Sandia National Laboratories

Environmental Program

Landfill Assessment and Monitoring System

Technology Need

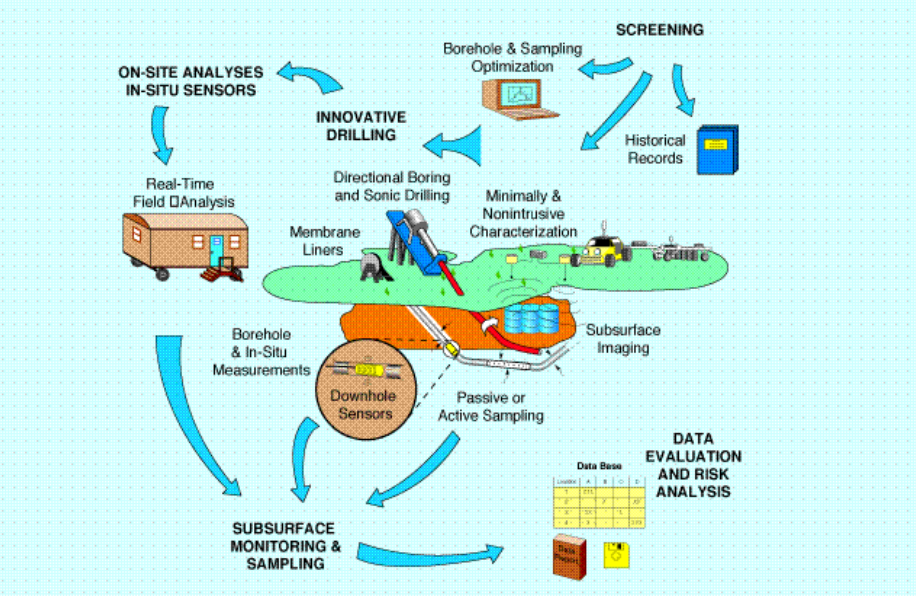
Several technologies are usually required for adequate assessment and monitoring of hazardous and mixed-waste sites. Often, these technologies are used sequentially with little thought given to the synergy and savings in cost and time that can be gained by using an integrated system of compatible and complimentary individual technologies. Components necessary to implement a systems approach to site assessment and monitoring include: (1) using technologies that are appropriate and suited for site-specific conditions and needs, (2) ensuring that the technologies are compatible and complementary, and (3) selecting and integrating the optimum suite of technologies to adequately perform a job.

Objective

The Landfill Assessment and Monitoring System (LAMS) ensures that technologies developed for assessing, monitoring, and remediating hazardous and mixed wastes sites are adequate and appropriate for their intended use. LAMS uses a systems approach whenever possible to maximize data gathered and minimize costs, worker exposure, and time expended for assessment and monitoring. The use of LAMS is aimed at facilitating rapid transfer of these technologies throughout the Department of Energy (DOE) complex and commercialization to the private sector.

Project Description

The LAMS is a method to assess hazardous and mixed waste contaminants, their sources, and their migration beneath landfills. It efficiently utilizes the best available and emerging technologies. The emphasis of the system is on minimally intrusive technologies and downhole sensors when possible.



Schematic of Monitoring Process

The LAMS is envisioned to be a start-to-finish system for landfill assessment, using compatible, complementary, and integrated technologies. The result is a savings in cost and time. The LAMS consists of five separate subsystems: (1) screening and sampling optimization techniques, (2) innovative drilling technologies, (3) on-site analysis and in situ sensors, (4) subsurface monitoring technologies and sampling, and (5) risk analysis and on-site data

evaluation and visualization technologies. In some instances, technologies may be combined to produce hybrid systems.

The emphasis of LAMS has shifted to long-term monitoring as this aspect of remediation and containment has become more important. Monitoring of active, in situ remedial actions, as well as post-closure and containment effectiveness, is being pursued. These activities include a Verification and Monitoring Options Study (VAMOS) to evaluate research options needed in this area. Field studies to monitor in situ chromium reduction, electrokinetic removal of chromium from unsaturated soils, subsurface barrier performance, and integrity of landfill caps and covers are also being conducted.

Technology Transfer

LAMS pursues the establishment of regulatory and technology transfer contacts. It has produced numerous successful technology transfers through partnerships, commercializations, demonstrations, implementation at environmental restoration sites, and reports and presentations.

Advantages

When individual technologies are used in conjunction with each other as a system, several advantages result. These include savings in time and cost. Also, a focus on minimally intrusive and in situ techniques reduces the risk of worker exposure to wastes or contaminated media. The LAMS provides better resolution of site characteristics, contamination sources, vertical and aerial extent of contaminant plumes, and monitoring of remedial and post-closure actions.

The Target Verification and Calibration (TVAC) task performed at Sandia National Laboratories' (SNL's) Technical Area II (TA-2) serves as an example of LAMS's cost-saving potential. LAMS was used to integrate multiple, non-intrusive, high-density geophysical, soil and soil vapor, and photographic data by employing innovative algorithms and visualization techniques to investigate anomalous targets identified outside of known landfills at TA-2. Excavation of select target sites provided feedback used to calibrate the interpretive algorithms and evaluate potential environmental concerns. Subsequent modifications of the algorithms and interpretation of the excavations created a more robust software product. The investigations allowed the SNL Environmental Restoration (ER) Project to eliminate numerous targets and areas of potential concern. It is estimated that TVAC, using the LAMS approach, may have saved the ER Project over $500K. Recently, LAMS and TVAC were used at the TA-2 Radioactive Waste Landfill where a large anomalous target located just outside of the landfill was accurately identified as a coalescence of underground utilities and near-surface debris. Eliminating this target from its scheduled remediation saved the ER project at least 3-4 days excavation in Level B gear and an estimated $20K - $30K in removal and disposal costs for this target alone.

Costs

Costs of using LAMS are highly dependent upon the particular technologies selected. However, a rough comparison to baseline would be 10% to 50% less expensive for start-up costs and 20% to 80% less expensive for operations and maintenance costs.

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