American Petroleum Institute

STEP Strategies for Today's Environmental Partnership

Estimation of Infiltration and Recharge for Environmental Site Assessment

Health and Environmental Sciences Department
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One of the most significant long-term trends affecting the future vitality of the petroleum industry is the public's concerns about the environment. Recognizing this trend, API member companies have developed a positive, forward-looking strategy called STEP: Strategies for Today's Environmental Partnership. This program aims to address public concerns by improving our industry's environmental, health and safety performance; documenting performance improvements; and communicating them to the public. The foundation of STEP is the API Environmental Mission and Guiding Environmental Principles.

API ENVIRONMENTAL MISSION AND GUIDING ENVIRONMENTAL PRINCIPLES

The members of the American Petroleum Institute are dedicated to continuous efforts to improve the compatibility of our operations with the environment while economically developing energy resources and supplying high quality products and services to consumers. The members recognize the importance of efficiently meeting society's needs and our responsibility to work with the public, the government, and others to develop and to use natural resources in an environmentally sound manner while protecting the health and safety of our employees and the public. To meet these responsibilities, API members pledge to manage our businesses according to these principles:

- To recognize and to respond to community concerns about our raw materials, products and operations.
- To operate our plants and facilities, and to handle our raw materials and products in a manner that protects the environment, and the safety and health of our employees and the public.
- To make safety, health and environmental considerations a priority in our planning, and our development of new products and processes.
- To advise promptly, appropriate officials, employees, customers and the public of information on significant industry-related safety, health and environmental hazards, and to recommend protective measures.
- To counsel customers, transporters and others in the safe use, transportation and disposal of our raw materials, products and waste materials.
- To economically develop and produce natural resources and to conserve those resources by using energy efficiently.
- To extend knowledge by conducting or supporting research on the safety, health and environmental effects of our raw materials, products, processes and waste materials.
- To commit to reduce overall emission and waste generation.
- To work with others to resolve problems created by handling and disposal of hazardous substances from our operations.
- To participate with government and others in creating responsible laws, regulations and standards to safeguard the community, workplace and environment.
- To promote these principles and practices by sharing experiences and offering assistance to others who produce, handle, use, transport or dispose of similar raw materials, petroleum products and wastes.

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ABSTRACT

Chemicals released to the vadose zone may present an environmental risk if they leach into groundwater. The rates of chemical leaching and migration to groundwater are strongly controlled by the diffuse recharge that occurs over large areas of the landscape. This report reviews important processes pertaining to diffuse recharge and presents a review of current physical and chemical methods (applied to the vadose zone and groundwater) to quantify diffuse recharge. Readily available estimates of diffuse recharge are compiled and organized according to major watersheds throughout the country.

The recommended approach to quantify recharge depends upon site-specific conditions, project budget, time constraints, and the nature of the project. In some cases, sufficiently accurate estimates of recharge are available in the technical literature. In other cases, field measurements are required. The methods selected from among the many available physical and/or chemical techniques must be appropriate for the site conditions. Physical methods are based on hydraulic or geophysical data collected in the soil, groundwater, or streamflow. Chemical methods rely primarily on natural and anthropogenic tracers found in the soil or groundwater. Mathematical models of soil and groundwater flow are also valuable recharge quantification tools. For projects with limited budget and time available, recharge can be determined from methods that use a one-time sampling of data, such as collecting soil cores, analyzing chemical tracers, or obtaining existing water-level or streamflow records. Where site-specific recharge must be known accurately and time is no factor, large soil lysimeters are the best choice.

Regardless of the method to obtain recharge, there is an inherent uncertainty in the estimate or calculation. Unfortunately, the degree of uncertainty is difficult to predict a priori and depends in part on the method, conditions such as water content and