



## LAND RESEARCH PROGRAM

### Research Guides Remediation of Contaminated Sediments Impacted by Groundwater Discharge

#### Issue

The discharge of groundwater into surface water may influence the concentrations and availability of contaminants in sediments. There are three predominant pathways by which groundwater may affect the characteristics of contaminated sediments:

- Direct contribution of contaminants from the discharge of contaminated groundwater
- Indirect influence on existing contaminants due to geologic and chemical processes that change the properties of sediments and contaminants
- Indirect influence on existing contaminants due to the influence of groundwater discharge on biological (e.g., microbial) processes that transform or degrade contaminants

Ground water can act as a conduit for dissolved pollutants and

sediment constituents. With an enhanced understanding of groundwater discharge to surface water systems, scientists can improve estimates of long-term contaminant loads in sediments and develop better management practices to control human and ecosystem exposure to contaminated sediments.

#### Science Objective

The Land Research Program in EPA's Office of Research and Development is conducting field-based research to:

- Develop methods to best characterize hydrologic and chemical processes at the groundwater / surface water (GW/SW) interface
- Understand the role of groundwater flux on sediment processes governing contaminant speciation and mass

This research entails characterization of water and

solids within the GW/SW transition zone to explain processes that occur during physical contact between groundwater and sediments. These measurements are conducted to capture the spatial and temporal variability that is commonly encountered in these natural systems.

The overarching research goal is to develop a framework for risk characterization at contaminated sites, which will assist risk managers in selecting remediation strategies to best manage human and ecosystem exposure to contaminated sediments impacted by groundwater discharge.

#### Application / Impact

The outcome of this research provides EPA with practical knowledge to guide site characterization and remediation at sites where groundwater discharge exerts short- and long-

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term influence on sediment contamination.

Field and laboratory studies conducted by the Land Research Program have enabled EPA to better predict the mobility, bioavailability, and fate of contaminants in sediments, and to develop effective remediation strategies.

Research accomplishments include:

- Identification of links between groundwater discharge and sediment contamination with emphasis on arsenic, lead and zinc
- Development of new approaches to identify spatial variability of groundwater discharge into surface-water systems using direct measurements and cost-effective surrogate measures
- Use of research findings by EPA Region 1 to identify the impact of groundwater discharge on metal contamination in sediments, and to select cost-effective remedies to manage

contaminant inputs at two Superfund sites.

Groundwater discharge may serve as a long-term source of contaminants to sediments within a watershed and/or may govern processes controlling the properties of existing contaminants. Design of appropriate remedies that account for the influences of groundwater provides the basis for more effective remedies to manage risks to human and ecosystem health.

### REFERENCES

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