

5.3.2 Groundwater Modeling

This section provides information regarding hydrogeological characterization and model selection to assist permit writers in evaluating modeling results submitted by Subpart X permit applicants.

Groundwater modeling can be used when monitoring is impractical or to supplement and verify monitoring data. Groundwater modeling has several applications in the permitting process for Subpart X units. The groundwater model can be used (1) to predict conservative, “worst-case” scenarios during a detailed groundwater assessment, (2) to assist in

the placement of groundwater monitoring wells, and (3) to provide data to estimate the magnitude and extent of contamination in the subsurface (vadose zone) once a release has occurred from a facility. Several hundred models for groundwater flow, vadose zone, and solute transport currently are on the market. Permit writers and reviewers cannot be expected to thoroughly understand the requirements, intricacies, and specific uses of each model. However, certain standards can help permit writers evaluate models used by the permit applicants. In addition, a permit writer should consult with personnel of Regional or State groundwater protection offices who have expertise in the field application of the specific model used by an applicant during review of the model.

Groundwater models generally can be divided into two main groups: groundwater flow models and solute transport models. Groundwater flow models solve for the distribution of hydraulic head in the hydrogeologic system. Solute transport models solve for the concentration of solute as affected by advection (movement of the solute with the average groundwater flow); dispersion (spreading and mixing of the solute); and chemical reactions, which slow down or transform solutes (Anderson and Woessner 1992). The level of effort required for the model and the decision to choose a specific model depend upon the specific objects of the modeling exercise.

Groundwater flow and solute transport models are valuable tools for the conduct of groundwater assessments. However, like air dispersion modeling, considerable limitations are inherent in the modeling process and the permit writer should recognize such limitations when evaluating a modeling analysis.

Technical Standards for the Mathematical Modeling of Groundwater Flow and Contaminant Transport at Hazardous Waste Sites (Technical Standards) (State of California 1990) presents the minimum requirements a groundwater model must meet to be considered valid and for a facility to be considered in compliance with applicable regulations. During the review of the permit applicant's model, the permit

writer can consult that document, which contains much of the information summarized in Table 5.4 and Table 5.5 on the following pages.