UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

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MEMORANDUM

SUBJECT: **Guidance for Using Daily Average Aquatic Concentrations in Ecological and Drinking Water Assessments**

TO: Environmental Fate and Effects Division (7507P)

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This memorandum announces a change in the way EFED will calculate acute estimated environmental concentrations (EECs) for ecological assessments and acute estimated drinking water concentrations (EDWCs) for human health assessments in surface water. Effective immediately, EFED will base acute EECs and acute EDWCs on the daily average aquatic concentration instead of the instantaneous peak concentration when evaluating acute risk in ecological and drinking water assessments.

Use of the Instantaneous Peak Concentration Versus the Daily Average Concentration in Ecological Risk and Drinking Water Exposure Assessments

Historically, EFED has based EECs and EDWCs in surface water on "instantaneous peak" values (or more accurately the initial daily concentration) as generated by the Pesticide in Water Calculator (PWC) or other similar aquatic models such as Variable Volume Water Model (VVWM) and the Pesticide Flooded Application Model (PFAM). The question that is addressed in this memorandum is: "What is the most appropriate, representative concentration for comparison to acute toxicity endpoints: instantaneous peak concentration or daily average concentration?"

In the PWC, the pesticide mass resulting from runoff and/or spray drift from a treated field is assumed to be delivered to the waterbody instantaneously at the beginning of that day and is assumed to be instantaneously and uniformly mixed throughout the waterbody. In PFAM, a pesticide applied directly to a treated rice paddy is treated in the same way: the model assumes all of the mass arrives at the beginning of the day and is instantaneously, uniformly mixed in the waterbody. This initial concentration is calculated by dividing the total daily delivered pesticide load (mass) by the waterbody volume. In particular, for runoff in the PWC, an inherent assumption is that the pesticide load enters the waterbody separately from, and entirely in advance of, the runoff water (if any) that transports this load to the waterbody. Conversely,

spray drift and direct applications to water are added instantaneously to the waterbody. The *instantaneous peak concentration* is unaffected by waterbody flow (washout), degradation, sorption, or movement between the water column and benthic zone. By contrast, the *daily average concentration* is calculated by integrating the water column concentration over the course of the entire day, and encompasses the effects of degradation, water-benthos movement, sediment sorption, and washout. **Figure 1** depicts a schematic example of the two concentration concepts, for illustrative purposes.

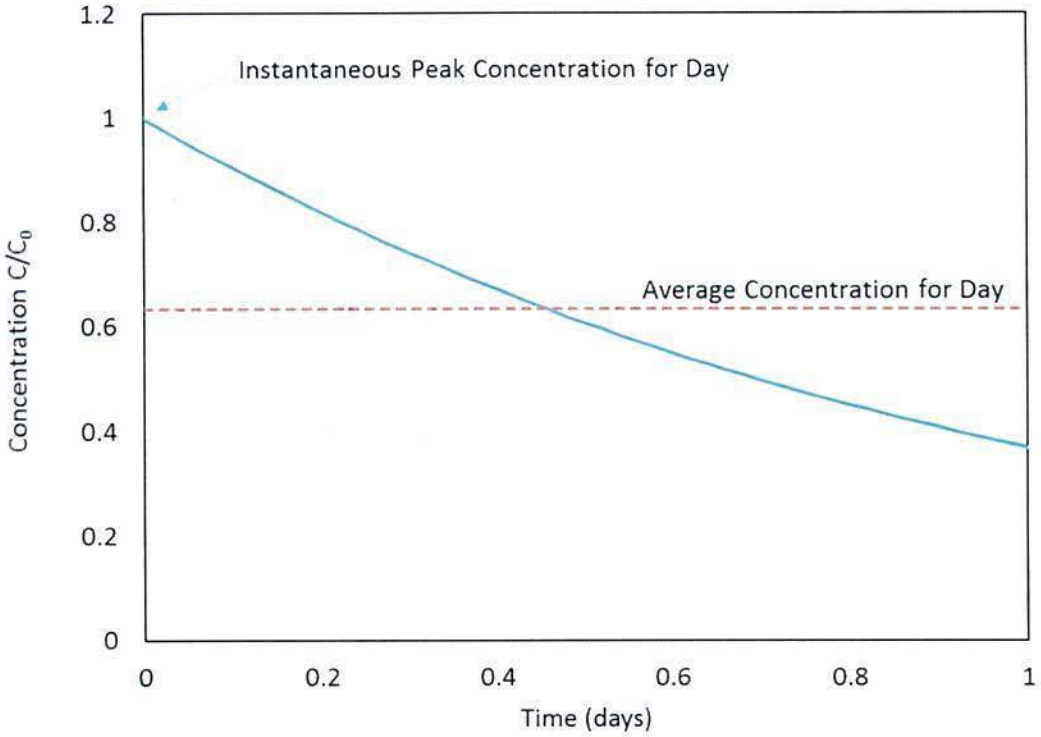

Figure 1. Depiction of the concentration of a hypothetical concentration over a 1-day period, illustrating the instantaneous peak and the daily average concentrations.

For risk assessment purposes, acute effects should be compared to the appropriate exposure estimates generated by the PWC. The exposure time for an acute response (*e.g.*, lethality) in an aquatic study is typically evaluated over several days and includes the time for the pesticide to be absorbed, be distributed, biochemically alter the organisms, and then be metabolized and excreted by the test organisms. Acute toxicity studies on pesticides are typically conducted for 48 to 96 hours, and derive a lethal concentration for 50% of the organisms tested (LC_{50}) during those exposure periods. In some studies, lethal effects have been observed at sub-daily exposure durations; however, sub-daily effects data for pesticides are not usually available. As a result, the daily average concentration, rather than the instantaneous peak concentration,

more closely aligns with the duration of the acute tests, while still providing a conservative estimate due to its shorter duration than the acute tests.

A sensitivity analysis has indicated that this policy change will result in negligible to minor changes in the acute EECs and EDWCs for the vast majority of chemicals and exposure scenarios (*i.e.,* < 2X). The greatest impact for reduction in acute EECs and EDWCs is for strongly sorbing and fast degrading pesticides, and for watersheds with high washout (*i.e.*, small flowing water bodies associated with large watersheds).

Please contact the EFED Aquatic Biology or Pesticide Fate and Transport Tech Teams for questions concerning this guidance document.