

SCCWRP #1066

## Using spatial and temporal variability data to optimize sediment toxicity identification evaluation (TIE) study designs

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### ABSTRACT

Toxicity tests are an important aspect of sediment quality assessments, but knowledge of the cause of toxicity is needed to determine effective management actions. Toxicity identification evaluation (TIE) methods were developed to meet this need. While TIE method manuals provide information on the procedures, little information on study design is presented. The level of variability associated with performing TIEs and how to account for it is also not addressed. The goal of this study was to collect data on both the spatial and temporal variability associated with sediment TIEs by use of the amphipod *Eohaustorius estuarius* 10-day survival test and then apply that information to make recommendations for designing future TIE studies. Ten stations were sampled at Consolidated Slip in Los Angeles Harbor, California, with samples collected 2 months apart. In the first stage, TIEs were conducted on whole sediment and pore water from 3 of the most toxic stations. In the second stage, focused TIEs were conducted on whole sediment from all stations. Chemical analysis for metals and organic contaminants was also performed. With a weight of evidence approach, it was determined that pyrethroid pesticides were the likely cause of toxicity, with a lesser contribution from polycyclic aromatic hydrocarbons (PAHs). Results of the individual TIEs fell into 3 broad categories: TIEs in which treatments for organic chemicals and pyrethroids were effective; TIEs in which the treatment for pyrethroids was not effective but the treatment for organic contaminants was effective; and TIEs in which the treatment for pyrethroids was effective but the treatment for organic contaminants was not. This variability was used to calculate that at least 3 TIEs were necessary to make a confident assessment of the cause of toxicity. There was not substantial temporal variability in the TIE outcomes. Other recommendations are made regarding effective TIE study design.

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