



Designation: E1903 – 19

## Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process<sup>1</sup>

This standard is issued under the fixed designation E1903; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This practice<sup>2</sup> covers a process for conducting a Phase II environmental site assessment (*ESA*) of a parcel of property with respect to the *presence* or the likely *presence* of *substances* including but not limited to those within the scope of the Comprehensive Environmental Response, Compensation and Liability Act (*CERCLA*) (e.g., *hazardous substances*), pollutants, contaminants, petroleum and *petroleum products*, and controlled *substances* and constituents thereof. It specifies procedures based on *the scientific method* to characterize *property* conditions in an objective, representative, reproducible, and defensible manner. To promote clarity in defining *Phase II ESA* objectives and transparency in communicating and interpreting *Phase II ESA* results, this practice specifies adherence to requirements for documenting the scope of assessment and constraints on the conduct of the assessment process.

1.1.1 A *user's* interest in the *presence* or likely *presence* of *substances* in *environmental media* at a property may arise in a wide variety of legal, regulatory, and commercial contexts, and may involve diverse objectives including those listed in 1.2. This practice contemplates that the *user* and the *Phase II Assessor* will consult to define the scope and objectives of investigation in light of relevant factors, including without limitation the *substances* released or possibly released at the *property*, the nature of the concerns presented by their *presence* or likely *presence*, the *behavior*, *fate* and *transport characteristics* of *substances* released or possibly released, the portion of

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee E50 on Environmental Assessment, Risk Management and Corrective Action and is the direct responsibility of Subcommittee E50.02 on Real Estate Assessment and Management.

Current edition approved Nov. 15, 2019. Published January 2020. Originally approved in 1997. Last previous edition approved in 2011 as E1903 – 11. DOI: 10.1520/E1903-19.

<sup>2</sup> As used herein, a “standard” is a document that has been developed and established within the consensus principles of the Society and that meets the approval requirements of ASTM procedures and regulations. A “practice” is a definitive set of instructions for performing one or more specific operations that does not produce a test result. A “guide,” in contrast, is a compendium of information or a series of options that does not recommend a specific course of action. A guide increases the awareness of information and approaches in a given subject area. See Form and Style for ASTM Standards, [http://www.astm.org/COMMIT/Blue\\_Book.pdf](http://www.astm.org/COMMIT/Blue_Book.pdf).

the property to be investigated, the information already available, the degree of confidence needed or desired in the results, the degree of investigatory sampling and *chemical testing* needed to achieve such confidence, and any applicable time and resource constraints. This practice requires that Phase II activities be conducted so that the resulting scope of work is performed, and the stated objectives are achieved, in a scientifically sound manner.

1.1.2 A *Phase II ESA* in accordance with this practice may be conducted after site assessment activities in accordance with Practice E1527 for *Phase I Environmental Site Assessments: Phase I Environmental Site Assessment Process*, Practice E2247 for *Environmental Site Assessments: Phase I Environmental Site Assessment for Forestland or Rural Property*, EPA's *All Appropriate Inquiries (AAI) Rule*, 40 C.F.R. Part 312, or Practice E1528 for *Limited Environmental Due Diligence: Transaction Screen Process*. In defining the scope and purposes of a *Phase II ESA*, however, previous decisions to classify *property* conditions or areas as *RECs*, or to refrain from doing so, are not determinative as to whether investigation of the same conditions or areas is appropriate to meet the objectives of the *Phase II ESA*.

1.2 *Objectives*—This practice is intended for use where a *user* desires to obtain sound, scientifically valid data concerning actual property conditions, whether or not such data relate to property conditions previously identified as *RECs* or *data gaps* in *Phase I ESAs*. Without attempting to define all such situations, this practice contemplates that *users* may seek such data to inform their evaluations, conclusions, and choices of action in connection with objectives that may include, without limitation, one or more of the following:

1.2.1 *Objective 1*—Assess whether there has been a *release* of *hazardous substances* within the meaning of *CERCLA*, for purposes including *landowner liability protections* (i.e., *innocent landowner*, *bona fide prospective purchaser*, and *contiguous property owner*).

1.2.2 *Objective 2*—Provide information relevant to identifying, defining or implementing landowner “*continuing obligations*,” or the criteria established under *CERCLA* (e.g., exercising appropriate care by taking *reasonable steps* to

prevent or limit exposures to previously released *hazardous substances*) for maintaining the *CERCLA landowner liability protections*.

1.2.3 *Objective 3*—Develop threshold knowledge of the *presence of substances* on properties within the scope of the *CERCLA* definition of a “brownfield site” and as required for qualifying for brownfields *remediation* grants from the *EPA* Brownfields Program.

1.2.4 *Objective 4*—Provide information relevant to identifying, defining and evaluating property conditions associated with *target analytes* that may pose risk to human health or the environment, or risk of bodily injury to persons on the property and thereby give rise to potential liability in tort.

1.2.5 *Objective 5*—Provide information relevant to evaluating and allocating *business environmental risk* in transactional and contractual contexts, including transferring, financing and insuring properties, and due diligence relating thereto.

1.2.6 *Objective 6*—Provide information to support disclosure of liabilities and contingent liabilities in financial statements and securities reporting.

1.2.7 Additional information concerning these six objectives may be found in the Legal Appendix, **Appendix X1**.

1.3 *Scope of Assessment in Relation to Objectives*—The scope of a *Phase II ESA* is related to the objectives of the investigation. Both scope and objectives may require ongoing evaluation and refinement as the assessment progresses.

1.3.1 In developing the scope of work and in evaluating data and information concerning the property, the *Phase II Assessor* must determine whether the available information is sufficient to meet the objectives of the investigation. Even after conducting *Phase II* activities to generate additional data, the *Phase II Assessor* must independently evaluate the sufficiency of the data in relation to the objectives. As the investigation progresses, the objectives may be refined or redefined in consultation between the *user* and the *Phase II Assessor*.

1.3.2 A single round of sampling and *chemical testing* may not always provide data sufficient to meet the chosen objectives. If not, this practice contemplates additional sampling in an iterative sequence that concludes when the available data are sufficient. This practice also acknowledges, however, that the *user* may instead elect either to redefine the objectives so that they can be met with the data available, or to terminate the investigative process without meeting the stated objectives. The *Phase II Assessment* report must disclose any respect in which available data are insufficient to meet objectives.

1.3.3 This practice does not require full *site characterization* in every instance, but may be used to carry out an investigation sufficient for that purpose if desired to meet the *user’s* objectives.

1.4 *Needs of the User*—The *user* and *Phase II Assessor* must have a mutual understanding of the context in which the *Phase II ESA* is to be performed and the objectives to be met by the investigation, i.e. the specific questions to be answered or problems to be resolved by the *Phase II ESA*. The scope of *Phase II* activities must be defined in relation to those objectives.

1.4.1 The degree of confidence desired by the *user* influences the scope of the investigation and the evaluation of data.

More extensive testing and more iterations of sampling and analysis may be needed if the objectives require detailed conclusions with high confidence. Less testing and fewer iterations of sampling and analysis may be needed if the objectives of the assessment require only general conclusions.

1.5 *Limitations*—This practice is not intended to supersede applicable requirements imposed by regulatory authorities. This practice does not attempt to define a legal standard of care either for the performance of professional services with respect to matters within its scope, or for the performance of any individual *Phase II ESA*.

1.6 *Organization of This Practice*—This practice has nine sections and four appendices. Section 1 covers the Scope of the practice. Section 2, Referenced Documents, lists ASTM and other organizations’ related standards and guidance that may be useful in conducting *Phase II ESAs* in accordance with this practice. Section 3, Terminology, contains definitions of terms and acronyms used in this practice. Section 4 addresses the Significance and Use of this practice, including the legal context into which *Phase II ESAs* may fall. Section 5 discusses development and documentation of the scope of the *Phase II ESA*, including the Statement of Objectives for the assessment. Section 6 provides a *Phase II ESA* Overview, with purpose and goal descriptions. Section 7 comprises the main body of Performing the *Phase II ESA*, and includes initiating scientific inquiry by formulating the question to be answered (7.1), collecting and evaluating information (7.2), identifying areas for investigation (7.3), developing the *conceptual model* (7.4), developing a plan and rationale for sampling (7.5), conducting the sampling (7.6), and validating the *conceptual model* (7.7). Interpretation of results is covered in Section 8. *Phase II Environmental Site Assessment* report preparation is addressed in Section 9. **Appendix X1** supports Section 4, and contains legal considerations pertaining to *Phase II Environmental Site Assessment*. **Appendix X2** contains contracting considerations between *Phase II assessor* and *user*. **Appendix X3** supports Section 9, and describes two examples and a sample table of contents illustrating possible approaches to reporting the results of a *Phase II Environmental Site Assessment*. **Appendix X4** supplements Section 2 with a list of standards and references that may be relevant in conducting a *Phase II Environmental Site Assessment*.

1.7 *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 The standards listed below are referenced in this practice.

## 2.2 ASTM Standards:<sup>3</sup>

**E1527** Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process

**E1528** Practice for Limited Environmental Due Diligence: Transaction Screen Process

**E2137** Guide for Estimating Monetary Costs and Liabilities for Environmental Matters

**E2173** Guide for Disclosure of Environmental Liabilities

**E2247** Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process for Forestland or Rural Property

**E2790** Guide for Identifying and Complying With Continuing Obligations

**E3123** Guide for Recognition and Derecognition of Environmental Liabilities

## 2.3 Environmental Protection Agency Documents:

**Standards and Practices for All Appropriate Inquiries, Final Rule, Federal Register, Tuesday, November 1, 2005, Part III Environmental Protection Agency (codified at 40 CFR Part 312), as amended<sup>4</sup>**

**Test Methods for Evaluating Solid Waste: Physical/Chemical Methods Compendium (SW-846)**

## 3. Terminology

### 3.1 Definitions:

3.1.1 *all appropriate inquiries (AAI)*—those inquiries constituting “all appropriate inquiries... into the previous ownership and uses of the facility in accordance with generally accepted good commercial or customary standards and practices” as defined in *CERCLA*, 42 U.S.C. § 9601(35)(B), and the *AAI Rule*, 40 CFR Part 312, that must be conducted to qualify for certain *landowner liability protections (LLPs)* under *CERCLA*, and to qualify for brownfields *remediation grants* awarded under *CERCLA* section 104(k)(3)(A)(ii).

3.1.2 *background concentration*—the concentration of a *target analyte* in groundwater, surface water, air, soil gas, sediment, or soil at a reference location near an area under investigation, which is not attributable to the area under investigation.

3.1.2.1 *Discussion*—Background samples may contain the *target analyte*, due to either naturally occurring or man-made sources, but not due to the *release(s)* in question.

3.1.3 *behavior, fate, and transport characteristics*—natural attributes of a *target analyte* that can be predicted based on the distinguishing physico-chemical characteristics of the *target analyte* and the properties of the media in which the *target analyte* occurs.

3.1.4 *bona fide prospective purchaser (BFPP)*—under *CERCLA*, a person who meets the criteria stated at 42 U.S.C. § 9601(40) and thereby becomes eligible for the *bona fide*

*prospective purchaser LLP* in accordance with 42 U.S.C. §9607(r). See Legal Appendix, **Appendix X1**.

3.1.5 *business environmental risk*—a risk which can have a material environmental or environmentally-driven impact on the business associated with the current or planned use of a parcel of commercial real estate, not necessarily limited to those environmental issues investigated in accordance with this practice.

3.1.5.1 *Discussion*—To the extent the user wishes to evaluate such risks for purposes of quantification and disclosure of business environmental risk, further guidance can be found in Guides **E2137**, **E2173**, and **E3123**.

3.1.6 *CERCLA*—the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. § 9601, *et seq.*, as amended.

3.1.7 *CFR*—Code of Federal Regulations.

3.1.8 *chain of custody*—a written or printed form that documents information regarding sample possession, condition, and responsibility, including the time from sample container acquisition through transportation, sample collection, and laboratory analysis.

3.1.9 *chemical testing*—measurement of the *presence* and concentration of *target analytes* by analytical chemistry methods in a laboratory; also, for purposes of this practice, measurement of certain *target analytes* by physical methods (e.g., for asbestos or radioactive isotopes).

3.1.10 *conceptual model*—a representation of hypothesized current site conditions, which describes the physical setting characteristics of a site and the likely distribution of *target analytes* that might have resulted from a known or likely *release*, and which is based on all *reasonably ascertainable* information relevant to the objectives of the investigation and the professional judgment of the *Phase II Assessor*.

3.1.11 *contiguous property owner (CPO)* —under (*CERCLA*) a person who meets the criteria stated at 42 U.S.C. § 9607(q) and thereby becomes eligible for the *contiguous property owner LLP*. See Legal Appendix, **Appendix X1**.

3.1.12 *continuing obligations*—includes requirements contained in the definition of a *bona fide prospective purchaser* at *CERCLA* §101(40)(D) and (F), the requirements for maintaining the *innocent landowner LLP* at 101(35)(a), which include the “due care” provisions of §107(b)(3)(a), as well as those requirements established for maintaining the *contiguous property owner liability protection* at §107(q)(1)(A) (iii) and (iv). These requirements are collectively referenced as the “*continuing obligations*” and are necessary for a person to maintain qualification for *LLPs* after a property is acquired, including among others, the requirement to exercise appropriate care by taking *reasonable steps* to stop or prevent releases or to limit human, environmental, or natural resources exposure to any previously released *hazardous substance* (section 101(35)(B)(i)(II), 101(40)(D), 107(a)(1)(A)(iii)). See Guide **E2790**.

3.1.13 *data gap*— as defined in Practice **E1527** and Practice **E2247** and determined in accordance with the process prescribed by those standard practices, a lack of or inability to

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

<sup>4</sup> Available from United States Environmental Protection Agency (EPA), Ariel Rios Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20004, <http://www.epa.gov>.

obtain information required by such practices despite good faith efforts to gather such information.

3.1.14 *de minimis condition*—a condition that generally does not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

3.1.15 *diffuse anthropogenic contamination*—the presence of *target analytes* that results from broad-scale activities that cannot be discriminated as readily as single, site-specific discharges or releases. The most obvious of these activities is agriculture, but urban land runoff, forestry, the urine of mammals, wastewater treatment plant effluent discharges, and atmospheric deposition can also be important general sources.

3.1.16 *environmental media*—soil, rock, groundwater, surface water, air, soil gas, sediment.

3.1.17 *EPA*—the United States Environmental Protection Agency.

3.1.18 *ESA*—environmental site assessment.

3.1.19 *exposure point*—a place at which a *receptor* comes into contact with a *target analyte*.

3.1.20 *field screening*—the measurement of physical properties or presence and approximate concentration of *target analytes* in *environmental media* by methods or techniques employed in the field during explorations and sampling. Measurements can be qualitative (positive/negative) or quantitative. Accuracy and precision of these methods generally are not equivalent to those achieved in a laboratory environment.

3.1.20.1 *Discussion*—Appropriate QA/QC measures must be followed for field screening equipment (e.g. calibration), for execution of field screening activities, and for interpretation of data obtained by field screening

3.1.20.2 *Discussion*—Calibrated field analytical equipment, such as field gas chromatographs, may provide levels of detection and accuracy comparable to those of a fixed laboratory.

3.1.21 *groundwater*—water below the land surface in a zone of saturation.

3.1.22 *groundwater flow*—the movement of water in the zone of saturation.

3.1.23 *groundwater flow direction*—the compass bearing of the horizontal component, and the vertical component, of water movement in the zone of saturation.

3.1.24 *hazardous substance*—any substance defined as a hazardous substance pursuant to CERCLA, 42 U.S.C. § 9601(14). See Legal Appendix, Appendix X1.

3.1.25 *innocent landowner (ILO)*—under CERCLA, a person who is within one of the three categories defined by 42 U.S.C. § 9601(35) and thereby becomes eligible for the *innocent landowner LLP* in accordance with 42 U.S.C. § 9607(b)(3). See Legal Appendix, Appendix X1.

3.1.26 *Landowner Liability Protections (LLPs)*—provisions that establish limitations of or defenses to potential CERCLA liability in favor of landowners who satisfy statutory conditions. See definitions in this section of *bona fide prospective*

*purchaser, contiguous property owner and innocent landowner* and corresponding LLPs; see also Legal Appendix, Appendix X1.

3.1.27 *likely release area*—a place where a *Phase II Assessor* judges it likely that *target analytes* were first introduced into *environmental media* as a result of a *release* such that the *target analytes* may now be present in *environmental media* at the property. *Likely release areas* can include, but need not be limited to, *recognized environmental conditions* identified in a *Phase I ESA* conducted in accordance with Practice E1527 or Practice E2247.

3.1.28 *migration pathway*—a route through *environmental media* taken by a *target analyte*; the physical feature allowing movement of *target analytes*.

3.1.29 *obvious*—that which is plain or evident; a condition or fact that could not be ignored or overlooked by a reasonable observer while visually or physically observing the property, or that could be deduced by a *Phase II Assessor*.

3.1.30 *petroleum products*—those substances included within the petroleum exclusion to CERCLA, 42 U.S.C. § 9601(14), as interpreted by the courts and EPA; that is, petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under Subparagraphs (A) through (F) of 42 U.S.C. § 9601(14), natural gas, natural gas liquids, liquefied natural gas, and synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas). (The word fraction refers to certain distillates of crude oil, including gasoline, kerosene, diesel oil, jet fuels, and fuel oil as defined in “Standard Definitions of Petroleum Statistics,” American Petroleum Institute).

3.1.31 *Phase I environmental site assessment (Phase I ESA)*—an assessment performed in accordance with the process described in Practice E1527, Practice E2247, or the EPA all appropriate inquiries (AAI) rule, 40 CFR Part 312.

3.1.32 *Phase II Assessor*—a person meeting the definition of an “Environmental Professional” as provided in Section 3.2.32 of Practice E1527, and possessing sufficient education, professional training, and relevant experience to conduct or be in responsible charge of environmental investigations and other activities in accordance with this practice, and to interpret the resulting data to develop opinions and conclusions regarding the presence of *target analytes* in *environmental media* in connection with the property in question. An individual’s status as a *Phase II Assessor* may be limited to the type of assessment to be performed. Overall, a *Phase II Assessor* should understand and be experienced in pertinent aspects of the scientific method, hydrogeology, geochemistry, environmental investigation/exploration techniques, interpretation of chemical testing data, and commercial and industrial operations pertaining to the use and handling of site-specific *target analytes* and production and handling of associated wastes. The *Phase II Assessor* may be an independent contractor or an employee of the user. Some jurisdictions may have licensing requirements for individuals who perform certain environmental investigation activities included in a *Phase II ESA*.

3.1.33 *Phase II environmental site assessment (Phase II ESA)*—an assessment performed in accordance with the process described in this practice.

3.1.34 *practically reviewable*—information that is *practically reviewable* means that the information is provided by the source in a manner and in a form that, upon examination, yields information relevant to the property without the need for extraordinary analysis of irrelevant data. The form of the information shall be such that the *user* can review the records for a limited geographic area. Records that cannot be feasibly retrieved by reference to the location of the property or a geographic area in which the property is located are not generally *practically reviewable*. Most databases of public records are *practically reviewable* if they can be obtained from the source agency by the county, city, zip code, or other geographic area of the facilities listed in the record system. Records that are sorted, filed, organized, or maintained by the source agency only chronologically are not generally *practically reviewable*. Listings in *publicly available* records which do not have adequate address information to be located geographically are not generally considered *practically reviewable*. For large databases with numerous records (such as RCRA hazardous waste generators and registered underground storage tanks), the records are not *practically reviewable* unless they can be obtained from the source agency in the smaller geographic area of zip codes. Even when information is provided by zip code for some large databases, it is common for an unmanageable number of sites to be identified within a given zip code. In these cases, it is not necessary to review the impact of all of the sites that are likely to be listed in any given zip code because that information would not be *practically reviewable*. In other words, when so much data is generated that it cannot be feasibly reviewed for its impact on the *property*, it is not *practically reviewable*.

3.1.35 *present or presence*—with regard to *target analytes* in *environmental media*, *present* or *presence* refers to the existence of the *target analyte* at the *property* and to places where the *target analyte* is located. *Presence* does not imply that the total extent of the *target analyte* is known.

3.1.36 *property*—the real *property* that is the subject of the *Phase II environmental site assessment* described in this practice. Real *property* includes buildings and other fixtures and improvements located on the *property* and affixed to the land.

3.1.37 *publicly available*—information that is *publicly available* means that the source of the information allows access to the information by anyone upon request.

3.1.38 *quality assurance/quality control (QA/QC)*—quality control is the use of standards and procedures designed to promote and ensure the collection of samples and generation of analytical results that are of good and acceptable quality for the purposes intended; quality assurance is the use of standards and procedures to evaluate work products to determine if they achieved good and acceptable quality.

3.1.39 *reasonable steps*—those actions to prevent or limit human, environmental or natural resources exposure to previously released *hazardous substances* that are required pursuant

to (*CERCLA*) Sections 101(35)(B)(i)II, 101(40)(D) and 107(q)(1)(A)(iii) to maintain qualification for *LLPs* after a *property* is acquired. See Legal Appendix, **Appendix X1**.

3.1.40 *reasonably ascertainable*—information that is (1) *publicly available*, (2) obtainable from its source within reasonable time and cost constraints, and (3) *practically reviewable*.

3.1.41 *receptor*—a living organism or habitat of a community of organisms that could be exposed to *target analytes* including, for example, occupants of a building if the objectives of the assessment implicate indoor air quality; also, an inanimate feature that, if contacted by *target analytes*, would be a proximal means of exposing living organisms to the *target analytes*, e.g., a drinking water well that could convey *ground-water* containing *target analytes* to people.

3.1.42 *recognized environmental condition (REC)*—as defined in Practice **E1527** and Practice **E2247** and determined in accordance with the process prescribed by those standard practices, the *presence* or likely *presence* of any *hazardous substances* or *petroleum products* in on or at a *property*: (1) due to release of the environment (2) under conditions indicative of a release to the environment; or (3) under conditions that pose *De minimis conditions* are not *recognized environmental conditions*.

3.1.43 *release*—as defined by § 101(22) of *CERCLA*, 42 U.S.C. § 9601(22), “any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles containing any hazardous *substance* or pollutant or contaminant), but exclud[ing] (A) any release which results in exposure to persons solely within a workplace, with respect to a claim which such persons may assert against the employer of such persons, (B) emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel, or pipeline pumping station engine, (C) release of source, by-product, or special nuclear material from a nuclear incident, as those terms are defined in the Atomic Energy Act of 1954 [42 U.S.C. § 2011 *et seq.*], if such release is subject to requirements with respect to financial protection established by the Nuclear Regulatory Commission under section 170 of such Act [42 U.S.C. § 2210], or, for the purposes of section 104 of *CERCLA* or any other response action, any release of source, by-product, or special nuclear material from any processing site designated under section 102(a)(1) or 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978; [42 U.S.C. § 7912(a)(1) or 7942(a)], and (D) the normal application of fertilizer.”

3.1.44 *remediation/remedial action*—activities conducted or measures taken to protect human health, safety and the environment. These include evaluating risk, monitoring quality of *environmental media* over time, imposing institutional controls, constructing engineering controls, removing *environmental media* containing *target analytes* from the environment, removing *target analytes* from *environmental media*, and generally designing and operating cleanup systems to isolate, remove, reduce, or destroy *target analytes*.

3.1.45 *site*—the contiguous land area under consideration in the *Phase II ESA* that includes all or part of the *property* and that is impacted or potentially impacted by *releases*; if necessary in order to achieve the objectives of the *Phase II ESA*, the area under consideration may extend off the *property* if migrating *target analytes* originate from the *property*, or may include off-*property* sources of *target analytes* migrating to the *property*.

3.1.46 *site characterization*—evaluation of the *presence* of *target analytes* in *environmental media* throughout a *site* impacted or potentially impacted by a *release* or *releases*. The evaluation typically includes the determination of geological, hydrogeological, hydrological, and engineered aspects of the *site* that influence the *presence* of *target analytes* (e.g., *migration pathways*, *exposure points*) and the existence of *receptors* and *mechanisms of exposure*.

3.1.47 *substance*—any element, compound or chemical, or mixtures or preparations thereof, whether man-made or naturally occurring, which can be *present* in or *released* to *environmental media*, including but not limited to those within the scope of the Comprehensive Environmental Response, Compensation and Liability Act (*CERCLA*) (e.g., *hazardous substances*), pollutants, contaminants, petroleum and *petroleum products*, and controlled *substances* and constituents thereof.

3.1.48 *surface water*—water exposed to the atmosphere above the surface of the ground, including but not limited to lakes, ponds, reservoirs, artificial impoundments, streams, rivers, springs, seeps and wetlands.

3.1.49 *target analytes*—*substances* that are *present* in, or have been *released* or potentially have been released to, *environmental media* at the site, and which are of interest in the context of the particular *Phase II ESA* and its objectives, the *presence* of which will be sought and concentrations of which will be quantified through *field screening* or *chemical testing*.

3.1.50 *the scientific method*—principles and procedures for systematic discovery, which involve recognizing and stating a problem for which a solution is sought, formulating an hypothesis that might resolve the problem (which hypothesis is consistent with the body of knowledge available), collecting objective and reproducible data by performing an investigation to test the hypothesis, and interpreting the data to validate or refute the hypothesis; and, if the hypothesis cannot be validated, revising the hypothesis consistent with the updated body of knowledge and conducting an iteration of the procedure.

3.1.51 *U.S.C.*—United States Code.

3.1.52 *user*—the party seeking to use this practice to conduct a *Phase II ESA*. A *user* may include, without limitation, a potential purchaser of property, a potential tenant of property, an owner of property, a lender, an insurer, or a property manager.

3.1.53 *vapor intrusion*—migration of one or more volatile chemical(s) from subsurface soil or water into an overlying or nearby building or other enclosed space.

3.1.54 *water table*—the surface of a *groundwater* body at which surface the water pressure equals atmospheric pressure. Earth material below the *water table* is saturated with water.

## 4. Significance and Use

### 4.1 *Uses*:

4.1.1 This practice is intended for use on a voluntary basis by parties who wish to evaluate known *releases* or *likely release areas* identified by the *user* or *Phase II Assessor*, and/or to assess the *presence* or *likely presence* of *substances*, for legal or business reasons such as those described in 1.2.

4.1.2 This practice is intended to meet the business community's need for a written, practical reference describing a scientifically sound approach to investigating a *property* to evaluate the *presence* or *likely presence* of a *substance*. It is impossible to generalize about the contexts in which a *user* may wish to conduct such investigations or the degree of confidence a *user* may require in the results. In any context, this practice, being rooted in sound scientific methodology, can assist *users* in achieving an objective and defensible assessment.

4.1.2.1 This practice does not address the evaluation of *business environmental risks* in light of data collected through the *Phase II ESA* process. Such evaluation is a function of site- and transaction-specific variables, and of the *user's* objectives and risk tolerance. This practice contemplates that the *Phase II ESA* process will be planned and conducted with such variables in mind, and that the *user* will evaluate legal, business and environmental risks in light of known data relating to the particular site and transaction, and in consultation with legal and business advisors as well as the *Phase II Assessor*.

4.1.2.2 Likewise, this practice does not define the threshold levels at which *target analytes* pose a concern of significance to the *user*. *Users* may apply this practice not only in light of applicable regulatory criteria and relevant liability principles, but also to meet self-defined objectives.

4.1.2.3 If a *Phase II ESA* conducted in accordance with this practice provides sufficient information from which the *Phase II Assessor* can conclude, consistent with *the scientific method*, that the question to be addressed by the assessment (see 6.4.1) has been answered, then further assessment is not warranted to meet the objectives of the assessment.

4.1.3 *Use Not Limited to CERCLA*—This practice is designed to assist a *user* in developing information about the environmental condition of the property and has utility for a wide range of *target analytes* (e.g., including *diffuse anthropogenic contamination* and naturally occurring *substances*) and *users* including those who may have no actual or potential *CERCLA* concerns.

4.1.4 *Site- and Transaction-Specific*—The scope of a *Phase II ESA* is site-specific and context-specific. The assessment process defined by this practice is intended to generate sound, objective, and defensible information sufficient to satisfy diverse *user* objectives.

4.1.5 *Use by Other Parties*—This practice does not define whether or to what extent any person other than the *user* may use or rely upon a *Phase II ESA* prepared for the *user*. The appropriateness of third party use or reliance is a contractual

matter that should be addressed between *user* and *Phase II Assessor*, see [Appendix X2](#), section [X2.4](#).

**4.2 Principles**—The following principles are an integral part of this practice and are intended to be referred to in resolving any ambiguity or exercising such discretion as is accorded the *user* or *Phase II Assessor*.

**4.2.1 Elimination of Uncertainty**—No *Phase II ESA* can eliminate all uncertainty. Furthermore, any sample, either surface or subsurface, taken for *chemical testing* may or may not be representative of a larger population. Professional judgment and interpretation are inherent in the process, and even when exercised in accordance with objective scientific principles, uncertainty is inevitable. Additional assessment beyond that which was reasonably undertaken may reduce the uncertainty.

**4.2.1.1 Failure to Detect**—Even when *Phase II ESA* work is executed competently and in accordance with this practice, it must be recognized that certain conditions present especially difficult *target analyte* detection problems. Such conditions may include, but are not limited to, complex geological settings, unusual or generally poorly understood behavior and fate characteristics of certain *substances*, complex, discontinuous, random, dynamic, or spotty distributions of existing *target analytes*, physical impediments to investigation imposed by the location of utilities and other man-made objects, and the inherent limitations of assessment technologies.

**4.2.1.2 Limitations of Information**—The effectiveness of a *Phase II ESA* may be compromised by limitations or defects in the information used to define the objectives and scope of the investigation, including inability to obtain information concerning historical site uses or prior site assessment activities despite the efforts of the *user* and *Phase II Assessor* to obtain such information in accordance with [5.1.3](#).

**4.2.1.3 Chemical Analysis Error**—*Chemical testing* methods have inherent uncertainties and limitations. The *Phase II Assessor* shall build quality control and quality assurance measures into the assessment, as outlined in [Section 7](#). The *Phase II Assessor* should require the laboratory to report any potential or actual problems experienced, or nonroutine events which may have occurred during the testing, so that such problems can be considered in evaluating the data. The *Phase II Assessor* should subsequently identify such problems in any reports or documentation provided to the *user*. Any laboratory utilized for *chemical testing* shall be accredited in accordance with applicable state requirements.

**4.2.2 Level of Assessment**—*Phase II ESAs* do not generally require an exhaustive assessment of environmental conditions on a *property*. There is a point at which the cost of information obtained and the time required to obtain it outweigh the benefit of the information and, in the context of private transactions and contractual responsibilities, may become a material detriment to the orderly conduct of business. If the *presence of target analytes* is confirmed on a *property*, the extent of further assessment is a function of the degree of confidence required and the degree of uncertainty acceptable, in relation to the objectives of the assessment.

**4.2.3 Comparison With Subsequent Inquiry**—The justification and adequacy of the findings of a *Phase II ESA* in light of the findings of a subsequent inquiry should be evaluated based on the reasonableness of judgments made at the time and under the circumstances in which they were made.

**4.2.4 Data Usability**—Investigation data generally only represent the site conditions at the time the data were generated and site conditions can be dynamic. Therefore, the usability of data collected as part of a *Phase II ESA* may have a finite lifetime depending on the application and use being made of the data. To the extent that investigation data would fall within the scope of data used in a *Phase I ESA* conducted pursuant to [Practice E1527](#) or [Practice E2247](#), the lifetime limits defined by those standards apply. In all other respects, a *Phase II Assessor* should evaluate whether previously generated data are appropriate for any subsequent use beyond the original purpose for which they were collected, or are otherwise subject to lifetime limits imposed by other laws, regulations or regulatory policies.

**4.2.5 Phase II Assessor Does Not Provide Legal or Business Advice**—The *Phase II ESA* is intended to develop and present sound, scientifically valid data concerning actual site conditions. It shall not be the role of the *Phase II Assessor* to provide legal or business advice.

## 5. Developing and Documenting the Scope of the Phase II Environmental Site Assessment

**5.1** To promote clarity in defining *Phase II ESA* objectives and transparency in communicating and interpreting *Phase II ESA* results, this practice specifies adherence to the following requirements for documenting the scope of assessment and constraints on the conduct of the assessment process.

**5.1.1 Statement of Objectives**—The objective(s) of the *Phase II ESA*, including the question(s) to be answered by the assessment in accordance with [6.4.1](#), must be developed on the basis of consultation between the *user* and the *Phase II Assessor*, and must be stated in a written “Statement of Objectives”. The Statement of Objectives must form part of a written scope of work, proposal, contract, work order, or similar instrument.

**5.1.2** The Statement of Objectives must identify and describe any schedule, cost, or budget limitations applicable to the *Phase II ESA* or to activities comprising the assessment process, including any predetermined limitation on the scope of investigation, the number of iterations of sampling, or other activities that bear on the scope, schedule, or cost of a *Phase II ESA*. In developing the Statement of Objectives, the *user* and the *Phase II Assessor* must consider whether any such limitations will compromise their ability to conduct the *Phase II ESA* in accordance with this practice. If so, the Statement of Objectives must either adapt the objectives of the *Phase II ESA* so that they are achievable subject to such limitations, or describe the anticipated effect of such limitations on the ability of the *Phase II ESA* to achieve such objective(s).

**5.1.3** In conferring to develop and draft the Statement of Objectives, the *Phase II Assessor* should provide the *user* with information and explanation regarding the *Phase II ESA* process so that the *user* can make informed decisions and

participate in formulating objectives. The *user* should provide the *Phase II Assessor* all pertinent documentation and information regarding the *property's* environmental conditions that are known to, and reasonably and practicably available to, the *user*, including but not limited to the following: previous *ESAs*, other environmental studies, and technical reports or documents pertinent to an understanding of the known or potential *presence* of *target analytes* at the *property*; oral histories concerning releases or disposal affecting the *property*; and the *user's* detailed knowledge of the nature of any specialized activities and operations conducted at the *property* that inherently pose the potential for the *presence* of *substances* on the *property*.

5.1.4 *Scope of Work*—The *Phase II Assessor* shall develop a description of the methods and work tasks to be implemented to achieve the *user's* *Phase II* objectives. See Section 7. A formal written description may not be required or appropriate in all circumstances and may be substituted by another document that contains the same elements, such as proposal or scope of work.

5.2 *Compensation Not Contingent on Results*—Payment for the *Phase II Assessor's* services as an independent contractor, or remuneration or job security for the *Phase II Assessor* as an employee of *user*, may not be contingent on the results or conclusions of a *Phase II ESA*. The *Phase II Assessor* must conduct and evaluate the results of the *Phase II ESA* objectively and without reference to whether any particular outcome or conclusion is desired by the *user*.

5.3 *Issues Beyond the Scope of the Practice*—Other than as specifically set forth in this Section 5, the content and form of the contractual relationship between a *Phase II Assessor* and *user* are not prescribed by this practice. Appendix X2 to this practice presents a discussion of some common contracting issues that may arise in the course of implementing a *Phase II ESA*, which may be useful in guiding the *user* and *Phase II Assessor* through the process. The discussion does not specify how issues or conflicts should be resolved.

## 6. *Phase II ESA* Overview

6.1 *Purpose*—The purpose of conducting a *Phase II ESA* in accordance with this practice is to acquire and evaluate information sufficient to achieve the objectives set forth in the “Statement of Objectives” developed by the *user* and the *Phase II Assessor* pursuant to Section 5 of this practice.

6.2 *Assessment to Determine Presence of Target Analytes*—The *Phase II ESA* is conducted to determine whether *target analytes* are *present* in *environmental media* at a *property*, mainly through *chemical testing* of samples of *environmental media* collected from locations where such *target analytes* are most likely to be *present*, and if present, to gain sufficient information regarding the *target analytes* to meet the objectives.

6.3 *The Degree of Assessment*—The *Phase II ESA* scope of work may warrant one or more rounds of the investigation planning, implementing, and evaluating steps, but this practice requires only as many iterations as needed to meet the *user's* objectives as reflected in the “Statement of Objectives.”

6.4 *Components of the Phase II Investigation*—The following general steps must be taken in performing a *Phase II ESA*, in the manner and level of detail appropriate to achieving the objectives set forth in the “Statement of Objectives” described in 5.1.1:

6.4.1 **Formulate the question.** The *user* and *Phase II Assessor* together must formulate the question(s) to be answered by the *Phase II ESA*. In doing so, the *user's* particular objective(s) for the *Phase II ESA* must be recognized, and the *Phase II Assessor* must formulate the hypothesis or hypotheses to be confirmed or refuted by the investigation. The question(s) to be addressed must be reflected in the written Statement of Objectives.

6.4.2 **Identify the areas** warranting *Phase II* investigation (i.e., sampling and *chemical testing of environmental media*) in order to achieve the stated objective(s) of the assessment. The *Phase II Assessor* should identify the areas to be investigated in light of all *reasonably ascertainable* information.

6.4.3 **Develop a conceptual model** that considers each area where *target analytes* are *present* or are likely *present* and that is to be investigated. The *conceptual model* describes the *target analytes* likely to be *present* and where the *target analytes* are likely to be located now, in light of the *environmental behavior, fate, and transport characteristics* of the particular *target analytes* and all *reasonably ascertainable* information about their *presence* or likely *presence*. The following tasks shall be undertaken to develop the *conceptual models*.

6.4.3.1 Identify *target analytes* associated with the particular *substances* that have, or may have, been released or may be *present*, based both on reported *substance* usage, generation or *presence* and potential for spatial and temporal dynamics influenced by environmental and anthropogenic factors, and on a professional understanding of the *substances* typically used and generated in current and historical operations and activities.

6.4.3.2 Determine how the *target analytes* likely would have first entered the environment (i.e. first contacted *environmental media*). To do so, the *Phase II Assessor* must draw on professional knowledge of the sorts of industrial and commercial operations and activities that are inherent to the current and historical uses of the *site*, known or inferred. The *Phase II Assessor* must also draw on knowledge of the characteristics of engineered structures, features, and containers *present* or known or inferred to have been *present* at the *site*, from which or through which the *target analytes* may have been released or dispersed on the *site*.

6.4.3.3 Infer the *environmental media* and locations currently most likely to have the highest concentrations of the *target analytes* given the possible mechanisms of first entry into the environment, the *site's* physical conditions, the *behavior, fate, and transport characteristics* of the *target analytes*, based on both known site-specific information (e.g., witness accounts of spills, location of likely *releases*, ground cover materials, etc.) and the *Phase II Assessor's* professional knowledge of natural environmental phenomena and processes, combined with the chemical behavior of the *target analytes*, as well as the hydrogeology and geochemistry of settings like those of the *property*.



6.4.4 **Plan the sampling and chemical testing** of *environmental media*. The data quality objective for *Phase II ESAs* is, at a minimum, to achieve reproducible *chemical testing* results for *target analytes* in samples of *environmental media* collected from locations relevant to the objectives of the assessment likely to have the highest concentration of *target analytes*. To be consistent with scientific inquiry, the work should be formulated such that another *Phase II Assessor* would be able to reproduce the assessment and obtain consistent results.

NOTE 1—Sampling and chemical testing of environmental media should conform to applicable procedures and protocols. Examples include SW-846 or similar agency-specific methods. See [Appendix X4](#).

6.4.5 **Carry out the sampling and chemical testing** in accordance with the plan, making observations and note of actual physical conditions revealed by the investigation (e.g., subsurface soil and *groundwater* characteristics), and of any physical or logistical impediments to accomplishing the sampling and *chemical testing* as planned (e.g., physical barriers barring sampling at specified locations, insufficient sample volume recovered, etc.).

6.4.6 **Validate the conceptual model** by evaluating the chemical testing results and other investigation findings at the completion of the latest round of investigation, to determine whether the available information is consistent with the *conceptual model* and sufficient to support sound conclusions regarding the *presence* and significance of *target analytes*.

6.4.6.1 If the results of the investigation are consistent with and support the assumptions of the *conceptual model*, and if the *Phase II Assessor* can draw sound conclusions regarding the *presence* of *target analytes*, then the *conceptual model* is validated and sufficient investigation has been demonstrated.

6.4.6.2 If the results of the investigation are inconsistent with or do not support the assumptions of the *conceptual model*, or if the *Phase II Assessor* cannot draw sound conclusions regarding the *presence* of *target analytes*, then it must be determined whether a revised *conceptual model* can be articulated in a manner that is consistent with available data and sufficient to meet the objectives of the assessment, either as originally stated or as revised in light of the results. If so, the revised *conceptual model* may be considered validated.

6.4.6.3 If the results of the investigation are not consistent with any *conceptual model* that can be articulated and the *Phase II Assessor* cannot draw sound conclusions regarding the *presence* of *target analytes*, then the *conceptual model* has not been validated and the *Phase II Assessor* and the *user* may consult to determine whether to conduct additional investigation to develop information sufficient to articulate and validate a *conceptual model*.

6.4.7 **Develop the conclusions of the Phase II ESA**, based on an interpretation of all results and findings, and consistent with the validated *conceptual model*. The conclusions must specifically answer the question(s) the *Phase II ESA* set out to address (6.1, 6.2) or clearly state why those questions cannot be answered and what conclusions, if any, can be drawn. See Section 8.

6.4.8 **Prepare a written report of Phase II ESA objectives, findings**, interpretations, and conclusions, along with descriptions of the *conceptual model*, the investigation(s)

performed, observations made, and data obtained, in sufficient detail to allow another *Phase II Assessor* to reproduce the assessment and obtain consistent results. See Section 9.

## 7. Performing the Phase II ESA

7.1 *Initiating scientific inquiry by formulating the question to be answered*—As in all scientific inquiry, the *Phase II ESA* process must begin with the formulation of the question to be answered by the *Phase II ESA*. The *user* and *Phase II Assessor* together formulate the question(s) in conjunction with the “Statement of Objectives” in accordance with 5.1.1 and 6.4.1. The *user’s* objectives may also dictate thresholds of concern or confidence desired in the conclusions to be derived from the assessment process. All relevant factors should be taken into account in formulating the “Statement of Objectives” for the assessment. Fundamental to the *Phase II ESA* is the notion that the *presence* of *target analytes* in *environmental media* may be indicative of a release unless such *presence* is due to natural origin or some other background condition. A *Phase II* objective may nonetheless call for investigation of *substances present* as a result of intentional application (e.g. pesticides) or natural origin (e.g. radon or naturally occurring metals).

7.2 *Collecting and Evaluating Information*—In formulating the question to be addressed and identifying areas to be investigated, the *Phase II Assessor* must review all *reasonably ascertainable* information relevant to the objectives of the assessment, including but not limited to any *Phase I ESA* report concerning the property, and, using his/her professional judgment, independently evaluate its completeness, accuracy and sufficiency as a foundation for identifying the *target analytes* and the areas of *presence* and likely *presence* to be addressed by the *Phase II ESA*.

7.3 *Identifying Areas for Investigation*—The *Phase II Assessor* must determine which areas have to be investigated in order to meet the objectives of the *Phase II ESA*. In doing so, the *Phase II Assessor* should exercise professional judgment based on knowledge of the types of activities, operations, and *releases* that are inherent to the past uses of the *property*.

7.3.1 To the extent needed to achieve the particular objective of the *Phase II ESA*, the *Phase II Assessor* may designate *RECs* identified in *Phase I ESAs* for further investigation in accordance with this practice. Not all conditions identified as *RECs* in *Phase I ESAs* necessarily need be designated for *Phase II* investigation. The *Phase II Assessor* may also designate conditions not identified as *RECs* in a *Phase I ESA* for *Phase II* investigation.

7.3.2 The *Phase II Assessor* must consider past activities and operations conducted at the property to identify the potential for *releases* to have occurred or other reasons to conclude that there is a *presence* or likely *presence* of *substances* that would be relevant to the objectives of the *Phase II ESA*. In reviewing *reasonably ascertainable* information and gaining firsthand familiarity with the *property*, the *Phase II Assessor* should exercise professional judgment based on knowledge of the manner in which releases commonly occur in connection with commercial or industrial activities and operations similar to those currently or historically conducted at the *property*, in order to identify conditions that obviously could

and commonly do lead to *presence* of *substances* in circumstances such as those known to have existed at the *property*.

7.3.3 The *Phase II Assessor* must consider whether any *data gaps* identified as such in a prior *Phase I ESA* report should be addressed by conducting sampling and *chemical testing* as part of the *Phase II ESA*. If so determined, then the area of the *property* and the potentially affected *environmental media* must be identified for investigation.

7.3.4 The *Phase II Assessor* must designate all areas where there is a *presence* or likely *presence* of *substances* that would be relevant to the objectives of the *Phase II ESA* and that must be investigated to meet the objectives of the *Phase II ESA*.

7.4 *Developing the Conceptual Model*—For purposes of a *Phase II ESA*, the *conceptual model* consists of a description of the likely environmental conditions of the *property* relative to the *presence* or likely *presence* of *target analytes* in *environmental media*. The model hypothesizes (i.e., predicts) where specific *target analytes* would occur now, in light of the likely mechanisms by which *target analytes* were released or may otherwise be *present*, how and where they likely first contacted *environmental media*, the environmental *behavior, fate, and transport characteristics* of the particular *target analytes* and/or the compounds or mixtures of which they are a part, and physical characteristics of the *site* that would influence the persistence and distribution of the *target analytes* (e.g., *transport or migration pathways*) and concentration dynamics should a *release* have occurred. The *conceptual model* must be conceived prior to sampling and *chemical testing* to guide the work, and must be refined throughout the investigation process to incorporate new information as the body of knowledge about site conditions evolves. The components of the *conceptual model* are described in 7.4.1 through 7.4.3, below, and include determining the *target analytes* (7.4.1), hypothesizing the mechanisms by which *substances* first entered into the environment and the points of entry (7.4.2), and hypothesizing the *behavior, fate, and transport characteristics* of the *target analytes* (7.4.3).

7.4.1 Determine the *target analytes*. In determining the *target analytes*, the *conceptual model* must consider the composition of *substances* known or likely to have been *present*, used, handled, or released in connection with past activities at the *property*, *substances* that are *present* or likely *present* as a result of other human activities, and *substances* that are naturally occurring. Such *substances* should be designated as the *target analytes* to be sought in analyses of samples of *environmental media* as needed to achieve the objectives of the assessment. Testing for broad categories of analytes is warranted when there is uncertainty as to the composition of *substances* that may have been released.

7.4.1.1 The *conceptual model* must consider the physical state in which a *target analyte* was likely released or might otherwise be *present*, as this will govern its environmental *behavior, fate, and transport characteristics*.

7.4.1.2 The *conceptual model* must consider the potential transformations of primary *target analytes* to secondary *target analytes*.

7.4.2 The *conceptual model* must consider the mechanism by which the *target analytes* first enter into the environment.

The manner(s) in which a *target analyte* or the compound or mixture of which it is a part first contacted *environmental media* is a primary consideration in determining where the *target analyte* is likely to be found now, and therefore where samples should be collected. The environmental medium at the point of entry is the first that was contacted by the *target analyte*, and commonly persists as the location likely to have the highest concentration of *target analytes*.

7.4.3 The *conceptual model* must consider the *behavior, fate, and transport characteristics* of the *target analytes*. The *conceptual model* hypothesizes the likely current locations of *target analytes* at the site; for the purposes of the *conceptual model* and the sampling plan (described in 7.5, below), the locations (distribution) of *target analytes* may be shown by a map or described verbally. The *conceptual model* must hypothesize where *target analytes* would likely occur now, given what is known about the *release* or likely *presence* (including the mechanism of entry into the environment), and considering physical, chemical and environmental factors that influence the persistence and migration of *target analytes* subsequent to their entry into the environment. Having identified the *target analytes* (as in 7.4.1, above) and their means and points of entry into the environment (as in 7.4.2, above), it is necessary to consider the probable *behavior, fate, and transport characteristics* of the *target analytes* in the particular setting of the *property*. As appropriate given the history and setting of the *property* and the objectives of the investigation, the *conceptual model* should be formulated in light of the following general principles:

7.4.3.1 *Target analytes* generally persist, and are commonly at their highest concentration, at the point of entry into *environmental media* (determined in accordance with 7.4.2, above).

7.4.3.2 Migration of *target analytes* subsequent to a *release* generally results in a three-dimensional expansion of the zone impacted by the *target analytes*.

7.4.3.3 Factors affecting the *behavior, fate, and transport* of *target analytes* should be considered in hypothesizing the probable three-dimensional distribution of the *target analytes*.

7.4.3.4 For each area where *target analytes* are *present* or are likely to be *present*, the *conceptual model* should hypothesize the point of entry location and the zone where *target analytes* are likely *present* (i.e., the *target analyte migration pathways*, the media and locations along the pathways likely to contain the highest concentrations of the *target analytes*, and locations of boundaries to *target analyte* migration). If needed to achieve the objective of the *Phase II ESA*, the *conceptual model* would also indicate the *presence* of potential *receptors, exposure points, and mechanisms of exposure*.

7.5 *Developing a Plan and Rationale for Sampling*—Develop a written plan for sampling based on the hypothesized three-dimensional distribution of *target analytes* represented by the *conceptual model* (7.4). The sampling plan may be stated in a free-standing document or as part of a document such as a proposal or scope of work that contains the same elements. However, the results of the investigation must be interpreted, and the conclusions of the *Phase II ESA* must be stated, in light of the sampling rationale that was followed (see