



Designation: E3242 – 23

Standard Guide for Developing Representative Background Concentrations at Sediment Sites—Data Evaluation and Development Methodologies¹

This standard is issued under the fixed designation E3242; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide describes data visualization, statistical, forensic chemistry and geochemical methodologies (including case studies) used in the evaluation of candidate background data sets; this evaluation leads to the development of representative background data sets for the sediment site. Statistical methodologies can then be applied to the representative background data sets to develop background threshold values (BTVs) that are measures of the upper limit of representative sediment background concentrations for the sediment site. In addition, representative background data sets and sediment site data sets can be compared using two-sample statistical tests to determine if there are statistically significant differences (at a specified confidence level) between the two data sets (such as, the median or mean values of the two data sets are significantly different).

1.1.1 This guide is intended to inform, complement, and support, but not supersede the guidelines established by local, state, tribal, federal, or international agencies.

1.2 Technically defensible representative sediment background concentrations are critical for several purposes (1).² These include sediment site delineation, establishing remedial goals and cleanup levels, remedy selection, assessment of risks posed by representative background concentrations, and establishing appropriate post-remedial monitoring plans.

1.3 The overarching framework for the development of representative sediment background concentrations at sediment sites is presented in Guide E3382. Guide E3240 provides a general discussion of how conceptual site model (CSM) development fits into the risk-based corrective action framework for contaminated sediment sites, while Guide E3382 provides a detailed discussion of the elements of a sediment

site CSM that need to be considered when developing representative sediment background concentrations. Guide E3344 describes how to select an appropriate background reference area(s) from which to collect sediment samples for laboratory analysis. Guide E3164 describes the sampling methodologies to obtain sediment samples in the field (whether from the sediment site or background reference area[s]), while Guide E3163 discusses appropriate laboratory methodologies for the chemical analysis of potential contaminants of concern (PCOCs) in the sediment samples. Relevant content contained in Guides E3344 and E3382 is summarized herein, but the individual guides should be consulted for more detailed coverage of these topics.

1.4 This guide focuses on the approach for the development of representative sediment background concentrations used for remedial actions performed under various regulatory programs, including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Although many of the references cited in this guide are CERCLA oriented, the guide is applicable to remedial actions performed under local, state, tribal, federal, and international cleanup programs. However, the guide does not describe requirements for each jurisdiction. The requirements for the regulatory entity under which the cleanup is being performed should be reviewed to confirm compliance.

1.5 This guide is designed to apply to contaminated sediment sites where sediment data have been collected and are readily available. Additionally, this guide assumes that risk assessments have been performed, so that the contaminants of concern (COCs) that exceed risk-based thresholds have been identified.

1.5.1 Furthermore, this guide presumes that the identified risk-based thresholds are low enough to pose corrective action implementation challenges, or the site is subject to recontamination from uncontrolled ongoing anthropogenic or natural sources, or both. In all cases, representative sediment background concentrations will be useful for determining the extent of corrective remedial actions (when used as remedial goals or cleanup levels), evaluating risks posed by representative background concentrations, and establishing appropriate post-remedial monitoring plans.

¹ This guide is under the jurisdiction of ASTM Committee E50 on Environmental Assessment, Risk Management and Corrective Action and is the direct responsibility of Subcommittee E50.04 on Corrective Action.

Current edition approved Dec. 1, 2023. Published January 2024. Originally approved in 2020. Last previous edition approved in 2020 as E3242–20. DOI: 10.1520/E3242–23

² The boldface numbers in parentheses refer to the list of references at the end of this standard.

1.6 *Units*—The values stated in SI or CGS units are to be regarded as standard. No other units of measurement are included in this standard.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:³

- D6312** Guide for Developing Appropriate Statistical Approaches for Groundwater Detection Monitoring Programs at Waste Disposal Facilities
- D7048** Guide for Applying Statistical Methods for Assessment and Corrective Action Environmental Monitoring Programs
- D7659** Guide for Strategies for Surface Sampling of Metals and Metalloids for Worker Protection
- D7720** Guide for Statistically Evaluating Measurand Alarm Limits when Using Oil Analysis to Monitor Equipment and Oil for Fitness and Contamination
- E178** Practice for Dealing With Outlying Observations
- E456** Terminology Relating to Quality and Statistics
- E1689** Guide for Developing Conceptual Site Models for Contaminated Sites
- E3163** Guide for Selection and Application of Analytical Methods and Procedures Used during Sediment Corrective Action
- E3164** Guide for Contaminated Sediment Site Risk-Based Corrective Action – Baseline, Remedy Implementation and Post-Remedy Monitoring Programs
- E3240** Guide for Risk-Based Corrective Action for Contaminated Sediment Sites
- E3248** Guide for NAPL Mobility and Migration in Sediment – Conceptual Models for Emplacement and Advection
- E3344** Guide for Developing Representative Sediment Background Concentrations at Sediment Sites—Selection of Background Reference Areas
- E3382** Guide for Developing Representative Background Concentrations at Sediment Sites — Framework Overview, Including Conceptual Site Model Considerations

3. Terminology

3.1 Definitions:

3.1.1 *anthropogenic background*, *n*—human-made substances present in the environment due to human activities, not

specifically related to current or historical site-related releases or activities. **E3344**

3.1.1.1 *Discussion*—The definition of “anthropogenic background” varies with jurisdiction. In some jurisdictions, the regulator defines anthropogenic background as having both human-made and naturally occurring components. **(2)**

3.1.2 *background (aka “reference”), n*—a term applied to substances, conditions, or locations that are similar to those found at a sediment site but not influenced by current or historical releases or activities from the sediment site; these are usually a combination of naturally occurring (consistently present in the environment but not influenced by human activity) and anthropogenic (influenced by human activity but not related to specific current or historical releases or activities at the sediment site) components. **E3382**

3.1.3 *candidate background data set, n*—a raw (that is, unprocessed) background data set obtained either by the collection of data from a background reference area(s), or by the extraction of background data from the sediment site data set, or a combination of both. **E3382**

3.1.3.1 *Discussion*—The candidate background data set must first be evaluated using the steps described in this guide to obtain a representative background data set.

3.1.4 *contaminant of concern (COC), n*—substances identified as posing a risk based on a tiered risk assessment and that may warrant corrective action. **E3382**

3.1.4.1 *Discussion*—Typically, all potential contaminants of concern (PCOCs) identified for a sediment site are evaluated in the risk assessment process. PCOCs that have sediment concentrations greater than risk-based thresholds identified in the risk assessment process are defined as COCs. Thus, the COCs identified for a sediment site are a subset of the PCOCs identified for that site.

3.1.5 *distribution, n*—as used in statistics, a set of all the various values that individual observations may have and the frequency of their occurrence in the sample or population. **D7720**

3.1.6 *high nondetect, n*—a nondetect concentration with a highly elevated detection limit; for example, a concentration that resides in the upper decile of the analyte’s distribution (that is, a detection limit above the 90th percentile of the data set). **E3382**

3.1.7 *median, n*—the 50th percentile in a population or sample. **E456**

3.1.8 *nonparametric, adj*—a term referring to a statistical technique in which the distribution of the constituent in the population is unknown and is not restricted to be of a specified form. **D7048**

3.1.9 *outlier, n*—see *outlying observation*.

3.1.10 *outlying observation, n*—an extreme observation in either direction that appears to deviate markedly in value from other members of the sample in which it appears. **E178**

3.1.11 *parametric, adj*—a term referring to a statistical technique in which the distribution of the constituent in the population is assumed to be known. **D7048**

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.