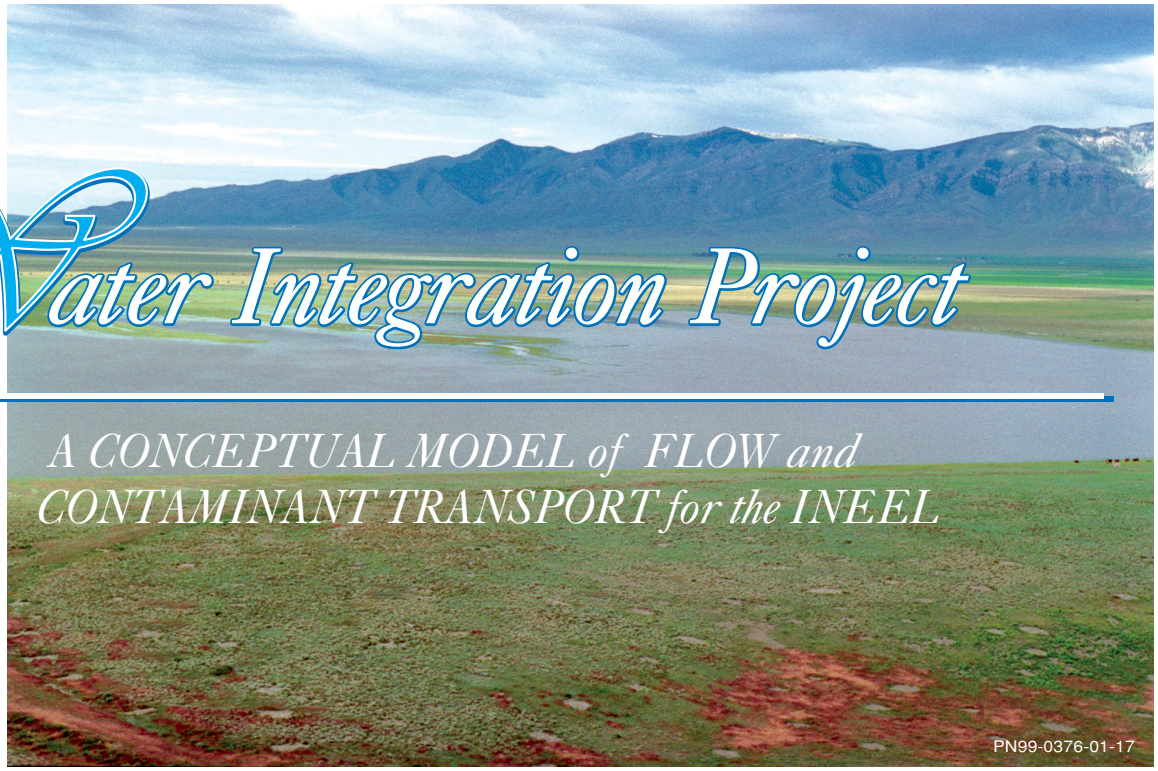
INEEL

# Water Integration Project

## A CONCEPTUAL MODEL of FLOW and CONTAMINANT TRANSPORT for the INEEL




*View of the Big Lost River sinks from Lemhi Point*

Idaho National Engineering and Environmental Laboratory

## *Commitment to Accelerated Cleanup at the INEEL*

In May 2002, the U.S. Department of Energy, the Idaho Department of Environmental Quality, and the U.S. Environmental Protection Agency agreed to pursue accelerated risk reduction and waste cleanup at the Idaho National Engineering and Environmental Laboratory. As a result of this collaborative plan for accelerating cleanup, INEEL's new Idaho Completion Project (ICP) will focus on achieving two fundamental goals:

1. Reduce risk to the public and the Snake River Plain aquifer
2. Consolidate INEEL Environmental Management activities and reinvest the savings into cleanup.

The INEEL Water Integration Project will help fulfill the first goal by:

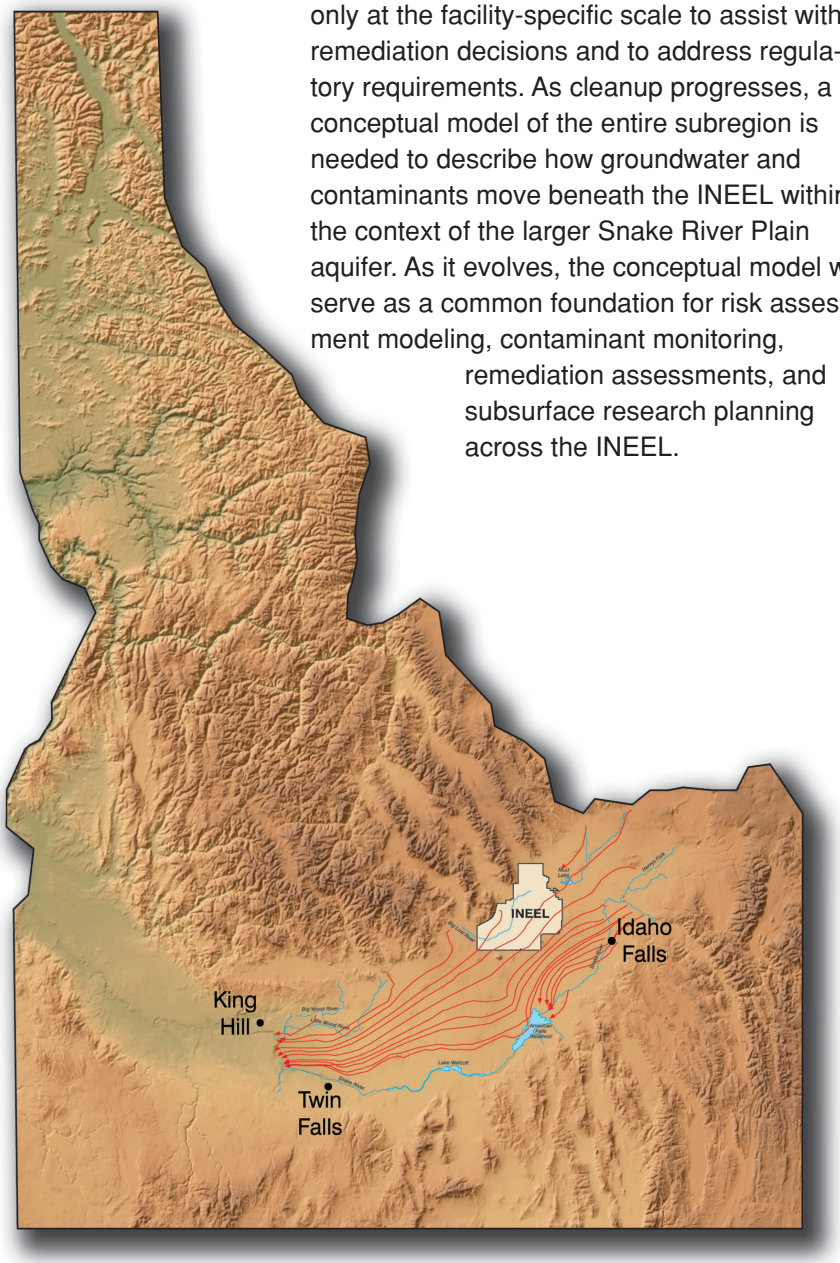
- Enhancing scientific understanding of surface water, groundwater, and contaminant movement at the INEEL
- Improving the technical basis for making cleanup decisions
- Strengthening and better coordinating vadose zone and groundwater monitoring programs.

# STEP 1

## *A Conceptual Model of Flow and Contaminant Transport*

The Water Integration Project is coordinating a multi-agency effort to develop a subregional conceptual model of flow and contaminant transport based on current understanding of geologic and hydrologic features, processes, and waste disposal history at the INEEL. Until recently, conceptual models were developed only at the facility-specific scale to assist with remediation decisions and to address regulatory requirements. As cleanup progresses, a conceptual model of the entire subregion is needed to describe how groundwater and contaminants move beneath the INEEL within the context of the larger Snake River Plain aquifer. As it evolves, the conceptual model will serve as a common foundation for risk assessment modeling, contaminant monitoring, remediation assessments, and subsurface research planning across the INEEL.

*Groundwater flow patterns in the Snake River Plain aquifer*




## *Compile Existing Knowledge*

The first step in developing a conceptual model for the INEEL is to compile and summarize all existing knowledge of the subsurface environment. Four products will be developed:

- The Geologic Framework of the Eastern Snake River Plain (a software product)
- Source Term Inventory and Release Mechanisms (a summary report)
- Vadose Zone Geometry and Transport Processes (a summary report)
- Aquifer Flow and Transport Processes (a summary report).

These documents and software will summarize areas of scientific agreement and differing hypotheses among scientists who have been studying the subsurface environment at the INEEL. The reports will be available for academic review and public discussion as they are completed. Periodic workshops will be held across Idaho to share with interested stakeholders the advances in understanding of subsurface features, processes, and events.

*Definition: A conceptual model is an evolving hypothesis identifying the important features, processes, and events controlling fluid flow and contaminant transport of consequence at a specific field site in the context of a recognized problem.*

*-- The National Research Council, 2001*

STEP

2

# *Build the Conceptual Model*

The four products described in step 1 will be incorporated into one subregional Conceptual Model of Flow and Contaminant Transport. The first version is expected to be available for public review by mid-2004, and it will have external peer review in 2005. The conceptual model will document current understanding of contaminant fate and transport processes at a scale sufficient to analyze the cumulative impacts on water quality of the Snake River Plain aquifer.

The model will continue to evolve as new information about subsurface components becomes available. It will serve as a valuable and consistent compilation of INEEL subsurface data at each step of its evolutionary process. Experience with other complicated subsurface environments, such as the Yellowstone Plateau—shows that careful synthesis of data can yield astonishing insights into subsurface processes. Such insights will improve the effectiveness and efficiency of INEEL remediation and lead to better understanding of how best to manage our common groundwater resource.

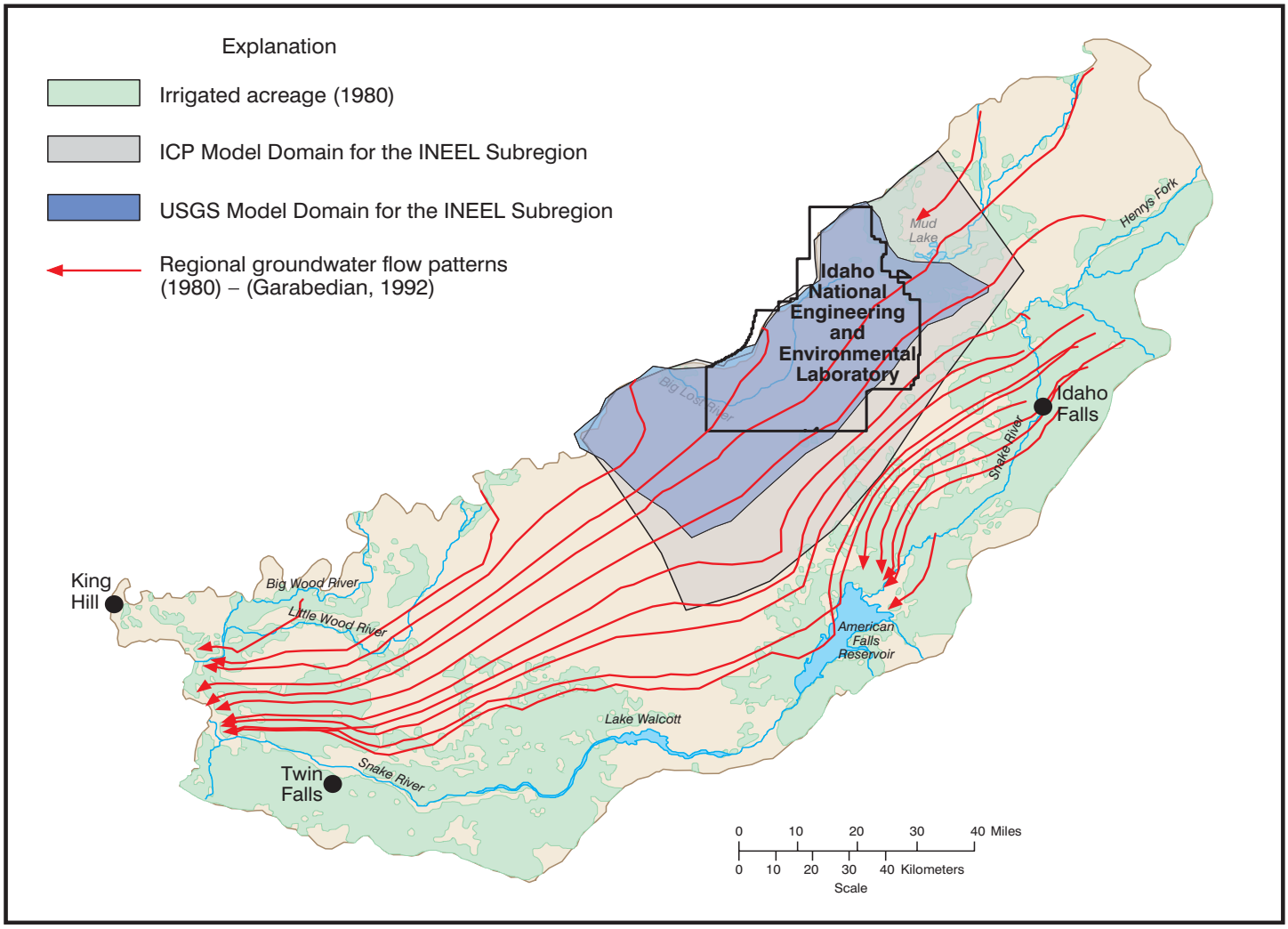



*Illustration of groundwater flow patterns*

GA03-50289-02

STEP

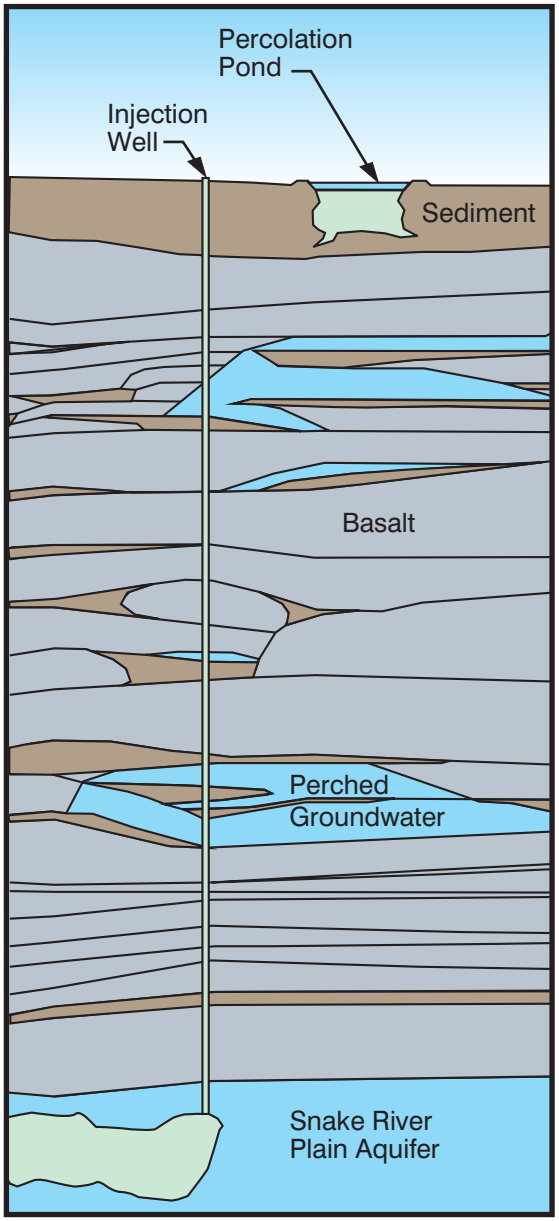
3

# *Apply the Conceptual Model*

The subregional conceptual model will maximize the benefits of research investments and expand the application of current scientific information and available tools. Improved cleanup decisions and engineering solutions will occur as technical uncertainty is reduced with respect to the movement of contaminants to and through the Snake River Plain aquifer. As it evolves, the conceptual model will serve as the foundation for evaluating remedial and monitoring activities for INEEL lands, facilities, and residual contamination.

The conceptual model will also provide the technical context for:

- A cumulative impacts analysis for the INEEL
- Understanding hydraulic characteristics and the impacts of biogeochemical transformations of the INEEL subsurface
- Completing the Remedial Investigation/ Feasibility Study for the balance of INEEL cleanup
- Identifying inconsistencies between facility-specfic conceptual models
- Resolving competing hypotheses regarding contaminant fate and transport
- Focusing research and development on the most pressing Environmental Management needs.

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*This artistic rendition of the subsurface environment shows several historic sources of contamination at the INEEL. Injection wells and percolation ponds are no longer used for waste disposal at the INEEL, but they still contribute contaminants to the aquifer.*

***For More Information***

Access the INEEL Water Integration Project Web site at www.inel.gov/environment/water, or contact:


Paul Wichlacz
208-526-1292
PLW@ inel.gov

Janice Brown
208-526-4342
browjm@inel.gov