Frequent Questions about the LEAF Methods and "How-To" Guide

1. What is the Leaching Environmental Assessment Framework (LEAF)?

LEAF is an integrated framework that includes four laboratory methods for characterizing the leaching behavior of inorganic constituents from solid materials under specified environmental conditions. The four test methods account for major factors known to affect the leaching behavior, such as leachate pH, the liquid-to-solid ratio (L/S) (e.g., rainfall infiltration rate), and the physical form of the material (i.e., monolithic block or powders/granular material). LEAF also provides data management tools and approaches for using leaching data to support leaching assessments.

2. Why did EPA develop LEAF?

Traditionally, the potential for environmental impacts through leaching of constituents of potential concern (COPCs) from a solid material disposed or otherwise in contact with the land into ground water or surface water has been estimated using one or more single-point leaching tests that represent a specific scenario or set of environmental conditions. Single-point leaching tests represent a specific scenario or set of environmental conditions. EPA developed LEAF to provide a flexible approach that reflects an anticipated set of field conditions and waste properties. The resulting LEAF test data can be used to provide more realistic estimates of impacts to ground water, surface water and other environmental media.

3. Why did EPA ask for comment on the LEAF How-To Guide and Test Methods?

EPA developed a technical implementation, or "How-To", guide to facilitate the use of the validated LEAF methods by a broad range of stakeholders. EPA sought public comment to provide feedback to improve the technical implementation guide's clarity and content. EPA was interested in enhancing the technical guide by including lessons learned from past and current uses of LEAF, information clarifying how to interpret the LEAF test data, and information to avoid misapplications of the LEAF test methods.

4. Is the use of LEAF required to meet federal requirements?

The Toxicity Characteristic Leachate Procedure (TCLP) is the required test method for determining if a RCRA solid waste is a RCRA toxicity characteristic hazardous waste. The LEAF tests are a set of non-regulatory tests that provide more flexibility by evaluating leaching under a wider range of environmental conditions. EPA encourages the use of LEAF to evaluate the potential for adverse impacts to human health or the environment that may result from uses of nonhazardous secondary materials, such as coal ash. Use of LEAF is voluntary and does not change or substitute for existing laws, regulations, or any beneficial use determinations that govern the management of individual wastes on either a federal or state level. LEAF may be used in the leaching evaluation of a material as part of a risk assessment. Individuals or entities that use LEAF should engage with relevant regulatory organizations to ensure that the application of these methods are consistent with all applicable federal and state requirements. The LEAF framework does not set new guidelines on evaluating risk. See https://www.epa.gov/risk/risk-assessment-guidelines for guidance on risk assessments.

5. Do commercial laboratories offer LEAF testing? Can EPA recommend to me a commercial laboratory?

EPA does not endorse the use of any individual laboratory. When contracting with an analytical laboratory for LEAF testing, EPA encourages review of the quality assurance and quality control (QA/QC) procedures, measured QA/QC solutions and evaluation frequencies with the contracted analytical laboratory.

6. What equipment do I need to do my own LEAF testing?

The LEAF test methods have been designed to use commonly available laboratory equipment. Anyone conducting their own leaching assessment using a LEAF test method should ensure their equipment meets quality assurance and quality control standards. The LEAF inter-laboratory validation studies provide data demonstrating instrument performance for the LEAF test methods and are available in the docket, docket ID EPA-HQ-OLEM-2017-0210, at https://www.regulations.gov/.

7. The LEAF test methods generate more data than other test methods. What tools are available to help me manage this data?

EPA does not endorse the use of a specific data management tool. Section 3.3 of the LEAF How-To Guide discusses LEAF Data Management Tools. LeachXS Lite is a spreadsheet based data management tool developed for use with the LEAF test methods. LEAF test results recorded in spreadsheets can be directly loaded into the LeachXS Lite software. LeachXS Lite can then be used to view and present data graphically and in tabular form. LeachXS Lite is currently available free of charge from http://www.vanderbilt.edu/leaching/leach-xs-lite/.

8. What types of materials can I evaluate with LEAF?

The LEAF test methods have been validated for evaluations of inorganic constituent leaching. For more information on the LEAF test methods validation, see the inter-laboratory validation studies in the docket, docket ID EPA-HQ-OLEM-2017-0210, available at https://www.regulations.gov/. LEAF provides a consistent approach to estimating leaching of COPCs from a wide range of solid materials including wastes, treated wastes (e.g., solidified/stabilized soils and sediments), secondary materials (e.g., blast furnace slags), energy residuals (e.g., coal fly ash, air pollution control residues), industrial processing residuals (e.g., mining and mineral processing wastes) and contaminated soil or sediments.

9. Can I use LEAF to determine if my waste is hazardous?

The LEAF test methods do not replace and cannot be directly substituted for required test methods under Resource Conservation and Recovery Act, such as the Toxicity Characteristic Leaching Procedure (TCLP, Method 1311). More information on federal requirements for hazardous waste are available at https://www.epa.gov/hw/defining-hazardous-waste-listed-characteristic-and-mixed-radiological-wastes.

10. Can I use LEAF to meet land disposal restrictions for hazardous waste?

The LEAF test methods do not supersede or replace existing land disposal restriction requirements. The land disposal restrictions (Title 40 CFR Part 268) set performance or technology standards for hazardous waste. More information on requirements under the land disposal restrictions can be found at https://www.epa.gov/hw/land-disposal-restrictions-hazardous-waste.

11. How do I use LEAF in my evaluation for beneficial use of non-hazardous secondary material?

In some cases, data from a LEAF leaching assessment may be used as one of several factors within an overall evaluation to determine the potential impacts to human health and the environment associated with the beneficial use of a material. EPA's *Methodology for Evaluating Beneficial Uses of Industrial Non-Hazardous Secondary Materials* presents a voluntary approach for evaluating a wide range of industrial non-hazardous secondary materials and their associated beneficial uses. Properties of non-hazardous secondary materials and intended applications may vary. Thus, it is the responsibility of the entity conducting the BU evaluation to ensure that use of the LEAF test methods are appropriate within a beneficial use evaluation. Individuals or entities that use LEAF should engage with relevant regulatory organizations to ensure that the application of these methods are consistent with all applicable federal and state requirements. More information on EPA's beneficial use methodology can be found at https://www.epa.gov/smm/methodology-evaluating-beneficial-uses-industrial-non-hazardous-secondary-materials-and.

12. Can I use the LEAF test methods to evaluate contaminated media or a contaminated site remedy?

EPA does not require the use of LEAF test methods to evaluate contaminated media or contaminated sites. In some situations, LEAF test methods may be appropriate to use in providing additional information for environmental decision-making. The contaminants of concern and environmental conditions will vary from one contaminated site to another and it is the responsibility of the site evaluator to determine whether the use of LEAF test methods are appropriate for any given site. An evaluator should also consider all applicable regulatory requirements before using the LEAF test methods in an evaluation.

For consideration or application of LEAF testing and methodology at Superfund sites, please contact Schatzi Fitz-James (Fitz-James.Schatzi@epa.gov) in the Office of Superfund Remediation and Technology Innovation for assistance.

13. Can I use an example evaluation in the LEAF How-To Guide to evaluate my own waste or application?

The example evaluations in the LEAF-How to Guide are intended to demonstrate the stepwise approach to using the LEAF test methods and data evaluation as part of a leaching assessment. An environmental/risk assessor or user of the LEAF How-To Guide needs to develop and conduct their own evaluation, taking into account all applicable regulatory requirements and particular material and intended use. The use of coal fly ash for structural fill discussed in the case study is a hypothetical scenario presented only for illustrative purposes. The case study does not draw conclusions about the appropriateness of this use and is not intended to be directly transposable to any real-world evaluation. When evaluating the potential impacts to human health and the environment that may result from the beneficial use of a material, an evaluator should consider the

properties of the material, the application of the material, and the anticipated environmental conditions. In addition, the evaluator is required to ensure that the beneficial use under consideration meets all applicable state and federal regulatory requirements.

The Agency has a considerable amount of LEAF test results for a range of coal combustion residual (CCR) materials generated under different conditions by different coal fired power plants. This is due to the Agency's need to assess the leaching of CCRs occurring in a similar timeframe as the Agency's development of the LEAF test methods. However, the LEAF test methods were developed as a research tool for the leaching assessment of a broad range of materials. The Methodology for Evaluating Beneficial Uses of Industrial Non-Hazardous Secondary Materials and the Beneficial Use Compendium presents EPA's approach for evaluating a wide range of industrial non-hazardous secondary materials and their associated beneficial uses.

For CCRs, the Agency's April 2015 CCR Disposal Final Rule promulgated a definition for beneficial use (40 CFR 257.53). This definition identifies four criteria that distinguish beneficial use from disposal (21349 FR 80). Those considering the beneficial use of a CCR material should consult both this definition and the relevant state authorities to identify all the requirements that may apply.

Submit comments on the LEAF Methods and How-To Guide during the public comment period to Docket ID No. EPA-HQ-2017-0210 via https://www.regulations.gov/.

FOR FURTHER INFORMATION CONTACT: The EPA SW-846 Methods Team, Materials Recovery and Waste Management Division, Office of Resource Conservation and Recovery, U.S. Environmental Protection Agency, orcrSW-846@epa.gov. For additional information, please visit https://www.epa.gov/hw-sw846/sw-846-update-vi-.

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