WAC 173-340-7493 Site-specific terrestrial ecological evaluation procedures. (1) **Purpose.**

(a) This section sets forth the procedures for conducting a site-specific terrestrial ecological evaluation if any of the conditions specified in WAC 173-340-7491 (2)(a) apply to the site, or if the person conducting the evaluation elects to conduct a site-specific terrestrial ecological evaluation under this section, whether or not a simplified terrestrial ecological evaluation has been conducted under WAC 173-340-7492.

(b) In addition to the purposes specified in WAC 173-340-7490 (1)(a), the site-specific terrestrial ecological evaluation is intended to facilitate selection of a cleanup action by developing information necessary to conduct evaluations of cleanup action alternatives in the feasibility study.

(c) There are two elements in planning a site-specific terrestrial ecological evaluation. Both elements shall be done in consultation with the department and must be approved by the department. The two elements are:

(i) Completing the problem formulation step as required under subsection (2) of this section; and

(ii) Selecting one or more methods under subsection (3) of this section for addressing issues identified in the problem formulation step.

(d) After reviewing information developed in the problem formulation step, the department may at its discretion determine that selection of one or more methods for proceeding with the evaluation is not necessary by making either of the following decisions:

(i) No further site-specific terrestrial ecological evaluation is necessary because the cleanup action plans developed for the protection of human health will eliminate exposure pathways of concern to all of the soil contamination.

(ii) A simplified terrestrial ecological evaluation may be conducted under WAC 173-340-7492 because this evaluation will adequately identify and address any threats to ecological receptors.

(2) **Problem formulation step.**

(a) To define the focus of the site-specific terrestrial ecological evaluation, identify issues to be addressed in the evaluation, specifying:

(i) **The chemicals of ecological concern.** The person conducting the evaluation may eliminate hazardous substances from further consideration where the maximum or the upper 95 percent confidence limit soil concentration found at the site does not exceed ecological indicator concentrations described in Table 749-3. For industrial or commercial land uses, only the wildlife values need to be considered. Any chemical that exceeds the ecological indicator concentrations shall be included as a chemical of ecological concern in the evaluation unless it can be eliminated based on the factors listed in WAC 173-340-703 (2)(b). *(Caution on the use of ecological indicator concentrations: These numbers are not cleanup levels, and concentrations that exceed the number do not necessarily require remediation.)*

(ii) **Exposure pathways.** Identify any complete potential pathways for exposure of plants or animals to the chemicals of concern. If there are no complete exposure pathways then no further evaluation is necessary. Incomplete pathways may be due to the presence of man-made physical barriers, either currently existing or to be placed (within a time frame acceptable to the department) as part of a remedy or land use.

To ensure that such man-made barriers are maintained, a restrictive covenant shall be required by the department under WAC 173-340-440 under a consent decree, agreed order or enforcement order, or as a condition to a written opinion regarding the adequacy of an independent remedial action under WAC 173-340-515(3).

(iii) **Terrestrial ecological receptors of concern.** Identify current or potential future terrestrial species groups reasonably likely to live or feed at the site. Groupings should represent taxonomically related species with similar exposure characteristics. Examples of potential terrestrial species groups include: Vascular plants, ground-feeding birds, ground-feeding small mammal predators, and herbivorous small mammals.

(A) From these terrestrial species groups, select those groups to be included in the evaluation. If appropriate, individual terrestrial receptor species may also be included. In selecting species groups or individual species, the following shall be considered:

(I) Receptors that may be most at risk for significant adverse effects based on the toxicological characteristics of the chemicals of concern, the sensitivity of the receptor, and on the likely degree of exposure.

(II) Public comments.

(III) Species protected under applicable state or federal laws that may potentially be exposed to soil contaminants at the site.

(IV) Receptors to be considered under different land uses, described under WAC 173-340-7490 (3)(b).

(B) Surrogate species for which greater information is available, or that are more suitable for site-specific studies, may be used in the analysis when appropriate for addressing issues raised in the problem formulation step.

(iv) **Toxicological assessment.** Identify significant adverse effects in the receptors of concern that may result from exposure to the chemicals of concern, based on information from the toxicological literature.

(b) The following is an example of a site-specific issue developed in this step: Is dieldrin contamination a threat to reproduction in birds feeding on invertebrates and ingesting soil at the site? If so, what measures will eliminate any significant adverse effects?

(c) If there are identified information needs for remedy selection or remedial design, these should also be developed as issues for the problem formulation process.

(d) The use of assessment and measurement endpoints, as defined in USEPA *Ecological Risk Assessment Guidance for Superfund*, 1997, should be considered to clarify the logical structure of the site-specific terrestrial ecological evaluation under this chapter. Assessment endpoints shall be consistent with the policy objectives described in WAC 173-340-7490 (3)(b).

(3) **Selection of appropriate terrestrial ecological evaluation methods.** If it is determined during the problem formulation step that further evaluation is necessary, the soil concentrations listed in Table 749-3 may be used as the cleanup level at the discretion of the person conducting the evaluation. Alternatively, one or more of the following methods listed in (a) through (g) of this subsection that are relevant to the issues identified in the problem formulation step and that meet the requirements of WAC 173-340-7490 (1)(a) shall be conducted. The alternative methods available for conducting a site-specific terrestrial ecological evaluation include the following:

(a) **Literature survey.** An analysis based on a literature survey shall be conducted in accordance with subsection (4) of this section and may be used for purposes including the following:

(i) Developing a soil concentration for chemicals not listed in Table 749-3.

(ii) Identifying a soil concentration for the protection of plants or soil biota more relevant to site-specific conditions than the value listed in Table 749-3.

(iii) Obtaining a value for any of the wildlife exposure model variables listed in Table 749-5 to calculate a soil concentration for the protection of wildlife more relevant to site-specific conditions than the values listed in Table 749-3.

(b) **Soil bioassays.**

(i) Bioassays may use sensitive surrogate organisms not necessarily found at the site provided that the test adequately addresses the issues raised in the problem formulation step. For issues where threats to plant life are a concern, the test described in *Early Seedling Growth Protocol for Soil Toxicity Screening*. Ecology Publication No. 96-324 may be used. For sites where risks to soil biota are a concern, the test described in *Earthworm Bioassay Protocol for Soil Toxicity Screening*. Ecology Publication No. 96-327 may be used. Other bioassay tests approved by the department may also be used.

(ii) Soil concentrations protective of soil biota or plants may also be established with soil bioassays that use species ecologically relevant to the site rather than standard test species. Species that do or could occur at the site are considered ecologically relevant.

(c) **Wildlife exposure model.** Equations and exposure parameters to be used in calculating soil concentrations protective of terrestrial wildlife are provided in Tables 749-4 and 749-5. Changes to this model may be approved by the department under the following conditions:

(i) Alternative values for parameters listed in Table 749-5 may be used if they can be demonstrated to be more relevant to site-specific conditions (for example, the value is based on a chemical form of a hazardous substance actually present at the site). An alternative value obtained from the literature shall be supported by a literature survey conducted in accordance with subsection (4) of this section.

(ii) Receptor species of concern or exposure pathways identified in the problem formulation step may be added to the model if appropriate on a site-specific basis.

(iii) A substitution for one or more of the receptor species listed in Table 749-4 may be made under subsection (7) of this section.

(d) **Biomarkers.** Biomarker methods may be used if the measurements have clear relevance to issues raised in the problem formulation and the approach has a high probability of detecting a significant adverse effect if it is occurring at the site. The person conducting the evaluation may elect to use criteria such as biomarker effects that serve as a sensitive surrogate for significant adverse effects.

(e) **Site-specific field studies.** Site-specific empirical studies that involve hypothesis testing should use a conventional "no difference" null hypothesis (e.g., H_0: Earthworm densities are the same in the contaminated area and the reference (control) area. H_A: Earthworm densities are higher in the reference area than in the contaminated area). In preparing a work plan, consideration shall be given to the adequacy of the proposed study to detect an ongoing adverse effect and this issue shall be addressed in reporting results from the study.

(f) **Weight of evidence.** A weight of evidence approach shall include a balance in the application of literature, field, and laboratory data, recognizing that each has particular strengths and weaknesses. Site-specific data shall be given greater weight than default values or assumptions where appropriate.

(g) **Other methods approved by the department.** This may include a qualitative evaluation if relevant toxicological data are not available and cannot be otherwise developed (e.g., through soil bioassay testing).

(4) **Literature surveys.**

(a) Toxicity reference values or soil concentrations established from the literature shall represent the lowest relevant LOAEL found in the literature. Bioaccumulation factor values shall represent a reasonable maximum value from relevant information found in the literature. In assessing relevance, the following principles shall be considered:

(i) Literature benchmark values should be obtained from studies that have test conditions as similar as possible to site conditions.

(ii) The literature benchmark values or toxicity reference values should correspond to the exposure route being assessed.

(iii) The toxicity reference value or bioaccumulation factor value shall be as appropriate as possible for the receptor being assessed. The toxicity reference value should be based on a significant endpoint, as described in subsection (2) of this section.

(iv) The literature benchmark value or toxicity reference value should preferably be based on chronic exposure.

(v) The literature benchmark value, toxicity reference value, or bioaccumulation factor should preferably correspond to the chemical form being assessed. Exceptions may apply for toxicity reference values where documented biological transformations occur following uptake of the chemical or where chemical transformations are known to occur in the environment under conditions appropriate to the site.

(b) A list of relevant journals and other literature consulted in the survey shall be provided to the department. A table summarizing information from all relevant studies shall be provided to the department in a report, and the studies used to select a proposed value shall be identified. Copies of literature cited in the table that are not in the possession of the department shall be provided with the report. The department may identify relevant articles, books or other documents that shall be included in the survey.

(5) **Uncertainty analysis.** If a site-specific terrestrial ecological evaluation includes an uncertainty analysis, the discussion of uncertainty shall identify and differentiate between uncertainties that can and cannot be quantified, and natural variability. The discussion shall describe the range of potential ecological risks from the hazardous substances present at the site, based on the toxicological characteristics of the hazardous substances present, and evaluate the uncertainty regarding these risks. Potential methods for reducing uncertainty shall also be discussed, such as additional studies or post-remedial monitoring. If multiple lines of independent evidence have been developed, a weight of evidence approach may be used in characterizing uncertainty.

(6) **New scientific information.** The department shall consider proposals for modifications to default values provided in this section based on new scientific information in accordance with WAC 173-340-702 (14), (15) and (16).

(7) **Substitute receptor species.** Substitutions of receptor species and the associated values in the wildlife exposure model described in Table 749-4 may be made subject to the following conditions:

(a) There is scientifically supportable evidence that a receptor identified in Table 749-4 is not characteristic or a reasonable surrogate for a receptor that is characteristic of the ecoregion where the site is located. "Ecoregions" are defined using EPA's *Ecoregions of the Pacific Northwest* Document No. 600/3-86/033 July 1986 by Omernik and Gallant.

(b) The proposed substitute receptor is characteristic of the ecoregion where the site is located and will serve as a surrogate for wildlife species that are, or may become exposed to soil contaminants at the site. The selected surrogate shall be a species that is expected to be vulnerable to the effects of soil contamination relative to the current default species because of high exposure or known sensitivity to hazardous substances found in soil at the site.

(c) Scientific studies concerning the proposed substitute receptor species are available in the literature to select reasonable maximum exposure estimates for variables listed in Table 749-4.

(d) In choosing among potential substitute receptor species that meet the criteria in (b) and (c) of this subsection, preference shall be given to the species most ecologically similar to the default receptor being replaced.

(e) Unless there is clear and convincing evidence that they are not characteristic of the ecoregion where the site is located, the following groups shall be included in the wildlife exposure model: A small mammalian predator on soil-associated invertebrates, a small avian predator on soil-associated invertebrates, and a small mammalian herbivore.

(f) To account for uncertainties in the level of protection provided to substitute receptor species and toxicologically sensitive species, the department may require any of the following:

(i) Use of toxicity reference values based on no observed adverse effects levels.

(ii) Use of uncertainty factors to account for extrapolations between species in toxicity or exposure parameter values; or

(iii) Use of a hazard index approach for multiple contaminants to account for additive toxic effects.

[Statutory Authority: Chapters 70A.305 and 70A.355 RCW. WSR 23-17-159 (Order 18-09), § 173-340-7493, filed 8/23/23, effective 1/1/24. Statutory Authority: Chapter 70.105D RCW. WSR 01-05-024 (Order 97-09A), § 173-340-7493, filed 2/12/01, effective 8/15/01.]