Risk Assessment

KEY Services

Highlights

Data distribution evaluation and statistical analysis

■

Baseline human health and ecological risk assessments

■

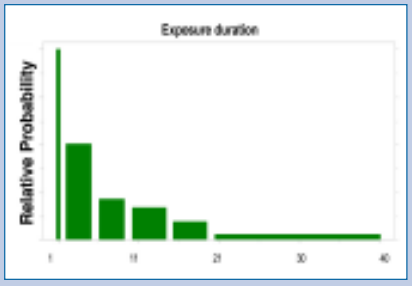
Probabilistic analysis (Monte Carlo simulations) and sensitivity analysis

■

Development of site-specific health-based cleanup goals

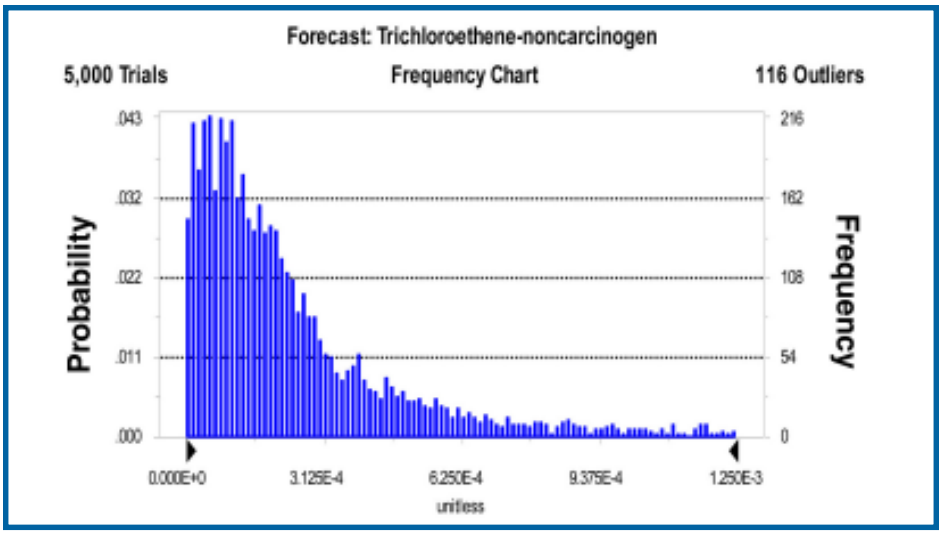
■

State-specific risk assessment procedures and agency negotiations



Probability distribution for exposure duration used in the estimation of potential risk

KEY ENVIRONMENTAL INCORPORATED



Results of a probabilistic approach (i.e. Monte Carlo) to estimate potential risk using various probability distributions to define exposure parameters

Key Environmental Inc. (KEY) performs risk assessment activities in support of various investigation and remediation efforts. The risk assessment process is routinely used to estimate the type and magnitude of potential risks to human health and the environment, associated with specific exposures to site-related constituents of interest (COI).

KEY utilizes different scientific tools and site-specific information to develop appropriate scenarios which will best suit the needs of a project. These tools and site-specific information may include:

- evaluating and selecting the appropriate distribution of site data using applicable statistical techniques (using both parametric and non-parametric methods);
- developing reasonable exposure scenarios for the site;
- applying industry recognized exposure parameters, and when necessary, developing and justifying site-specific exposure parameters;
- utilizing both deterministic and probabilistic methods to estimate risk; and,
- incorporating reasonable potential future use of a site when estimating potential risks and developing site-specific cleanup goals.

KEY has successfully employed development of reasonable site-specific scenarios when performing risk assessments versus the standard conservative regulatory approach.

Data Distribution Evaluation and Statistical Analysis

KEY has been pro-active in applying different statistical techniques to assist in estimating reasonable exposure point concentrations (EPCs). This process is critical because misuse of a particular statistical method may significantly overestimate or underestimate the EPC.

KEY primarily uses the GIS/KEY® data management system in combination with the GIS/KEY® STAT Module to assist in evaluating the distribution of site analytical data. The system provides for a cost effective, systematic, and organized approach to managing all types of analytical data and evaluates the data utilizing the W-Test by Shapiro and Wilk or D'Agostino for data which follow a normal or lognormal distribution. KEY also uses, when necessary, various non-parametric techniques.

Baseline Human Health and Ecological Risk Assessments

KEY has performed numerous baseline human health and ecological risk assessments under various industrial settings and regulatory frameworks.

Baseline risk assessments include five basic steps:

- site characterization;
- exposure assessment;
- toxicity assessment;
- risk characterization; and,
- uncertainty analysis.

As part of the **site characterization**, analytical data are reviewed in order to select COI. During the **exposure assessment** evaluation, development of a site conceptual model (SCM) is a critical element of the baseline assessment. The **toxicity assessment** involves reviewing various databases to collect and apply the most up-to-date COI toxicity information. **Risk characterization** combines each of the three previous steps into a quantitative estimate of site-related risks. **Uncertainty analysis** is an important part of the baseline risk assessment process. Each element of the risk assessment process has uncertainty associated with it, however, KEY takes an active role in understanding this uncertainty and making sure the uncertain elements are clearly defined and explained to enable the results of the risk assessment to be used correctly.

Sensitivity analysis showing the influence various exposure assumptions may have when estimating potential risk

Probabilistic Analysis (Monte Carlo Simulations) and Sensitivity Analysis

Probabilistic analysis is a technique KEY uses to aid in controlling inherent variability and uncertainty associated with specific risk assessments. KEY has received state agency concurrence and continues to work with state agencies in employing this technique. KEY has used this technique as a useful tool when the reasonable maximum exposure scenario does not define reasonable site-specific conditions and leads to unacceptable risks for a site. As a result, applicable risk goals can be met, therefore, eliminating the need for potential remediation of the site.

KEY also performs **sensitivity analyses** to evaluate how a particular assumption or input parameter in the risk assessment may effect the outcome (risk estimate). Based on this type of analysis, KEY has been successful in adjusting particular input parameters (*e.g.* exposure duration, exposure frequency) during the development of site-specific health-based remediation goals.

Development of Site-Specific Health-Based Cleanup Goals

KEY has used several different methods to calculate cleanup goals, but in particular, use of site-specific risk techniques is the primary means in deriving these values. KEY has successfully developed and negotiated site-specific cleanup goals for numerous sites. In developing these values, KEY recognizes that one of the most important factors to consider, is assessing reasonable exposure scenarios.

State-Specific Risk Assessment and Agency Negotiations

KEY has worked with many different state agencies to address state-specific requirements. Many states have specific procedures to follow, ranging from the selection of COI to the use of probabilistic techniques. KEY's experience over this wide range of requirements allows for the evolution of specific novel approaches, which in turn, lead to potential cost savings at later stages of the site assessment/remediation process.

KEY has built a solid background in negotiating many different aspects of the risk assessment process, from development of site-specific exposure parameters for potential trespassers to applicable statistical techniques for use in evaluating analytical data. KEY understands the importance of negotiating certain aspects of the risk assessment, especially when particular procedures are not recognized as being standard, but yet may be reasonable to consider for the site.

KEY ENVIRONMENTAL INCORPORATED

KEY SERVICES

Remedial Investigations and Site Assessments
Phase I Assessments
Geophysical Evaluations
Hydrogeological/Aquifer Testing
Soil/Sediment Characterization
Groundwater Characterization
Fate & Transport Evaluations
Risk Assessments
Natural Attenuation Assessments
GIS/GPS/Data Management

Environmental Engineering
Feasibility Studies
Remedial Design
Turnkey Projects
Construction Management
Construction QA/QC Oversight
Monitoring/Reporting
System Operations

Program Support
Permitting
Regulatory Support
Expert Witness and Reports
Contractor Procurement
Decommissioning/Demolition

KEY OFFICES

Pennsylvania (Corporate)
1200 Arch Street, Suite 200
Carnegie, Pennsylvania 15106
P: (412) 279-3363, F: (412) 279-4332

New Jersey
456 Route 22 West, Suite D
Whitehouse Station, New Jersey 08889
P: (908) 534-4501, F: (908) 534-6785

New England
185 Lancaster St., Ste, 304
Portland, Maine 04101
P: (207) 772-8100, F: (207) 772-8101

www. keyenviron.com
mailbox@keyenvir.com