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2. AUTHOR(s)
Osvaldo Pensado/John Bradbury/Timothy McCartin/Stuart Stothoff

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|---|---|
| Bruce P. Hallbert<br>Director, PSAM10<br>Idaho National Lab oraqtory<br>Idaho Falls, Idaho, USA | 208.526.9867 |

| 6. CONTRACTOR NAME AND COMPLETE MAILING ADDRESS (*Include ZIP code*) | TELEPHONE NUMBER OF THE CONTRACTOR |
|---|---|
| Dr. Osvaldo Pensado<br>Center for Nuclear Waste Regulatory Analyses<br>Southwest Research Institute<br>6220 Culebra Road<br>San Antonio, TX 78238 | (210) 522-6084 |

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**Dependence of Dynamic Averages on Events Randomly Distributed in Time**

Osvaldo Pensado
John Bradbury
Timothy McCartin
Stuart Stothoff

The average of a physical quantity (e.g., contaminant concentration in groundwater) is a common metric to evaluate compliance with laws. For example, one requirement for the maximum of the average of the physical quantity may be that it not exceed a threshold value in a given period. Dynamic averages (e.g., average release rate versus time of a contaminant of groundwater computed at a detection boundary) can be estimated from multiple realizations of a stochastic performance assessment model, executed in Monte Carlo mode to address uncertainty propagation of its input parameters. Although plots of the physical quantity versus time may exhibit spikes for individual realizations, the average versus time is generally a smooth curve that is less impacted by events affecting individual realizations. In this paper we study the behavior of the dynamic average and identify event types that could affect the magnitude of this average. In the example of groundwater contamination, random events that remobilize or transitorily expedite contaminant transport in the system tend to have a marginal effect on the average release rate versus time curve. However, on a realization-by-realization basis, the effect of these events can be significant. On the other hand, events that insert more contaminant mass in the system tend to more readily increase the magnitude of the average. In this paper, we quantify the increase in the average contaminant release rates at a capture location as a function of the additional contaminant mass inserted in the system for a particular example. We briefly discuss event types that could belong to each of the categories analyzed (i.e., events that remobilize contaminants and events that insert more contaminants in the system), in the context of a groundwater contamination problem, without the intention to be exhaustive. This abstract is an independent product of the Center for Nuclear Waste Regulatory Analyses and does not necessarily reflect the view or regulatory position of the U.S. Nuclear Regulatory Commission (USNRC). The USNRC staff views expressed herein are preliminary and do not constitute a final judgment or determination of the matters addressed or of the acceptability of a license application for a geologic repository at Yucca Mountain.