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Standard Guide for Data and Information Options for Conducting an Ecological Risk Assessment at Contaminated Sites¹

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1. Scope

1.1 An ecological-risk assessment (ERA) is a process for organizing and analyzing data, information, assumptions, and uncertainties to evaluate the likelihood that adverse ecological effects might occur or are occurring as a result of a stressor. This guide is intended to assist remedial project teams, specifically ecological risk assessors, in identifying data and information options that may be used to perform a screening or complex ecological risk assessment (ERA) at a contaminated site.

NOTE 1—While the intent of ERA is to evaluate risk (that is, the probability of adverse effects occurring in ecological receptors), there are no measures, statistics, or metrics that calculate or express risk explicitly. However, various metrics or indices, a common example being the hazard quotient, are used to inform risk assessments.

1.2 The identification of data and information options for human health risk assessment is outside the scope of this guide.

1.3 This guide is intended to provide a list for identifying data and information options and does not recommend a specific course of action for ERA activities.

1.4 This guide addresses data and information options for the ecological risk assessment, not verification or long-term monitoring studies.

1.5 This guide lists many of the common data and information options for ERA, but there may be others relevant for any particular site.

1.6 This guide considers one component of an ERA, that is, identification of data and information options. Other ASTM guides have been developed, for example, Guides E1689 and E1848, and are being developed to cover other components of the risk assessment process.

1.7 This guide does not provide information on how to perform any of the analytical procedures used to perform a risk assessment once data collection options are defined.

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:²

D5730 Guide for Site Characterization for Environmental Purposes With Emphasis on Soil, Rock, the Vadose Zone and Groundwater (Withdrawn 2013)³

E1391 Guide for Collection, Storage, Characterization, and Manipulation of Sediments for Toxicological Testing and for Selection of Samplers Used to Collect Benthic Invertebrates

E1525 Guide for Designing Biological Tests with Sediments

E1689 Guide for Developing Conceptual Site Models for Contaminated Sites

E1848 Guide for Selecting and Using Ecological Endpoints for Contaminated Sites

E3163 Guide for Selection and Application of Analytical Methods and Procedures Used during Sediment Corrective Action

E3164 Guide for Sediment Corrective Action – Monitoring

E3240 Guide for Risk-Based Corrective Action for Contaminated Sediment Sites

E3242 Guide for Determination of Representative Sediment Background Concentrations

E3248 Guide for NAPL Mobility and Migration in Sediment – Conceptual Models for Emplacement and Advection

2.2 Other Documents:

ISO 21365:2019 Soil quality -- Conceptual site models for potentially contaminated sites⁴

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 E50.05 on Environmental Risk Management.

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² 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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <https://www.iso.org>.

EPA/600/R-17/448F, 2018 USEPA. Procedures For Delin-eating And Characterizing Watersheds For Stream And River Monitoring Programs (Final Report). U.S. EPA Office of Research and Development, Washington, DC.⁵ Government of Canada. Federal Contaminated Site Action Plan: Ecological Risk Assessment Guidance, March 2012

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *assessment endpoint*, *n*—an explicit expression of the environmental value to be protected.

3.1.2 *baseline condition*, *n*—the initial physical, biological, and environmental condition of the project area, prior to intervention or disruption.

3.1.2.1 *Discussion*—The baseline condition may include soil properties, the geological characteristics, the topography, watershed properties, the initial level of environmental impairment of water, air, soil, sediment, the biodiversity of the area, types of flora and fauna, species richness, species distribution, types of ecosystems, presence or absence of endangered species and/or sensitive ecosystems etc.

3.1.3 *baseline ecological risk assessment*, *n*—an ecological risk assessment completed using quantitative methods, which relies on site-specific data and may include toxicity testing, field biological surveys, and probabilistic analysis.

3.1.4 *bioaccumulation*, *n*—the net increase of contaminant concentrations in organisms following uptake from the ambient environmental medium.

3.1.4.1 *Discussion*—Different sources of exposure contribute to contaminant bioaccumulation.

3.1.5 *chemical stressor*, *n*—a chemical, chemical mixture, or radionuclide present in an environmental medium that is known or suspected to induce an adverse biological, toxicological, or ecological response in an exposed ecological receptor.

3.1.6 *complex ecological risk assessment*, *n*—an ecological risk assessment completed using quantitative methods, which relies on site-specific data and may include toxicity testing, field biological surveys, and probabilistic analysis.

3.1.7 *data quality objective*, *n*—a specification of the amount and quality of data required to adequately complete the risk assessment such that a risk management decision can be made.

3.1.8 *ecological receptor*, *n*—ecosystems, communities, populations, and individual organisms (except humans), that can be exposed directly or indirectly to site stressors.

3.1.9 *ecological-risk assessment (ERA)*—a process for organizing and analyzing data, information, assumptions, and uncertainties to evaluate the likelihood that adverse ecological effects might occur or are occurring as a result of a stressor.

3.1.10 *measurement endpoint*, *n*—a measurable response to a stressor that is quantifiably related to the valued characteristic chosen as the assessment endpoint.

3.1.11 *non-chemical stressor*, *n*—a biological agent, physical disturbance, condition, or nonchemical characteristic of a waste material, substrate, or source associated with a contaminated site and corrective actions that is known or suspected to interfere with the normal functioning of an ecological receptor.

3.1.12 *screening ecological risk assessment*, *n*—an ecological risk assessment completed using qualitative or simple quantitative methods, which relies on literature information and is unlikely to include toxicity testing, field biological surveys, or probabilistic analysis.

3.1.13 *site*, *n*—the terms “site,” “on-site,” and “off-site,” have not been defined in this guide. They will need to be defined on a case-by-case basis. They could be defined by regulatory needs, natural boundaries, or property boundaries.

3.2 Acronyms:

3.2.1 *CEC*—Cation Exchange Capacity

3.2.2 *DOC*—Dissolved Organic Carbon

3.2.3 *DQO*—Data Quality Objective

3.2.4 *EPA / USEPA*—United States Environmental Protection Agency

3.2.5 *ERA*—Ecological Risk Assessment

3.2.6 *GIS*—Geographic Information System

3.2.7 *PCB*—Polychlorinated Biphenyls

3.2.8 *TDS*—Total Dissolved Solids

3.2.9 *TOC*—Total Organic Carbon

3.2.10 *TSS*—Total Suspended Solids

4. Summary of Guide

4.1 This guide provides a series of lists of data and information options for conducting an ecological risk assessment at a contaminated site and is organized in accordance with the major components of the risk assessment process: problem formulation, exposure characterization, effects characterization, and risk characterization (**1-4**).⁶ Lists are provided for screening and complex ERAs.

5. Significance and Use

5.1 This guide is significant in that it addresses the data and information options of each component of the ecological risk assessment process, for both a screening and complex ERA. It outlines the data and information options while recognizing that an ecological risk assessment may be focused to achieve a particular stated goal. This guide is not intended to represent the views of the U.S. Environmental Protection Agency (USEPA), or any other regulatory agency, on data collection for ecological risk assessment.

5.2 This guide is to be used by managers, scientists, and technical staff of contractors, industry, government agencies, and universities responsible for conducting ecological risk assessments at contaminated sites. It is to be used to guide data collection phases of the ecological risk assessment. It will assist in the development of the conceptual site model (see Guide **E1689**) and the identification of potential assessment and measurement endpoints (see Guide **E1848** and US EPA's

⁵ Available from United States Environmental Protection Agency (EPA), William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460, <http://www.epa.gov>.

⁶ The boldface numbers in parentheses refer to the list of references at the end of this standard.