used for landfill modeling. As an alternative, the Agency has used the HELP model to calculate infiltration rates for waste piles directly. In the initial evaluation, the runoff used in the water balance calculation was computed by the HELP model as a function of soil texture and vegetative cover (bare ground). The Agency has evaluated the impact of representative bare, but unevenly surfaced, waste piles on simulated runoff using the HELP model. A comparison of the impact of using this alternative procedure against the values used in this proposal for the base case, on the regulatory leachate concentration limit, was conducted. The comparison of regulatory leachate concentration limits is based on a nondegrading, non-sorbing constituent, which has a concentration limit of 1.0 mg/L in the proposal. Using the alternative procedure, the corresponding leachate concentration level changes to 0.77. The Agency is inviting comments on the two methods for the waste piles for the estimation of infiltration rates through them. If you have any data and other information to support your comment, send it along with your comments to the Docket.

(5) Land Application Unit Infiltration Rates

In the calculation of infiltration rates for land application units for the base case in the proposal, it was assumed that land application units receive, on average, 1,295.4 m<sup>3</sup>ha (5.1 inches) of water annually through the application of the waste. This amount of water was included in the HELP model water balance calculation, resulting in an increased net infiltration as compared to ambient conditions. The waste application rate may or may not represent true field situations. As an alternative to the modeling procedure used for the base case of this proposal, the Agency evaluated the effect of using ambient recharge rates, i.e., the application of waste does not significantly alter the water balance, on the calculated leachate concentration limits. The comparison of this alternative with the procedure used for the base case shows that the regulatory leachate concentration limits for a nondegrading, non-sorbing constituent in land application units changes to 1.12 mg/L from 1.0 mg/L for the procedure used in the base case.

(6) Aggregate Effects of Alternative Groundwater Modeling Procedures and Data

The preceding sections have presented the effect of alternative modeling options and data sources that have been considered by the Agency. A

consequence of the Monte Carlo exposure modeling approach is that the effects of changes in model parameters are not always linearly additive; rather the aggregate effect of changing multiple parameters or options may be to either magnify or reduce the effect of the individual changes. The Agency, therefore, has conducted modeling analyses of the aggregate effect of the alternatives discussed above for each of the four waste management scenarios. In addition to the alternatives presented in the preceding subsections, a modification was also made in the procedure for modeling waste sites for which the corresponding hydrogeological region was initially assigned as "not classifiable". Rather than ignoring the small fraction of sites involved, they were incorporated into the analysis by assigning them nationwide average values for the groundwater parameters. Table 5 presents the aggregate effect of all changes for each of the four waste management scenarios modeled. The modeling results correspond to a nondegrading, non-sorbing constituent. The leachate concentration limits are normalized with respect to a value of 1.0 mg/L for the landfill scenario, under the modeling procedure for the base case of this proposal. The results are presented for a 1,000 year time horizon; however for a non-sorbing constituent, these same results also hold for the 10,000 year time horizon.

TABLE5.—AGGREGATEEFFECTOFMODELINGALTERNATIVESONLEACHATECONCENTRATIONLIMITSFORNON-DEGRADING,NON-SORBINGCONSTITUENTSFORWASTEMANAGEMENTSCENARIOS

Waste management scenario	HWIR proposal	Alter- native Options
Landfill	1.0	0.71
Surface Impoundment	0.22	0.27
Waste Pile	0.29	484
Land Application Unit	0.08	0.22

Table 5 shows that, except for landfills, the aggregate effect of the combined alternative options is a less conservative (higher) leachate concentration limit. For landfills, adoption of the alternative modeling options would have resulted in a 30 % less stringent regulatory leachate limit for the groundwater pathway for nonsorbing and non-degrading constituents. For surface impoundments, there is little overall impact because the opposing effects of increasing the impeding layer hydraulic conductivity,

and the alternative Monte Carlo procedure for handling parameter bound exceedances, nearly cancel out. For waste piles on the other hand, the procedure used for the base case, results in a significantly more conservative leachate concentration limit as compared to the alternative modeling options. This is due to the handling of parameter exceedances in the Monte Carlo simulation. Because many waste piles have very small sizes (surface areas), the alternative Monte Carlo procedure has a large impact. For land application units, the procedures used in the proposal for the base case also result in a more conservative regulatory limit as compared to the alternative modeling options. The contributing factors are much the same as for waste piles, but the overall impact is much smaller, primarily because there are only few land application units with very small areas.

## F. Additional Eco-Receptor Considerations

EPA considered two different policy goals with respect to protection of terrestrial ecological receptors (i.e., soil fauna, birds, mammals, and plants). One goal protected terrestrial ecological receptors outside the boundaries of the waste management site, thus, the constituent had to travel off-site before exposures would be assessed. The alternative goal protected terrestrial ecological receptors on the closed land application site.

The Agency chose to propose exit levels based on off-site impacts for several reasons. One reason is that there are many land use decisions that significantly affect terrestrial ecological receptors on the property of a party making those decisions (e.g., a decision to pave a portion of land as a parking lot). EPA does not generally regulate those sort of decisions. However, many impacts are judged through local zoning regulations. Congress has typically asked EPA or other Federal entities to regulate activities on a property when there are significant off-site impacts, such as a groundwater plume that migrates, an air release that moves beyond the property, a wetland (located on the property) that is a significant resource for migratory birds and has broader ecological significance, or an endangered species with social values beyond the impact on a specific landowners purview.

EPA asks for comment, however, on the alternative of protecting terrestrial ecological receptors on-site. The rationale for this alternative approach would relate to protection from impacts on bird and mammal populations, and