

Toxicity Identification Evaluation of Sediment (Sediment TIE) in Ballona Creek Estuary: Final Report

Steven M. Bay, Darrin J. Greenstein, Keith A. Maruya and Wenjian Lao

EXECUTIVE SUMMARY

Previous studies have reported that sediments within Ballona Creek Estuary are contaminated and toxic to marine life. This prevalence of toxicity led to an Environmental Protection Agency 303(d) listing and the subsequent development of a total maximum daily load (TMDL) for multiple trace organics and metals. In support of the TMDL, a three-year study was conducted to determine the current extent of chemical contamination within the estuary and identify the likely causes of toxicity. Advanced chemical analysis and toxicity identification evaluation (TIE) methods were used in this study.

The results of the study indicated that chemical contamination and toxicity were widespread in the estuary. Each sampling event detected toxicity at multiple stations within the estuary. Concentrations of TMDL listed compounds often exceeded target levels, but there was a poor correlation between these concentrations and toxicity. Toxicity and chemical concentrations were highly variable in both space and time. This variability was likely due to the dynamic forces of tidal action and runoff.

TIE analyses of whole sediments and porewater found that pyrethroid pesticides were the likely primary source of toxicity within the estuary. Comparison of these pesticides' toxicity thresholds to chemical analysis results confirmed that sufficient pyrethroids were present in the estuary sediments to cause toxicity. Another current use pesticide, fipronil, was detected in estuary sediments and may also be of concern.

Spiked sediment tests were conducted to estimate the toxicity thresholds of several trace organics listed in the TMDL: DDT, DDE, and chlordane. Comparison of Ballona Creek Estuary sediment chemical concentrations to the toxicity thresholds indicated that these chemicals were not present at concentrations high enough to cause toxicity. Concentrations of DDT, DDE, and chlordane were 10 to 10000 times below toxicity thresholds either developed in this study or reported in other studies. Sediment concentrations of PAHs and PCBs were also below levels likely to cause direct sediment toxicity. Metals concentrations in field sampled sediment porewater were below California water quality standards for the protection of aquatic life.

The Effects Range Low (ERL) sediment quality guideline values used as target concentrations for the chemicals listed in the TMDL were found to be inaccurate and highly conservative. The ERLs for some metals were below background concentrations typical of estuarine environments. For the organic compounds, ERLs were several orders of magnitude below toxicity thresholds for benthic organisms.

Full Text

ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/634_BallonaTIE.pdf