



Response to Comments: Leaching Environmental Assessment Framework (LEAF) How-To Guide

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1. Introduction

1.1 EPA Request for Comments

The Agency recently added four new tests for assessing the leaching potential of waste to the [SW-846 validated methods page](#). The four tests (EPA Methods 1313, 1314, 1315 and 1316), known as the Leaching Environmental Assessment Framework (LEAF) Tests, evaluate how waste constituent leaching changes with different environmental conditions. The tests are intended to be more accurate than other leaching tests by assessing constituent leaching potential under actual or plausible disposal conditions. Because the LEAF test methods represent a new approach to evaluating leaching potential, the Agency is developing technical implementation guidance (The LEAF How-To Guide) to help potential users understand the LEAF tests and how to use them. The guidance will also help users interpret the data generated by these tests and provide examples of how the test data can be used for assessing possible constituent release and provide a source term for groundwater fate and transport models used in risk assessment.

The Agency sought public comment for 90 days, beginning November 2, 2017 and ending January 31, 2018, on the LEAF Test Methods and companion How-To Guide to be sure that the guide clearly and accurately presents the test methods and methods for evaluation and does so for the range of anticipated users of the tests. This document summarizes the comments the Agency received and describes how the Agency intends to address comments, if appropriate.

1.2 Comment Summary

EPA reviewed and organized individual comments associated with each public submission made to EPA Docket Number EPA-HQ-OLEM-2017-0210. Comment excerpts were grouped into several categories, as shown in Table 1-1 below, and provide a collective summary of all comments received for a particular topic. A count of unique comments received for each category is summarized.

Table 1-1. Number of Comments per Topic

Category/Topic	Number of Comments
Method-Specific Comments	2
Method(s) Applications	8
Results Interpretation	3
Testing Costs	4
Case Studies	9
Policy Considerations	4
Editorial Comments	9
Other Topics ¹	5
Total	44

¹ The Other Topics category is used to capture comments not otherwise classified.

DCN: EPA-HQ-OLEM-2017-0210-0093

Excerpt: Page 5-4: Issue in judgement on the basis of concentration only. If for a constituent release is solubility controlled (meaning constant concentration irrespective of L/S until the controlling phase runs out) and the level is just below the regulatory concentration limit, then the long term release into the environment can become quite high. Is this a consideration or is there another way around that?

EPA Response: The potential for accumulation over time as a result of a continued release may be a consideration that is factored in when developing the goal for testing. However, it is not a specific element of the leaching test.

- b) A period has been added to the end of the sentence.
- c) The acronym POC is previously defined as point of compliance. POC has been added to the list of acronyms and abbreviations.
- d) The acronym DAF is now defined as dilution and attenuation factor on page 4-1.
- e) The relation to redox and use of ORP measurements has been expanded in Section 4.3.1 Reducing and Oxidizing Conditions.

DCN: EPA-HQ-OLEM-2017-0210-0094

Excerpt: Overall, this is a well-written guidance document, which is needed to help potential users gain maximum advantage from the LEAF methods. It would benefit from better high-level guidance early in the document.

EPA Response: The introduction has been revised to include a table summarizing the key topics in each section and a new figure that relates the LEAF test methods to the environmental parameters varied by the tests and the assessment approaches outlined in the document.

DCN: EPA-HQ-OLEM-2017-0210-0097

Excerpt: The LEAF How-To Guide explains many terms and methods used in LEAF in the plainest language our commenters have seen to date. Nonetheless, many explanations will be difficult to understand for those without a chemistry background.

EPA Response: The document is written for a diverse audience. The terms and methods used in the How-To Guide will provide more of a benefit to some users than others. The Agency will continue to consider a broad audience as it develops future materials.

DCN: EPA-HQ-OLEM-2017-0210-0098

Excerpt:

Page xii: The definition for leachate uses the word “leachate”. “Water” or “liquid” may be a more appropriate word.

EPA Response: The word “leachate” has been replaced with “leachant” in the definition of leachate.

Excerpt:

Page 2-3 Footnote: The discussion of adsorption-controls versus solubility-controls is important and well-stated. Depending on the surface charge of a granular material, adsorption can result in a constituent concentration much lower than expected based on solubility alone.

EPA Response: The dependence on surface charge has been added to the footnote on page 2-3.

Excerpt:

Page 2-7 Bulleted List: We suggest adding a bullet for diagenesis, as a broad term that could include both self-cementation and natural weathering.

EPA Response: A bullet point was added to specifically mention weathering and self-cementation.

Excerpt

Figure 4-13: What data were used for this figure? Was coal ash total porosity or effective porosity used?

Equation 4-16: Please clarify that “Cleach_max is the estimated maximum concentration for COPC within the applicable pH range.”

Figure 5-1: Although referenced in the text and the figure legend, there were no orange diamonds or open circles on the figure.

Page 5-7 and Table 5-3: The text states that only barium is acceptable based on the calculated AR. The ARs for boron and lead are also below 1, so these constituents would also would be acceptable using this criteria.

EPA Response: The data for Figure 4-13 is coal fly ash. Porosity for the coal ash was estimated from annual infiltration rates for the locations in the CCR risk assessment. Cleach_max has been clarified to be the estimated maximum concentration for the COPC [mg/L] (within the applicable pH domain when using Method 1313 results or L/S range when using results from either Method 1314 or Method 1316. Figure 5-1 has been fixed so that there are now orange diamonds and open circles. The text describing the results in Table 5-3 has been updated to reflect that boron and lead are also acceptable based on the AR being below 1.

9. Other Topics

DCN: EPA-HQ-OLEM-2017-0210-0093

Excerpt: General: Great to have a guide on leaching test use with explanations on what tests are for and how to use them!!

EPA Response: Thank you for your comment. No change.

DCN: EPA-HQ-OLEM-2017-0210-0097

Excerpt: Not all members were aware that compilations existed of LEAF studies already performed on various waste streams, especially on coal combustion residuals. Members recommend EPA continue to announce when peer-reviewed studies using LEAF on other waste streams have been completed. Waste and by-product streams of concern to Task Force members include, but are not limited to, construction and demolition debris fines, steelmaking slag, oil and gas development drill cuttings, and dredged material.

EPA Response: The Agency continues to develop more tools and studies on leaching of wastes. You can check <https://www.epa.gov/hw-sw846> and sign up for the SW-846 mailing list to receive updates as they are available.

DCN: EPA-HQ-OLEM-2017-0210-0098

Excerpt: Overall this Guidance is well written and provides an excellent resource on general leaching geochemistry as well as the rationale behind the various tests comprising the LEAF protocol. The LEAF suite of tests and the data they generate are more complicated to use and understand than the conventional single-point tests such as TCLP and SPLP. As a result, this Guidance is highly technical in nature, and provides a good reference for leaching geochemistry and the basis of the LEAF methodologies, including the fundamental strengths and weaknesses of the approach. Given the complexity of the framework there is a clear need for a Guidance such as this, as evidenced by the confusion and misuse/misinterpretation of data generated using LEAF since its development.

EPA Response: Thank you for your comment. No change.

DCN: EPA-HQ-OLEM-2017-0210-0099

Excerpt: The LEAF How-to Handbook is very helpful in understanding the LEAF process and methods. The contents outlines the intended use of LEAF, defines conditions for use, demonstrates how to set up a program, and outlines the methods.

EPA Response: Thank you for your comment. No change.