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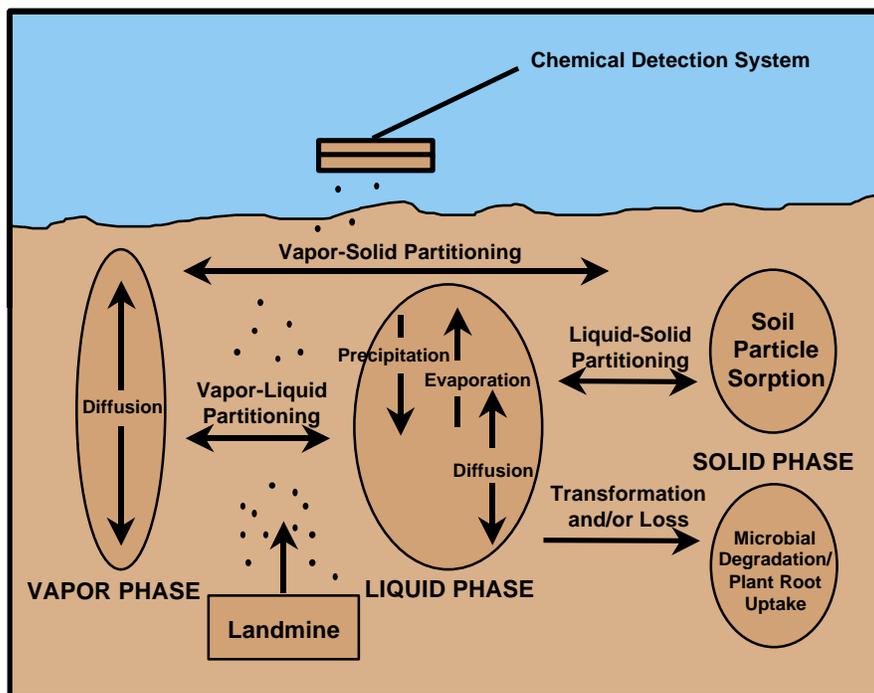
Environmental Program



Environmental Fate and Transport of Chemical Signatures Through Soil Impacts Chemical Detector Survey Success

The fate and transport of chemicals through soil are complex phenomena. Explosive chemical signature molecules

- interact with soil components and soil water
- move through the soil by diffusion and advection
- change from vapor state, are dissolved in soil water, and are sorbed on stationary soil solid phases
- are chemically transformed by microorganisms and soil minerals.



This illustration shows a conceptual model of the environmental fate and transport processes that impact the movement of landmine chemical constituents to the surface for chemical detection.

Need for technology

Environmental conditions in which buried landmines reside are broad, extending from subzero to extremely hot temperatures, from arid regions to regions of heavy, regular precipitation, and with soil conditions that range from mostly sand to mostly organic matter. The impacts these environmental conditions have on the fate and transport of chemical signature molecules from buried landmines have been individually explored but are poorly understood as interacting phenomena.

A fundamental understanding of the environmental conditions that affect the movement of the chemical signature is needed to ensure successful chemical detector-based surveys. Such fundamental work is required because the current knowledge base may limit the effective use of chemical detectors. The data do not exist to

support sampling system designs and operational strategies. Prediction of surface vaporization flux rates, or the distribution in vapor, liquid and on solid phases, as a function of soil and environmental conditions is important to technology developers and demining programs interested in chemical detector-based platforms.

Leveraging the National laboratories

Sandia National Laboratories is a valuable asset to the technology developers and government demining programs.

Sandia researchers have initiated efforts to map the environmental fate and transport of chemical signature molecules through soils and can provide technology that will assess

- whether a chemical sensor will be able to detect chemical signatures from buried landmines
- how much sample collection and concentration are needed to confidently detect buried landmines and other unexploded ordnance
- what soil and environmental conditions favor a successful chemical detector platform survey.

Does a hot, dry spell in the Afghanistan desert promote transport? How many days after a heavy rain will the chemical signature reappear on the surface? These and other key questions need answers before chemical detector platforms can become valuable humanitarian or military demining tools.

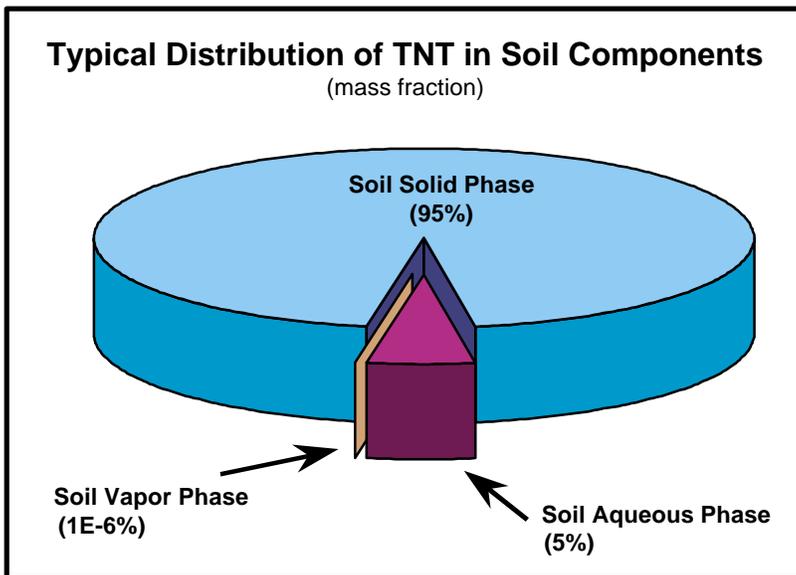
Partnering opportunities

Sandia National Laboratories welcomes the participation of industrial partners in developing the chemical signature environmental fate and transport technologies.

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Sandia has initiated efforts to map fate and transport of chemical signature molecules. This chart shows distribution of TNT in soil.

