

2020 ITRC Project Proposal

Use of Soil Background Concentrations in Risk Assessment

Proposal Date

June 5, 2019 for 2020 project year

Proposal Contacts

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Proposal Summary

The intended audience of this project proposal is risk assessment staff from state and federal government, consultants and academia. The guidance would also be useful to risk managers, hydrologist and other scientists from state or federal government, consultants and academia working on cleanup sites or with other projects that require assessment of risks to contaminants in soil or soil like material.

Soil background concentrations are important to consider when conducting human health and ecological risk assessments. Regulators use soil values specific to contaminants commonly found in soil to evaluate whether they will pose risks to people or the environment. These soil values are health-based values; they are derived using toxicity data, exposure parameters and chemical specific parameters. For some chemicals, health-based values calculate to be below what is found in our soils from natural or ambient sources. In these cases, since it is not common practice to require regulated parties to take action if the amount of the chemical in soil is less than background, regulators often allow soil background values to be used instead of the health-based value.

There is inconsistency in the way stakeholders define background for use in risk assessment. This is especially true when it comes to defining ambient background for inorganics and organics such as benzo[a]pyrene and 2,3,7,8-tetrachlordibenzo-p-dioxin (TCDD) that are present at low concentrations in soil due to their persistence in the environment and their ability to be transported long distances. Some inconsistency also exists between stakeholders when defining natural background for inorganics.

Recommendations regarding appropriate sampling methods to determine background also differs among stakeholders. Although ITRC's Incremental Sampling Methodology (ISM) guidance has been released since 2012, there are still some stakeholders that do not support using ISM to establish background.

A consensus among stakeholders regarding appropriate statistical methods to use to establish default background values and site-specific background has not been reached. Stakeholders also use a variety of statistical methods to compare site concentrations to a default background value or site-specific background. There is also a lack of consensus regarding situations where it is appropriate to use averages and upper end estimates.

Other sources of valuable information such as the use of geochemical evaluations and forensic methods are not widely accepted or used. This may be a result of the lack of guidance regarding their use in determining site-specific background in risk assessment.

Although some state and federal agencies and other entities do have various guidance documents regarding this subject, there is no one nationwide comprehensive guidance including all of the suggested topics in this proposal. In addition, much of the existing guidance is in need of revision and there are inconsistencies between different guidance. There is also no summary of the existing guidance and the existing soil background data/studies that are currently available. An ITRC project to create a guidance document and training developed by academia, regulators and regulated entities would provide a useful framework for using soil background concentrations in risk assessment. The guidance could also include some information regarding the applicability of this information to soil like material such as sediments and mining sites. This guidance and training would provide:

- a source to find other useful guidance from states, agencies and other entities
- a source to find existing background data from other studies that might be used instead of conducting background studies which require significant effort and can be costly
- a source of appropriate methods to establish state or area default inorganic and organic background values and a consistent way to use them in risk assessment, including appropriate statistical methods for comparisons
- a source of appropriate methods to establish site-specific inorganic and organic background values and a consistent way to use them in risk assessment, including appropriate statistical methods for comparisons
- a source of appropriate sampling methods to be used to establish default background values and site-specific background and reference to existing ITRC documents regarding sampling, including ITRC's Incremental Sampling Methodology guidance
- a source of information regarding the use of appropriate analytical methods and the differences in results from different analytical methods and how this might impact the use of existing data to set background values
- a source of information regarding appropriate statistical methods to use to establish default background values and site-specific background values
- a source of information regarding appropriate statistical methods to use to compare site concentrations to default background values and site-specific background values
- a source for information regarding the appropriate use of geochemical evaluations in background determinations leading to an increase in use of this tool, which is not commonly used, understood or accepted by regulatory agencies
- a source of information regarding the appropriate use of forensics to determine the source of site concentrations of organics leading to an increase in this tool, which is not commonly used, understood or accepted by regulatory agencies

- a comprehensive framework developed by all interested parties taking into considerations all perspectives which is more likely to be accepted by all parties making the process of using soil background more efficient
- an increase in understanding of how to use soil background in risk assessment which will lead to an increase in using soil background in risk assessment
- an increase in consistency among regulatory agencies making the use of background in risk assessment easier for regulated entities and consultants working in multiple states and/or between state and federal regulatory agencies
- references to other ITRC guidance that address these issues, including Incremental Sampling Methodology, Issues and Options in Human Health Risk Assessment and Bioavailability of Contaminants in Soil.

Primary Project Deliverables

Deliverables

The proposed deliverables include an ITRC technical guidance document and online trainings. Completion of the guidance and training is estimated to take 18 months. Subjects proposed to be covered in the ITRC guidance document are listed below.

Section 1: Definition of different types of soil background for organics and inorganics

Section 2: Existing soil (and possibly sediment) background guidance available, including existing ITRC guidance regarding incremental sampling, human health risk assessment and bioavailability of contaminants in soil

Section 3: Existing soil (and possibly sediment) background studies/data available

Section 4: Appropriate analytical methods and differences between the results of different analytical methods

Section 5: Establishing default background values for organics and inorganics; appropriate sampling and statistical methods

Section 6: Using background values in risk assessment; appropriate statistical methods for comparisons

Section 7: Establishing site-specific background for organics and inorganics; appropriate sampling and statistical methods

Section 8: Using site-specific background in risk assessment; appropriate statistical methods for comparisons

Section 9: Geochemical evaluations to support site-specific background evaluations; appropriate sampling and statistical methods

Section 10: Using geochemical evaluations in risk assessment; appropriate statistical methods for comparisons

Section 11: Forensics methods to support determining contaminant source; appropriate sampling and statistical methods

Section 12: Using forensics to support use of background in risk assessment

Section 13: Applicability of information provided to soil like materials including sediment and mining material

Section 14: Case studies; 1 each of the following used in risk assessment - default background values, site-specific background, geochemical evaluation and possibly sediment and/or mining material

Timeline

The proposed timeline is as follows:

January 2020 to February 2020: Introductions of group members; finalize background definitions and break into smaller sub-groups including:

- Section 1: Definitions (organics and inorganics)
- Sections 2 and 3: Existing guidance and soil (and possibly sediment) data/studies
- Section 4: Analytical methods
- Sections 5 and 6: Establishing default background values and using in risk assessment; sampling; statistics
- Sections 7 and 8: Establishing site-specific background and using in risk assessment; sampling; statistics
- Sections 9 and 10: Geochemical evaluations and using in risk assessment; sampling; statistics
- Sections 11 and 12: Forensic methods to support use of background in risk assessment

The following sub-groups will form but not start their work until sections 1 through 12 are complete.

- Section 13: Soil like material applicability
- Section 14: Case studies

March 2020 to July 2020: Sub-groups complete sections 1 through 12.

August 2020 to October 2020: Review of sections 1 through 12; sub-groups begins working on sections 10 and 11 in August and completes in October.

November 2020 to December 2020: Revise sections 1 through 12 as necessary; review of sections 13 and 14.

January 2021 to March 2021: Revise sections 13 and 14 as necessary; begin creating presentations for training; continue reviewing and/or revising guidance documents as necessary.

Proposed training sections:

- Introduction to document and background definition (organics, inorganics)
- Analytical methods; differences between results and applicability to using existing data
- Establishing default background values and using in risk assessment; sampling; statistics; case study
- Site specific background and using in risk assessment; sampling; statistics; case study
- Geochemical evaluations and using in risk assessment; sampling; statistics; case study
- Might include forensic methods or possibly just mention and refer to guidance
- Might include applicability to soil like material or just state in the introduction to refer to the guidance

April 2021 to June 2021: Review and revise training presentations, practice training and any final review or revisions to guidance document.

July 2021: Post guidance document and begin online training sessions.

Proposed Team Composition

The team would be composed of any interested academia and regulatory and regulated entities including: state and federal agencies, tribes, consultants and industry.

State Team Leads

Minnesota Pollution Control Agency, Bonnie Brooks
Oregon Department of Environmental Quality, Susan Turnblom - Tentative

State Agencies (confirmed)

California Department of Toxic Substances Control, Kimberly Gettmann
Delaware Department of Natural Resources & Environmental Control, Stephanie Gordon, Morgan Price
Florida Department of Health, Dr. Anita Poulson
Idaho Department of Environmental Quality, Norka Paden, Susan Beattie
Illinois Environmental Protection Agency, Carol Hawbaker, Justin Irlam
Iowa Department of Health, Stuart Schmitz
Kentucky Energy and Environment Cabinet, Sheri Adkins
Minnesota Pollution Control Agency, Bonnie Brooks
Nebraska Department of Health and Human Services, Sue Dempsey
Oregon Department of Environmental Quality, Susan Turnblom
South Carolina Department of Health & Environmental Control, Sandra Snyder
Utah Department of Environmental Quality, Douglas Bacon
Washington Department of Ecology, Beth Rochette
Wisconsin Department of Natural Resources, Joseph Graham
Wisconsin Department of Health, to be determined

State Agencies (tentative)

Iowa Department of Natural Resources, to be determined
Wyoming Department of Environmental Quality, to be determined

State Agencies – Interested Party

Hawaii Department of Health, Roger Brewer

Federal Agencies

Environmental Protection Agency, Matt Lambert, Michele Burgess, Keith Fusinski
United States Geological Survey, Jean Morrison

Academia

University of Florida, Leah Stuchal
University of Minnesota, Marta Shore, Statistician
University of Pittsburgh, Daniel Bain

Consultants

AECOM, Kenneth Pinella

APTIM, Karen Thorbjornsen, Geochemist
Barr Engineering, Stephanie Theriault
Cardno, Mark Maddaloni
ENSAFE, Brian Mulhearn
Exponent, Mike Kierski
The Javelin Group, Kevin Pierson

Analytical Laboratories

Eurofins TestAmerica, Mark Bruce

All states that have not been contacted and additional federal agencies, tribes, academia and consultants would be contacted to request their participation. Additional subject experts in geochemistry, statistics and geology would be also be contacted to request their participation.

Additional Information

Many state and federal agencies have developed guidance that provide valuable information that can be used in development of this guidance and training. None of the guidance currently available covers all of the subjects intended to be covered in this guidance and training, some are older and require revision and there is some inconsistency between them. Many state and federal agencies and other entities have also conducted soil and sediment studies and established different types of soil and sediment background values which would also provide valuable information that could inform this document.

Some of the existing EPA guidance relevant to background is included below:

- EPA's ProUCL Version 5.0.00 User Guide
- EPA's ProUCL Version 5.0.00 Technical Guide
- EPA's Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites
- EPA's Role of Background in the CERCLA Cleanup Program
- EPA's Frequently Asked Questions About the Development and Use of Background Concentrations at Superfund Sites: Part One, General Concepts

There does not appear to be any existing information or guidance regarding soil background from the Strategic Environmental Development Program (SERDP).

No potential funding sources have been identified.