a particular site based on the site conditions. This approach is applied for situations where the cost of remediation is very high. It may include comprehensive modeling and optimization techniques.