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Sediment Quality Assessment Technical Support Manual

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ABSTRACT

Sediment quality influences the overall condition of a water body. Sediments act as a reservoir for contaminants that can be transferred to the water column and are also a primary source of contaminant exposure for sediment-dwelling organisms. Sediment quality assessment has been an important feature of many California monitoring programs. It was a major focus in the Bay Protection and Toxic Cleanup Program (BPTCP; (Anderson *et al.* 1997)), the California Environmental Monitoring and Assessment Program (EMAP; (USEPA 2005a)), the Regional Monitoring Program for Water Quality in the San Francisco Estuary (SFEI 2005), and the Southern California Bight Regional Monitoring Program (SCCWRP 2003, 2007; Southern California Bight 2008 Regional Monitoring Program Coastal Ecology Committee 2012).

Sediment is a complex matrix of components and forms. Consequently, evaluating sediment quality based on a single type of data (line of evidence) is problematic. For example, bulk measures of chemical concentration fail to differentiate between the fraction of a contaminant that is tightly bound to sediment and that which is biologically available. Multiple mechanisms of contaminant exposure, including uptake of chemicals from interstitial water, sediment ingestion, and bioaccumulation through the food web further complicate interpretation of sediment chemistry data. For these reasons, sediment quality assessment often involves simultaneously evaluating multiple lines of evidence (MLOE) that measure both contaminant exposure and effects on organisms: an approach commonly known as the sediment quality triad (Long and Chapman 1985). Lines of evidence (LOEs), such as sediment chemistry, toxicity, and benthic community condition are often used. Virtually all of the ambient sediment quality monitoring programs in this country rely on more than one line of evidence (USEPA 1998; Crane *et al.* 2002; MacDonald and Ingersoll 2002; USEPA 2004). Such programs include the two largest nationwide estuarine monitoring programs: the United States Environmental Protection Agency (USEPA) EMAP and the National Oceanic and Atmospheric Administration (NOAA) National Status and Trends Program, as well as California's BPTCP (Anderson *et al.* 1997; Fairey *et al.* 1998; Phillips *et al.* 1998; Anderson *et al.* 2001; Hunt *et al.* 2001).

In 2003, the California State Water Resources Control Board (SWRCB) initiated a program to develop sediment quality objectives (SQO) for chemical contaminants in bays and estuaries based on an MLOE approach. This first phase of the California SQO (CASQO) program was completed in 2008, which resulted in the SWRCB's adoption of new policy regarding sediment quality as part of the water quality control plan for enclosed bays and estuaries (SWRCB 2008). This policy contains two narrative sediment quality objectives: one for the protection of aquatic life due to the direct effects of exposure to sediment contaminants and one for the protection of human health from indirect effects through the consumption of seafood. To implement the aquatic life SQO, which is the focus of this document, the policy specifies a series of required analyses and a data interpretation framework based on the integration of three LOEs: 1) sediment chemistry, 2) sediment toxicity, and 3) benthic community (Figure 1.1). While the SQO policy specifies the types of measurements and describes how to interpret the results, many technical details regarding the analysis methods are referenced in other documents. As a result, new users of the CASQO assessment approach may have difficulty obtaining the information necessary to apply the tools correctly.

The objective of this document is to describe these technical details in an integrated manner in order to facilitate the assessment of sediment quality using the CASQO approach.

Full text:
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