UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
ATMOSPHERIC SCIENCES RESEARCH LABORATORY
RESEARCH TRIANGLE PARK
NORTH CAROLINA 27711

MEMORANDUM

DATE: October 13, 1987

SUBJECT: Ventilated Valley Diffusion Model

FROM: Robert E. Eskridge, Meteorologist REE
Terrain Effects Branch, MD/ASRL (MD-80)

TO: Joseph A. Tikvart, Chief
Source Receptor Analysis Branch, OAQPS (MD-14)

Model:

This is a simple box model which uses Briggs' (1982) estimates of the depth of the drainage flow together with conservation of mass and emission estimates to make concentration estimations. The method of specifying box heights seems to have certain shortcomings. The boxes are only one layer deep which means that they frequently will be of greater depth than the drainage flow and, hence, pollutants will be mixed vertically in the model when they should not be mixed.

There is no guidance in how to specify the upwind velocity boundary condition.

Analysis:

This model could be used to estimate surface concentrations in drainage flows if the heights of the boxes are specified using met data or Briggs equations. The model will not be adequate for valley stagnation simulation. Also, the single boxes in the vertical mean that it is inappropriate to use this model for, say, 24-hr simulations. The authors of this model do not seem to recognize the importance of the vertical boundary condition (e.g., transport of pollutants through the temperature inversion) in stagnation simulations.

Recommendation:

I do not recommend use of this model. The model is much too simple to simulate pollution concentrations in valleys. I believe that box models are an appropriate approach but this one is much too simple.