

environmental engineer

Focus on Environmental Background Data Analysis

The Navy's Installation Restoration Program is looking to better focus investigations and response actions at past waste operation sites by using two distinct methods for analyzing background constituent levels. The two methods are the "comparative method" and the onsite background data evaluation method, hereafter referred to as the "onsite method".

Both the comparative and onsite methods can be used to effectively identify background data concentration ranges by applying various geochemical and/or statistical techniques. The comparative method has been used with varying success at a number of sites, while the onsite method is gaining regulatory acceptance and also should be considered when differentiating background conditions from releases.

The major challenge for both methods is to differentiate releases of site operation related chemicals from background conditions. A high variability or heterogeneity in the composition of soils makes it difficult to establish a single universal background concentration for soils or sediments in a region. EPA 1995 guidance indicates that it is more useful to discuss the range of background concentrations for a contaminant than to identify a single background concentration.

Two types of background conditions are considered when evaluating environmental background conditions. They are natural background and anthropogenic background. Natural background is defined as concentration ranges of naturally occurring constituents that have not been influenced by human activities. Examples of natural background constituents include metals derived from native rocks,

asbestos fibers, hydrocarbons from oil seeps, and polynuclear aromatic hydrocarbons (PAHs) from forest fires.

Anthropogenic background is defined as widely distributed chemicals present in the environment because of human activities, but not related to an onsite release. Examples of anthropogenic background constituents include atmospheric deposition of lead from the offsite use of leaded motor vehicle fuels and contaminating onsite sediments by offsite agricultural storm water runoff.

Under the Navy's Installation Restoration Program, there is no requirement to clean up background constituents at past waste sites. Therefore, it is important to draw a distinction between background conditions and contaminants of potential concern (COPCs) that can be attributed to releases associated with past and/or present site activities.

Comparative Method

The comparative method is the more conventional approach for identifying COPCs. Sample data collected from a nearby uncontaminated or "background" site are compared to data from samples collected at a site suspected to be contaminated. A variety of statistical comparison tests are performed using both data sets to determine if the ranges are statistically similar. These

Substance	Number of Sample Results	Degrees of Freedom	Statistical Distribution of Data
Arsenic-MK	10	9	lognormal better fit than normal
Arsenic-NE	10	9	normal better fit than lognormal

Table 1. Statistical distribution of subsurface soil data for mucky peat (MP) and silty loam (SL) for U.S. East Coast landfill.