6.4 Computer Software for Multimedia Assessments

EPA has published modeling equations for estimating concentrations of chemicals in plants and animals, as well as transfer between media. The equations range from simple to complex, as more site-specific information is used or the need for a more precise estimate is recognized. For example, detailed models are available to estimate concentrations of contaminated airborne particulates suspended from surface soil. This approach may be preferable to dividing soil concentrations of a chemical by a default emission factor to estimate an airborne concentration.

Because of the increasing interest in integrating fate and transport modeling into risk evaluations, several models that can provide risk estimates based on multimedia exposures have been developed over the past several years. While the software has the advantage of easy application, care should be taken to select the one model, or combination of models, that adequately represents site conditions. In addition, both the information entered and that produced will vary; consideration of available data, results desired, and default assumptions is vital in the selection of an appropriate software modeling package. As in any risk evaluation, all assumptions made and parameters and equations used in the model should be provided for review and acceptance. The user must verify that all parameters in the computer model are current, particularly toxicity values used to calculate risks and HIs.

Regardless of whether a computer model is used to perform the risk assessment, a section on uncertainty must be included in the risk evaluation, as described above. Few models will include a quantitative analysis of uncertainty but, if desired, the uncertainty software described above can assess the results of a computer-modeled multimedia risk evaluation.

The Multimedia Environmental Pollutant Assessment System (MEPAS) model is discussed here as an example of the models that are available. The MEPAS software was developed by Pacific Northwest Laboratory (Whelan and others, 1992). According to the authors, MEPAS "is a physics-based risk computation code that integrates source-term transport, and exposure models." It was designed to use readily available information for site-specific health assessments of both carcinogenic and noncarcinogenic chemicals. The authors state that "the system has wide applicability to a range of environmental problems using air, groundwater, surface water, overland, and exposure models" (Whelan and others 1992). The software is said to be applicable to both screening level and detailed assessments.

The software uses a source term that is entered by the user. The source term describes the mechanism and rate of release of the contaminant. It may be entered directly into the program, or the user can enter site- and release-specific data and allow MEPAS to compute the source term. A source term is entered for each medium of interest (Whelan et al 1992).

MEPAS assesses multiple exposure routes and scenarios, including inhalation and ingestion of soil particulates; ingestion of water and inhalation of chemicals in water; and ingestion of crops, fish, and animal products contaminated by surface water, groundwater, or soil. MEPAS also evaluates external exposure to radionuclides. While the exposure pathways evaluated are applicable to many sites, dermal exposures to soil, surface water, and groundwater do not appear to be included in the program. If those pathways are complete at the combustion unit or off-site areas of concern, they

must be evaluated in addition to those in the MEPAS program, if that program is used in developing the risk assessment.

One of the issues associated with use of models such as MEPAS is the recency of their design. As a rule, risk assessment models designed in the 1980s do not offer the level of sophistication necessary for risk assessments under Subpart X. Among the materials submitted when a model is used should be a discussion of how the model was selected. As always, documentation of performance of the model with the data used is required.