

HQ Air Force Center for Environmental Excellence

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# **GUIDANCE FOR CONTRACT DELIVERABLES**



Appendix D: Risk Assessment Methods Version 2.1

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August 2003

## **PREFACE**

This document is the *Air Force Center for Environmental Excellence Guidance for Contract Deliverables, Appendix D: Risk Assessment Methods, Version 2.1*. This appendix has been prepared for use as a guidance document by contractors who perform human health and environmental risk assessment services to ensure the risk assessments produced are well reasoned and scientifically valid. In addition to providing guidance in the conduct of human health and ecological risk assessments, this version of Appendix D clearly delineates the AFCEE's requirements concerning selected elements of these risk assessments. A history of the evolution of the risk assessment guidance that the AFCEE has developed for its contractors is provided in Table i-1.

Although this guidance document is most applicable to new Environmental Restoration Program study contracts, it should be used to guide delivery order specific risk assessments whenever applicable to the type of work to be performed. Certain projects may require specialized approaches to risk assessment. Some of the reasons a project may require a particular approach include: impacts of new standards on previous work; cost concerns; state, regional, international or program requirements; assumptions regarding future use exposure scenarios, etc.

The process of tailoring the project risk assessment begins as early as defining the project data quality objectives, and continues through actual sampling, analysis, and risk determination. Mid-course corrections requiring variations after delivery order performance begins will be handled on a case-by-case basis as required. The Contracting Officer must approve variances. At the discretion of the Contracting Officer, this responsibility may be delegated to the Contracting Officer's Representative. Approved variations will become addenda to the approved project compliance documents.

## HISTORY OF REVISIONS

VERSION	DATE	TITLE	SUMMARY OF CHANGES
	May 1989	Handbook to Support the Installation Restoration Program (IRP) Statements of Work for Remedial Investigation/Feasibility Studies (RI/FS) Version 3.0	Provides basic guidance on risk assessment.
	May 1991	Handbook to Support the Installation Restoration Program (IRP) Statements of Work. Volume I - Remedial Investigation/ Feasibility Studies (RI/FS)	Adds a brief description of ecological risk assessment, expands somewhat on exposure assessment and toxicity assessment.
	Sep 1993	Handbook to Support the Installation Restoration Program (IRP) Statements of Work. Remedial Investigation/ Feasibility Studies (RI/FS)	Includes new EPA guidance on dermal exposure, and slightly expands the section on estimation of chemical intake.
1.0	2 Jun 1997	Guidance for Contract Deliverables. Appendix D: Risk Assessment Methods	Updates, reorganizes, and greatly expands previous AFCEE guidance on risk assessment requirements.
2.0	2 Mar 2002	Guidance for Contract Deliverables. Appendix D: Risk Assessment Methods	Reorganizes guidance information and more directly delineates the AFCEE's risk assessment requirements.
2.1	14 Aug 2003	Guidance for Contract Deliverables. Appendix D: Risk Assessment Methods	Expands reorganized guidance information and delineated requirements.

Table i-1: Record of the historical changes in the risk assessment guidance provided by the AFCEE to its Environmental Restoration Program contractors.

## **RISK ASSESSMENT METHODS**

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## **1. INTRODUCTION**

This *Risk Assessment Methods, Version 2.1* (RAM) provides Air Force Center for Environmental Excellence (AFCEE) requirements and guidance for conducting and reporting human health and ecological risk assessments. The primary purposes of this document are (1) to ensure consistency of AFCEE risk assessment products and (2) to ensure that the risk assessments are well reasoned, scientifically valid, and sufficiently documented to provide a solid basis for making informed remedial decisions for each Environmental Restoration Program (ERP) site. Although information is provided on tiered risk assessments, radionuclide risk assessments, risk assessments following the feasibility study, and risk management, human health and ecological risk assessments are addressed in greater detail because they are the predominant assessments conducted for the Department of Defense ERP.

This document is not intended to be a comprehensive guide for the completion of human health or ecological risk assessments. It is developed to direct those AFCEE contractors that are conducting risk assessments to appropriate guidance documents and to articulate the AFCEE requirements in the conduct and reporting on selected components of human health and ecological risk assessments. The RAM is comprised of the following sections (1) Introduction, (2) Guide to the Guidance, and (3) AFCEE Notes. It is structured such that it can be readily revised as new guidance becomes available and as specific AFCEE requirements are developed or modified.

The Guide to the Guidance is organized to facilitate the identification of AFCEE requirements relevant to the selected components of risk assessments that are addressed in the AFCEE Note section. In the Guide to the Guidance section each of the major elements of human health and ecological risk assessments are incorporated as subsections. For each of the human health and ecological risk assessment subsections, as well as for tiered risk assessments, radionuclide risk assessments, and risk assessment efforts that follow the feasibility study, the contractor is notified of selected AFCEE requirements by the list of AFCEE Notes that is provided.

Also provided in each subsection of the human health and ecological risk assessment sections and the tiered risk assessments, radionuclide risk assessments, and risk assessment efforts that follow the feasibility study sections is a list of germane guidance documents. These listed guidance documents have been evaluated for their relevance and applicability to the subsection. Documents rated “1” have greatest applicability to the subsection, documents rated “2” have moderate applicability, and those rated “3” have limited applicability under most circumstances. Many of the more general guidance documents will be listed in several subsections. For example *Risk Assessment Guidance for Superfund Volume I – Human Health Evaluation Manual (Part A) Interim Final* (1989) is listed as highly applicable to almost every element of human health risk assessment. Similarly, *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, U.S. EPA Interim* (1997) is

listed as highly applicable to almost every element of ecological risk assessment. Finally, the guidance documents that are cited in the AFCEE Notes applicable to the subsection and have a relevance rating of “1” are noted.

The Guide to the Guidance also provides a list of those guidance documents that have been superseded by subsequent documents to facilitate application of the most recent guidance to risk assessments developed for the AFCEE. The format of the Guide to the Guidance section is illustrated in Figure 1-1.

The current version of the RAM Guide to the Guidance Section includes comprehensive evaluation of relevant documents developed by the United States Environmental Protection Agency and its regional offices, the Department of Defense, and the states of California and Texas. Additional guidance documents will be included in future versions of the RAM. Although diligence was exercised in securing applicable guidance, more recent guidance may be available and documents not listed may be applicable to risk assessment(s) conducted for the AFCEE. The contractors conducting these risk assessments should not limited their resource base to the guidance documents appearing in this RAM. Databases and risk evaluation programs available on line were not evaluated and are not listed in this version of the RAM. The AFCEE has not evaluated the programs and is cautious on the use of many databases, which may not be undated consistently.

The AFCEE Notes section has two subsections: Technical Decision Point Notes and Technical Notes. The Technical Decision Point Notes provide the ERP contractors information on the requirements of the AFCEE. However, to meet these requirements decisions will need to be made by the remedial project manager (RPM) or the team of RPMs before additional work can be conducted effectively. Therefore, the notes in the Technical Decision Point Notes subsection contain elements that require coordination with the RPM(s). If this coordination is not accomplished the ERP contractor is to notify the AFCEE Program Manager. The notes in the AFCEE Technical Notes section generally do not have elements that require RPM coordination to meet AFCEE requirements.

All of the AFCEE Notes are listed in at least one of the subsections of the Guide to the Guidance section. Each note provides an Introduction to the subject of the note, the AFCEE Requirements, and Recommended Practices and Guidance. These notes delineate the AFCEE’s minimum requirements relevant to specific components of risk assessments (conceptual site models, uncertainty analysis, etc.). The Recommended Practices and Guidance section of each note provides information that should facilitate the effective meeting of the delineated requirements. These requirements are to be met using the documents cited in the AFCEE Notes as well as the highly applicable guidance documents listed in the appropriate subsections of the Guide to the Guidance. These guidance documents provide valuable information on the conduct and on the reporting requirements of risk assessments.

Section 4, Documents Evaluated for Risk Assessment Relevance, provides the reader the list of documents that were evaluated for their relevance to the subsections of the Guide to the Guidance section. There are some documents in this list that were found not to have applicability to the risk assessments conducted by the AFCEE and therefore, do not appear in any of the subsections of the Guide to the Guidance. The list is provided as information of the documents actually evaluated.



## 2.1 Human Health Risk Assessments

### 2.1.1 Scoping

#### Applicable AFCEE Notes

AFCEE Requirements for Development and Application of Conceptual Site Models  
AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

Component of risk assessment being addressed.

AFCEE Notes (see Section 3) applicable to element of risk assessment being addressed.

Indicates guidance document is referenced in applicable AFCEE notes (limited to those documents with greatest relevance to element of risk assessment being addressed.)

#### Applicable Guidance

Relev. Rank	Note Refer.	Author	Date	Title	Additional Citation Data	Web Link
1		U. S. EPA	1988	Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA	OSWER Publ. 9355.3-01	<a href="http://www.epa.gov/superfund/action/guidance/remedy/rifs/overview.htm">http://www.epa.gov/superfund/action/guidance/remedy/rifs/overview.htm</a>
1	Yes	U. S. EPA	1989	Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final (RAGS, Part A)	EPA/540/1 -89/002 OSWER Directive 9285.7-01A	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/index.htm">http://www.epa.gov/superfund/programs/risk/ragsa/index.htm</a>
1		U. S. EPA	1991	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Part B. Development of Risk-Based Preliminary Remediation Goals, Interim	EPA/540/R 92/003 OSWER Directive 9285.7-01B	<a href="http://www.epa.gov/superfund/programs/risk/ragsb/index.htm">http://www.epa.gov/superfund/programs/risk/ragsb/index.htm</a>
1	Yes	U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk/datause/parta.htm">http://www.epa.gov/superfund/programs/risk/datause/parta.htm</a>
1		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	
1		U. S. EPA	1993	Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objective Process	Issued from Office of Research and Development	
1		U. S. EPA Reg. 1	1996	Groundwater Use and Value Determination Guidance		<a href="http://www.epa.gov/region1/superfund/resource/gwater.pdf">http://www.epa.gov/region1/superfund/resource/gwater.pdf</a>
1		U. S. ACE	1998	Technical Project Planning (TPP) Process	USACE EM200-1-2	
1		U. S. ACE	1999	Risk Assessment Handbook - Volume I: Human Health Evaluation	Publication Number: EM 200-1-4	

Relevance rank of guidance document to element of risk assessment being addressed.

Guidance document citation information.

Figure 1.1 Explanation of the format of the Guide to the Guidance section.

## 2. Guide to the Guidance

### 2.1 Human Health Risk Assessments

#### 2.1.1 Scoping

##### Applicable AFCEE Notes

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

##### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1988	Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA	OSWER Publ. 9355.3-01	<a href="http://www.epa.gov/superfund/action/guidance/remedy/rifs/overview.htm">http://www.epa.gov/superfund/action/guidance/remedy/rifs/overview.htm</a>
1	Yes	U. S. EPA	1989	Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final (RAGS, Part A)	EPA/540/1 -89/002 OSWER Directive 9285.7-01A	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/index.htm">http://www.epa.gov/superfund/programs/risk/ragsa/index.htm</a>
1		U. S. EPA	1991	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Part B. Development of Risk-Based Preliminary Remediation Goals, Interim	EPA/540/R 92/003 OSWER Directive 9285.7-01B	<a href="http://www.epa.gov/superfund/programs/risk/ragsb/index.htm">http://www.epa.gov/superfund/programs/risk/ragsb/index.htm</a>
1	Yes	U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk/datause/parta.htm">http://www.epa.gov/superfund/programs/risk/datause/parta.htm</a>
1		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	<a href="http://epa.gov/superfund/programs/risk/datause/partb.htm">http://epa.gov/superfund/programs/risk/datause/partb.htm</a>
1		U. S. EPA	1993	Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objective Process	Issued from Office of Research and Development	
1		U. S. EPA Reg. 1	1996	Groundwater Use and Value Determination Guidance		<a href="http://www.epa.gov/region1/superfund/resource/gwater.pdf">http://www.epa.gov/region1/superfund/resource/gwater.pdf</a>
1		U. S. ACE	1998	Technical Project Planning (TPP) Process	USACE EM200-1-2	<a href="http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-2/toc.htm">http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-2/toc.htm</a>

#### 2.1.1 Scoping

## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. ACE	1999	Risk Assessment Handbook - Volume I: Human Health Evaluation	Publication Number: EM 200-1-4	<a href="http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm">http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm</a>
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html_guidance">http://www.epa.gov/quality/qa_docs.html_guidance</a>
1		U. S. Army	2000	Principles of Environmental Restoration	U.S. Army Environmental Center, Aberdeen Proving Ground, Edgewood Area	<a href="http://aec.army.mil/usaec/restoration/per-manual01.pdf">http://aec.army.mil/usaec/restoration/per-manual01.pdf</a>
1	Yes	U. S. EPA	2000	Science Policy Council Handbook: Risk Characterization	EPA 100-B-00-002	<a href="http://www.epa.gov/osp/spc/rchandbk.pdf">http://www.epa.gov/osp/spc/rchandbk.pdf</a>
1	Yes	U. S. EPA	2001	Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) Final	Pub. 9285.7-47	<a href="http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm">http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm</a>
2		U. S. EPA	1992	Guidance for Performing Site Inspections Under CERCLA, Interim Draft		
2		U. S. EPA	1994	Guidance on Accelerating CERCLA Environmental Restoration at Federal Facilities		
2		U. S. EPA Reg. 9	1996	US EPA Region 9 Preliminary Remediation Goals		<a href="http://www.epa.gov/region09/waste/sfund/prg/index.htm">http://www.epa.gov/region09/waste/sfund/prg/index.htm</a>
2		U. S. EPA	1997	The Role of CSGWPPs in EPA Remediation Programs	OSWER 9283.1-09	<a href="http://www.epa.gov/superfund/resources/csgwpp/role.pdf">http://www.epa.gov/superfund/resources/csgwpp/role.pdf</a>
2		U. S. DOD/EPA	1999	Lead-Based Paint Guidelines for Disposal of Department of Defense Residential Real Property - A Field Guide	Interim Final	
2		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4, EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final">http://www.epa.gov/quality1/qsdocs/g4final</a>
2		U. S. EPA Reg. 6	2000	Region 6 Human Health Medium-Specific Screening Levels		
2		U. S. EPA Reg 4	2001	Environmental Investigations Standard Operating Procedures and Quality Assurance Manual		<a href="http://www.epa.gov/region4/sesd/eisopqam/eisopqam.pdf">http://www.epa.gov/region4/sesd/eisopqam/eisopqam.pdf</a>
2		U. S. EPA Reg. 4	2001	EPA Region 4 Human Health Risk Assessment Bulletins-- Supplement to RAGS	U.S. EPA Region 4	
2		U. S. EPA	2001	Framework for Cumulative Risk Assessment	NECA-F-1098	

### **2.1.1 Scoping**

## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. Navy	2001	Navy Policy for Conducting Human Health Risk Assessments Under the Environmental Restoration Program	Memorandum 5090 Ser N453E/1U595168	<a href="http://www-nehc.med.navy.mil/hhra/guidancedocuments/policy/pdf/hrapolicy.pdf">http://www-nehc.med.navy.mil/hhra/guidancedocuments/policy/pdf/hrapolicy.pdf</a>
2		U. S. EPA	2001	Risk Assessment Guidance for Superfund, Volume 1 – Human Health Evaluation Manual Part E, Interim Supplemental Guidance for Dermal Risk Assessment, Review Draft for Public Comment	OSWER Directive 9285.7-02EP	<a href="http://www.epa.gov/superfund/programs/risk/ragse/">http://www.epa.gov/superfund/programs/risk/ragse/</a>
2		U. S. Navy	2001	U.S. Navy Human Health Risk Assessment Guidance		<a href="http://www-nehc.med.navy.mil/hhra/guidancedocuments/process/pdf/introduction.pdf">http://www-nehc.med.navy.mil/hhra/guidancedocuments/process/pdf/introduction.pdf</a>
3		U. S. EPA	1998	Proposed TSCA §403 Soil Lead Hazard and OSWER's Lead-in-Soils Policy	EPA 540-F-98-061. OSWER 9200.4-29, PB99-963211	<a href="http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf">http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf</a>
3		U.S. Army	1998	US Army Environmental Restoration Programs Guidance Manual		
3		U. S. EPA	1999	A Community Guide to Superfund Risk Assessment.	EPA 540-K-99-003. OSWER 9285.7-	<a href="http://www.epa.gov/superfund/programs/risk/commeng.htm">http://www.epa.gov/superfund/programs/risk/commeng.htm</a>
3		U. S. EPA	1999	Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual Supplement to Part A: Community Involvement in Superfund Risk Assessments.	EPA 540/R-98/042 HWC. OSWER 9285.7-01E-P. PB99-963303	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/ci_ra.pdf">http://www.epa.gov/superfund/programs/risk/ragsa/ci_ra.pdf</a>
3		U.S. EPA	2000	EPA Quality Manual for Environmental Programs		<a href="http://www.epa.gov/quality/qs-docs/5360.pdf">http://www.epa.gov/quality/qs-docs/5360.pdf</a>
3		U. S. EPA	2000	Part II. Environmental Protection Agency: National Primary Drinking Water Regulations; Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring; Proposed Rule	Federal Register	<a href="http://www.epa.gov/safewater/ars/arsenic.pdf">http://www.epa.gov/safewater/ars/arsenic.pdf</a>
3		U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>
3		U. S. EPA	2001	Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action (Final)	Solid Waste and Emergency Response (5303W) EPA/530/R-01/015	<a href="http://www.epa.gov/correctiveaction">http://www.epa.gov/correctiveaction</a>

### **2.1.1 Scoping**

## **2.1 Human Health Risk Assessments**

### **2.1.2 Screening Approaches**

#### **Applicable AFCEE Notes**

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments

AFCEE Requirements for Selecting Chemicals of Potential Concern in Human Health and Ecological Risk Assessments

AFCEE Requirements for Evaluation of Vapor Intrusion into Indoor Air

#### **Applicable Guidance**

<b>Relev. Rank</b>	<b>Note</b>	<b>Refer. Author</b>	<b>Date</b>	<b>Title</b>	<b>Additional Citation Data</b>	<b>Web Link</b>
1		U. S. EPA	1991	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Part B. Development of Risk-Based Preliminary Remediation Goals, Interim	EPA/540/R 92/003 OSWER Directive 9285.7-01B	<a href="http://www.epa.gov/superfund/programs/risk/ragsb/index.htm">http://www.epa.gov/superfund/programs/risk/ragsb/index.htm</a>
1		U. S. EPA	1991	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors." Interim Final	OSWER Directive 9285.6-03	<a href="http://www.epa.gov/superfund/programs/risk/tooltrad.htm">http://www.epa.gov/superfund/programs/risk/tooltrad.htm</a>
1	Yes	U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk/datause/parta.htm">http://www.epa.gov/superfund/programs/risk/datause/parta.htm</a>
1		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	<a href="http://epa.gov/superfund/programs/risk/datause/partb.htm">http://epa.gov/superfund/programs/risk/datause/partb.htm</a>
1		U. S. EPA	1996	Soil Screening Guidance: Technical Background Document	EPA/540/R 95/128 OSWER Publ. 9355.4-17A NTIS PB94-963502	<a href="http://www.epa.gov/superfund/resources/soil/introtd.htm">http://www.epa.gov/superfund/resources/soil/introtd.htm</a>
1	Yes	U. S. EPA	1996	Soil Screening Guidance: User's Guide	EPA/540/R 96/018 OSWER Publ. 9355.4-23 NTIS PB94-963505	<a href="http://www.epa.gov/superfund/resources/soil/">http://www.epa.gov/superfund/resources/soil/</a>
1		U. S. EPA	1996	Soil Screening Guidance: Fact Sheet	EPA/540/F-95/041	<a href="http://www.epa.gov/superfund/resources/soil/fact_sht.pdf">http://www.epa.gov/superfund/resources/soil/fact_sht.pdf</a>
1		U. S. EPA Reg. 9	1996	US EPA Region 9 Preliminary Remediation Goals		<a href="http://www.epa.gov/region09/waste/sfund/prg/index.htm">http://www.epa.gov/region09/waste/sfund/prg/index.htm</a>

### **2.1.2 Screening Approaches**

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1998	Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.	EPA/540/F-98/030 OSWER 9200.4-27, PB98-963244	<a href="http://www.epa.gov/superfund/programs/lead/products.htm">http://www.epa.gov/superfund/programs/lead/products.htm</a> - guidance
1		U. S. ACE	1999	Risk Assessment Handbook - Volume I: Human Health Evaluation	Publication Number: EM 200-1-4	<a href="http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm">http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm</a>
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html">http://www.epa.gov/quality/qa_docs.html</a> - guidance
1		U. S. EPA Reg. 6	2000	Region 6 Human Health Medium-Specific Screening Levels		
1		U. S. Navy	2001	U.S. Navy Human Health Risk Assessment Guidance		<a href="http://www-nehc.med.navy.mil/hhra/guidancedocuments/process/pdf/introduction.pdf">http://www-nehc.med.navy.mil/hhra/guidancedocuments/process/pdf/introduction.pdf</a>
1	Yes	U. S. EPA	2002	Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)		<a href="http://www.epa.gov/correctiveaction/eis/vapor.htm">http://www.epa.gov/correctiveaction/eis/vapor.htm</a>
1		U.S. EPA Reg. 6	2002	EPA Region 6 Human Health Medium-Specific Screening Levels		<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/pd-n/screen.htm">http://www.epa.gov/Arkansas/6pd/rcra_c/pd-n/screen.htm</a>
1		U.S. EPA Reg. 3	2002	EPA Regions 3 Risk-based Concentration Table		<a href="http://www.epa.gov/reg3hwmd/risk/rbc1002">http://www.epa.gov/reg3hwmd/risk/rbc1002</a>
1		U.S. EPA	2002	National Recommended Water Quality Criteria: 2002	EPA-822-R-02-047	<a href="http://www.epa.gov/waterscience/pc/revcom">http://www.epa.gov/waterscience/pc/revcom</a>
1	Yes	U. S. EPA Reg 9	2002	Region 9 Preliminary Remediation Goals (PRGs) Table 2002 Update		<a href="http://www.epa.gov/region09/waste/sfund/prg/files/">http://www.epa.gov/region09/waste/sfund/prg/files/</a>
1		U.S. EPA	2002	Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites		<a href="http://www.epa.gov/superfund/programs/risk/toolthh.htm">http://www.epa.gov/superfund/programs/risk/toolthh.htm</a>
2		U. S. EPA	1995	Establishing Background Levels	EPA/540/F-94/030 NTIS PB94-9633 13	<a href="http://www.ertresponse.com/Training/train_pdfFiles/Fact_Sheets/75.pdf">http://www.ertresponse.com/Training/train_pdfFiles/Fact_Sheets/75.pdf</a>
2		U. S. EPA	1995	Establishing Background Levels, EPA/540/F-94/030	NTIS PB94-9633 13 Number is EPA 540F94030	<a href="http://www.epa.gov/superfund/sites/npl/hrsres/fact/bglevels.pdf">http://www.epa.gov/superfund/sites/npl/hrsres/fact/bglevels.pdf</a>
2		U. S. EPA	1998	Proposed TSCA §403 Soil Lead Hazard and OSWER's Lead-in-Soils Policy	EPA 540-F-98-061. OSWER 9200.4-29, PB99-963211	<a href="http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf">http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf</a>
2		U.S. EPA	1999	Improving Site Assessment: Abbreviated Preliminary Assessments	EPA 540-F-98-037	<a href="http://www.epa.gov/superfund/programs/siteasmt/apa.pdf">http://www.epa.gov/superfund/programs/siteasmt/apa.pdf</a>

### 2.1.2 Screening Approaches

## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U.S. EPA	1999	Improving Site Assessment: Combined PA/SI Assessments	EPA 540-F-98-038 OSWER 9375.2-10FS	<a href="http://www.epa.gov/superfund/programs/siteasmt/pasifin.pdf">http://www.epa.gov/superfund/programs/siteasmt/pasifin.pdf</a>
2		U. S. EPA Reg. 9	2000	Drinking Water Standards and Health Advisories Table	Compiled by Bruce MacIer Region 9, Drinking Water Office	
2		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4, EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final.pdf">http://www.epa.gov/quality1/qsdocs/g4final.pdf</a>
2		U. S. EPA	2000	Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California	Federal Register: May 18, 2000 (Volume 65, Number 97) [Rules and Regulations] [Page 31681-31719]	
2		U. S. EPA	2001	Guidance for Characterizing Background Chemicals in Soil at Superfund Sites	External Review Draft Office of Emergency and Remedial Response	
2		U. S. Navy	2001	Navy Policy for Conducting Human Health Risk Assessments Under the Environmental Restoration Program	Memorandum 5090 Ser N453E/1U595168	<a href="http://www-nehc.med.navy.mil/hhra/guidancedocuments/policy/pdf/hrapolicy.pdf">http://www-nehc.med.navy.mil/hhra/guidancedocuments/policy/pdf/hrapolicy.pdf</a>
2		U. S. EPA	2001	Reuse Assessment: A Tool To Implement The Superfund Land Use Directive Alternative Title: Reuse Assessment Guide	OSWER 9355.7-06P	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>
2		U. S. EPA	2002	2002 Edition of the Drinking Water Standards and Health Advisories	EPA 822-R-02-038	
2		U.S. EPA Reg. 3	2002	Derivation of Vinyl Chloride RBCs - Memorandum		<a href="http://www.epa.gov/reg3hwmd/risk/vcrbc.P">http://www.epa.gov/reg3hwmd/risk/vcrbc.P</a>
3		U. S. Army	1999	Derivation of Health-Based Environmental Screening Levels for Chemical Warfare Agents - A Technical Evaluation	USACHPPM	
3		U.S. EPA	1999	Improving Site Assessment: Pre-CERCLIS Screening Assessments	EPA 540-F-98-039 OSWER9375.2-11FS	<a href="http://www.epa.gov/superfund/programs/siteasmt/prefin.pdf">http://www.epa.gov/superfund/programs/siteasmt/prefin.pdf</a>
3		U. S. EPA	2000	Part II. Environmental Protection Agency: National Primary Drinking Water Regulations; Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring; Proposed Rule	Federal Register	<a href="http://www.epa.gov/safewater/ars/arsenic.pdf">http://www.epa.gov/safewater/ars/arsenic.pdf</a>
3		U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>
3		U.S. EPA	2002	National Ambient Air Quality Standards (NAAQS)		<a href="http://www.epa.gov/reg3artd/airquality/NA AQS.htm">http://www.epa.gov/reg3artd/airquality/NA AQS.htm</a>

### **2.1.2 Screening Approaches**

## **2.1 Human Health Risk Assessments**

### **2.1.3 Hazard Identification**

#### **Applicable AFCEE Notes**

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Development and Application of Uncertainty Analyses in Risk Assessment

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments

AFCEE Requirements for Selecting Chemicals of Potential Concern in Human Health and Ecological Risk Assessments

AFCEE Requirements for Evaluation of Vapor Intrusion into Indoor Air

AFCEE Requirements for Risk Characterizations in Human Health Risk Assessments

#### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note</i>	<i>Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U.S. EPA	1989	RCRA Facility Investigation (RFI) Guidance, Vol. I of IV: Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations	EPA 530/SW-89-031	<a href="http://www.hanford.gov/dqo/project/level5/r-crav1.pdf">http://www.hanford.gov/dqo/project/level5/r-crav1.pdf</a>
1		U.S. EPA	1989	RCRA Facility Investigation (RFI) Guidance, Vol. II of IV: Soil, Ground Water and Subsurface Gas Releases	EPA 530/SW-89-031	<a href="http://www.hanford.gov/dqo/project/level5/r-crav2.pdf">http://www.hanford.gov/dqo/project/level5/r-crav2.pdf</a>
1	Yes	U. S. EPA	1989	Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final (RAGS, Part A)	EPA/540/1-89/002 OSWER Directive 9285.7-01A	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/index.htm">http://www.epa.gov/superfund/programs/risk/ragsa/index.htm</a>
1		U.S. EPA	1989	Soil Sampling Quality Assurance User's Guide - Second	EPA/600/8-89/045	<a href="http://www.epa.gov/tio/download%2Fchar%2Fsoilsamp.pdf">http://www.epa.gov/tio/download%2Fchar%2Fsoilsamp.pdf</a>
1		U. S. Army	1991	Health Risk Assessment Guidance for the Installation Restoration Program and Formerly Used Defense Sites	Pamphlet 40-578	<a href="http://www.army.mil/usapa/epubs/pdf/p40_578.pdf">http://www.army.mil/usapa/epubs/pdf/p40_578.pdf</a>
1		U. S. EPA Reg. 3	1991	Risk Assessment: Technical Guidance Manual: EPA Region III Guidance on Handling Chemical Concentration Data Near the Detection Limit in Risk Assessments		<a href="http://www.epa.gov/reg3hwmd/risk/guide3.h">http://www.epa.gov/reg3hwmd/risk/guide3.h</a>

### **2.1.3 Hazard Identification**



## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note</i>	<i>Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1	Yes	U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk/datause/parta.htm">http://www.epa.gov/superfund/programs/risk/datause/parta.htm</a>
1		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	<a href="http://epa.gov/superfund/programs/risk/datause/partb.htm">http://epa.gov/superfund/programs/risk/datause/partb.htm</a>
1		U. S. EPA	1992	Statistical Training Course for Ground-Water Monitoring Data Analysis	EPA/530/R-93-003	
1		U. S. EPA	1993	Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening, US EPA Region III	EPA/903/R 93/001	<a href="http://www.epa.gov/reg3hwmd/risk/guide2.htm">http://www.epa.gov/reg3hwmd/risk/guide2.htm</a>
1		U.S. EPA Reg. 9	1994	Region 8 Superfund Technical Guidance Evaluating and Identifying Contaminants of Concern for Human Health		<a href="http://www.epa.gov/Region8/superfund/risks/ra03.pdf">http://www.epa.gov/Region8/superfund/risks/ra03.pdf</a>
1	Yes	U. S. EPA	1995	Engineering Forum Issue: Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites	EPA/540/5-96/500 OSWER	<a href="http://www.epa.gov/swertio1/tsp/download/bckgrnd.pdf">http://www.epa.gov/swertio1/tsp/download/bckgrnd.pdf</a>
1		U. S. EPA	1995	Establishing Background Levels	EPA/540/F-94/030 NTIS PB94-9633 13	<a href="http://www.ertresponse.com/Training/train_pdffiles/Fact_Sheets/75.pdf">http://www.ertresponse.com/Training/train_pdffiles/Fact_Sheets/75.pdf</a>
1		U. S. EPA	1995	Establishing Background Levels, EPA/540/F-94/030	NTIS PB94-9633 13 Number is EPA 540F94030	<a href="http://www.epa.gov/superfund/sites/npl/hrsres/fact/bglevels.pdf">http://www.epa.gov/superfund/sites/npl/hrsres/fact/bglevels.pdf</a>
1		U. S. EPA	1996	Soil Screening Guidance: Technical Background Document	EPA/540/R 95/128 OSWER Publ. 9355.4-17A NTIS PB94-963502	<a href="http://www.epa.gov/superfund/resources/soil/introtbd.htm">http://www.epa.gov/superfund/resources/soil/introtbd.htm</a>
1	Yes	U. S. EPA	1996	Soil Screening Guidance: User's Guide	EPA/540/R 96/018 OSWER Publ. 9355.4-23 NTIS PB94-963505	<a href="http://www.epa.gov/superfund/resources/soil/">http://www.epa.gov/superfund/resources/soil/</a>
1		U. S. EPA	1996	Soil Screening Guidance: Fact Sheet	EPA/540/F-95/041	<a href="http://www.epa.gov/superfund/resources/soil/fact_sht.pdf">http://www.epa.gov/superfund/resources/soil/fact_sht.pdf</a>
1		U. S. EPA Reg. 9	1996	US EPA Region 9 Preliminary Remediation Goals		<a href="http://www.epa.gov/region09/waste/sfund/prg/index.htm">http://www.epa.gov/region09/waste/sfund/prg/index.htm</a>
1		U. S. EPA	1997	To Filter, or Not to Filter; That is the Question	EPA-SAB-EEC-97-011 SAB letter to the EPA Administrator	
1		U. S. EPA Reg. 4	1998	Application of RAGS Part D at Federal Facilities in Region	Memorandum	
1		U. S. Navy	1998	Procedural Guidance for Statistically Analyzing Environmental Background Data		

### **2.1.3 Hazard Identification**

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note</i>	<i>Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U.S. EPA Reg. 8	1999	Background Concentrations - Use in EPA Risk Assessments		<a href="http://www.epa.gov/Region8/superfund/risksf/backgrd8.pdf">http://www.epa.gov/Region8/superfund/risksf/backgrd8.pdf</a>
1		U. S. EPA Reg. 1	1999	EPA Region 1 Risk Updates, Number 5.		<a href="http://www.epa.gov/region1/superfund/resource/guidance.htm">http://www.epa.gov/region1/superfund/resource/guidance.htm</a>
1		U. S. Navy	1999	Handbook for Statistical Analysis of Environmental Background Data	SWDIV and EFA West of Navel Engineering Command	
1		U. S. ACE	1999	Risk Assessment Handbook - Volume I: Human Health Evaluation	Publication Number: EM 200-1-4	<a href="http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm">http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm</a>
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html-guidance">http://www.epa.gov/quality/qa_docs.html-guidance</a>
1	Yes	U. S. EPA	2000	Guidance for Data Quality Assessment: Practical Methods for Data Analysis	EPA/600/R 96/084 EPA/QA/G-9	<a href="http://www.epa.gov/quality/qa_docs.html-guidance">http://www.epa.gov/quality/qa_docs.html-guidance</a>
1		U. S. EPA Reg. 4	2000	Human Health Risk Assessment Bulletins - Supplement to RAGS		<a href="http://www.epa.gov/region04/waste/ots/healbul.htm">http://www.epa.gov/region04/waste/ots/healbul.htm</a>
1		U. S. Navy	2000	Navy Interim Final Policy on the Use of Background Chemical Levels		<a href="http://web.ead.anl.gov/ecorisk/policy/pdf/bkgpolicy.pdf">http://web.ead.anl.gov/ecorisk/policy/pdf/bkgpolicy.pdf</a>
1		U. S. EPA Reg. 6	2000	Region 6 Human Health Medium-Specific Screening Levels		
1		U. S. EPA	2001	Guidance for Characterizing Background Chemicals in Soil at Superfund Sites	External Review Draft Office of Emergency and Remedial Response	
1	Yes	U. S. EPA	2001	Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) Final	Pub. 9285.7-47	<a href="http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm">http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm</a>
1	Yes	U.S. EPA	2002	Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites	EPA 540-R-01-003	<a href="http://www.epa.gov/superfund/programs/risk/background.pdf">http://www.epa.gov/superfund/programs/risk/background.pdf</a>
1		U. S. EPA	2002	Role of Background in the CERCLA Cleanup Program	OSWER Dir.: 9285.6-07P	<a href="http://www.epa.gov/superfund/programs/risk/role.pdf">http://www.epa.gov/superfund/programs/risk/role.pdf</a>
1		U.S. EPA	2002	Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites		<a href="http://www.epa.gov/superfund/programs/risk/toolthh.htm">http://www.epa.gov/superfund/programs/risk/toolthh.htm</a>
2		U.S. EPA	1989	RCRA Facility Investigation (RFI) Guidance, Vol. III of IV: Air and Surface Water Releases	EPA 530/SW-89-031	

### 2.1.3 Hazard Identification

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA	1992	Guidance for Performing Site Inspections Under CERCLA, Interim Draft		
2		U.S. EPA	1992	National Study of Chemical Residue in Fish, Volume 1	EPA 823-R-92_006a	<a href="http://www.epa.gov/waterscience/library/fish/residuevol1.pdf">http://www.epa.gov/waterscience/library/fish/residuevol1.pdf</a>
2		U. S. EPA	1992	National Study of Chemical Residue in Fish, Volume 2	EPA 823-R-92_006b	<a href="http://www.epa.gov/waterscience/library/fish/residuevol2.pdf">http://www.epa.gov/waterscience/library/fish/residuevol2.pdf</a>
2		U. S. EPA	1994	Data Quality Objectives Decision Error Feasibility Trials (DEFT)	EPA Computer Program	
2		U. S. EPA Reg. 3	1994	Risk Assessment: Technical Guidance Manual Use of Monte Carlo Simulation in Risk Assessments		<a href="http://www.epa.gov/reg3hwmd/risk/guide1.h">http://www.epa.gov/reg3hwmd/risk/guide1.h</a>
2		U. S. EPA	1994	US EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Reviews		
2		U. S. EPA Reg. 8	1995	Use of Monte Carlo Simulation in Risk Assessment		
2		U. S. EPA Reg. 1	1996	Groundwater Use and Value Determination Guidance		<a href="http://www.epa.gov/region1/superfund/resouce/gwater.pdf">http://www.epa.gov/region1/superfund/resouce/gwater.pdf</a>
2		U. S. EPA Reg. 1	1996	Immunoassay Guidelines for Planning Environmental Projects		
2		U. S. EPA	1998	Guidance for Data Quality Assessment Practical Methods for Data Analysis	EPA/600/R-96/084 EPA QA/G-9	
2		U.S. EPA	1998	Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities: Volumes 1 - 3	EPA530-D-98-001	<a href="http://www.epa.gov/epaoswer/hazwaste/com bust/riskvol.htm">http://www.epa.gov/epaoswer/hazwaste/com bust/riskvol.htm</a>
2		U. S. EPA	1998	Proposed TSCA §403 Soil Lead Hazard and OSWER's Lead-in-Soils Policy	EPA 540-F-98-061. OSWER 9200.4-29, PB99-963211	<a href="http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf">http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf</a>
2		U. S. EPA	1999	Guidance on Environmental Data Verification and Validation	EPA-QA/G8 Peer Review Draft	
2		U. S. DOD/EPA	1999	Lead-Based Paint Guidelines for Disposal of Department of Defense Residential Real Property - A Field Guide	Interim Final	
2		U. S. EPA	1999	Risk Assessment Guidance for Superfund, Volume 3 – Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A). Draft	OSWER EPA 000-0-99-000	<a href="http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm">http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm</a>

### 2.1.3 Hazard Identification

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA	1999	Toxicological Review Cadmium and Compounds. Draft. CAS No. 7440-43-9		<a href="http://www.epa.gov/ncea/pdfs/cad/cad1.pdf">http://www.epa.gov/ncea/pdfs/cad/cad1.pdf</a>
2		U. S. EPA	1999	US EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review		
2		U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part I: Estimating Exposure to Dioxin -Like Compounds, Volume 3: Properties, Environmental Levels, and Background Exposures	EPA/600/P-00/001Bc DO NOT CITE OR QUOTE Draft Final Report	
2		U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part I: Estimating Exposure to Dioxin -Like Compounds, Volume 4: Site-Specific Assessment Procedures	EPA/600/P-00/001Bd DO NOT CITE OR QUOTE Draft Final Report	
2		U. S. EPA	2000	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 1: Fish Sampling and Analysis - Third Edition	EPA 823_B_00-007	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
2		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4, EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final">http://www.epa.gov/quality1/qsdocs/g4final</a>
2		U. S. EPA	2000	Options for Development of Parametric Probability Distributions for Exposure Factors	EPA/600/R-00/058.	<a href="http://www.epa.gov/ncea/paramprob4ef.htm">http://www.epa.gov/ncea/paramprob4ef.htm</a>
2		U. S. EPA Reg. 4	2001	EPA Region 4 Human Health Risk Assessment Bulletins-- Supplement to RAGS	U.S. EPA Region 4	
2		U. S. EPA	2001	Risk Assessment Guidance for Superfund, Volume 1 – Human Health Evaluation Manual Part E, Interim Supplemental Guidance for Dermal Risk Assessment, Review Draft for Public Comment	OSWER Directive 9285.7-02EP	<a href="http://www.epa.gov/superfund/programs/risk/ragse/">http://www.epa.gov/superfund/programs/risk/ragse/</a>
2		U. S. EPA	2001	Sources, Emission and Exposure for Trichloroethylene (TCE) and Related Chemicals	National Center for Environmental Assessment	
2		U. S. EPA	2002	Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)		<a href="http://www.epa.gov/correctiveaction/eis/vapor.htm">http://www.epa.gov/correctiveaction/eis/vapor.htm</a>
2		U. S. EPA	2002	Handbook on the Management of Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites	Interim Final Draft	

### 2.1.3 Hazard Identification

## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U.S. EPA Reg. 6	2002	RCRA Delisting Technical Support Document	EPA906-D-98-001	<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/pd-o/dtsd.htm">http://www.epa.gov/Arkansas/6pd/rcra_c/pd-o/dtsd.htm</a>
3		U.S. EPA	1989	RCRA Facility Investigation (RFI) Guidance, Vol. IV of IV: Case Study Examples	EPA 530/SW-89-031	
3		U. S. EPA	1991	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Part B. Development of Risk-Based Preliminary Remediation Goals, Interim	EPA/540/R-92/003 OSWER Directive 9285.7-01B	<a href="http://www.epa.gov/superfund/programs/risk/ragsb/index.htm">http://www.epa.gov/superfund/programs/risk/ragsb/index.htm</a>
3		U. S. Army	1994	Field Manual on Environmental Chemistry and Fate of Chemical Warfare Agents	Southwest Research Institute	
3		U. S. EPA	1997	Guiding Principles for Monte Carlo Analysis	EPA/630/R-97/001	<a href="http://www.epa.gov/ncea/monnteabs.htm">http://www.epa.gov/ncea/monnteabs.htm</a>
3		U. S. EPA	1999	Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual Supplement to Part A: Community Involvement in Superfund Risk Assessments.	EPA 540/R-98/042 HWC. OSWER 9285.7-01E-P. PB99-963303	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/ci_ra.pdf">http://www.epa.gov/superfund/programs/risk/ragsa/ci_ra.pdf</a>
3		U.S. EPA	2000	EPA Quality Manual for Environmental Programs		<a href="http://www.epa.gov/quality/qs-docs/5360.pdf">http://www.epa.gov/quality/qs-docs/5360.pdf</a>
3		U. S. EPA U. S. DoD U. S. DOE	2000	Uniform Federal Policy for Implementing Environmental Quality Systems – Evaluating, Assessing, and Documenting Environmental Data Collection/Use and Technology	Intergovernmental Data Quality Task Force	
3		U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>
3		U. S. EPA	2001	Policy for Addressing Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites	DRAFT - 16 July 2001 Review Copy	
3		U. S. ACE	2002	Guide for Characterizing Sites Contaminated with Energetic Materials	EDRC/CRREL TR02-1US ACE Engineer Research and Development Center	
3		U.S. EPA Reg. 6	2002	Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities - Peer Review Draft		<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/protocol.htm-add">http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/protocol.htm-add</a>

### **2.1.3 Hazard Identification**

## **2.1 Human Health Risk Assessments**

### **2.1.4 Exposure Assessment**

#### **Applicable AFCEE Notes**

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Development and Application of Uncertainty Analyses in Risk Assessment

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments

AFCEE Requirements for Evaluation of Vapor Intrusion into Indoor Air

AFCEE Requirements for Risk Characterizations in Human Health Risk Assessments

#### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note</i>	<i>Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1988	Superfund Exposure Assessment Manual	EPA/540/1 -88/001 OSWER Directive 9285.5-1 NTIS PB89-135859	
1		U.S. EPA	1989	RCRA Facility Investigation (RFI) Guidance, Vol. I of IV: Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations	EPA 530/SW -89-031	<a href="http://www.hanford.gov/dqo/project/level5/r-crav1.pdf">http://www.hanford.gov/dqo/project/level5/r-crav1.pdf</a>
1	Yes	U. S. EPA	1989	Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final (RAGS, Part A)	EPA/540/1 -89/002 OSWER Directive 9285.7-01A	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/index.htm">http://www.epa.gov/superfund/programs/risk/ragsa/index.htm</a>
1		U. S. EPA	1989	Statistical Analysis of the Ground Water Monitoring Data at RCRA Facilities, Interim Final Guidance	EPA/530/SW -89/026OSW,W MD NTIS PB89-151-047	
1		U. S. EPA Reg. 3	1991	Exposure Point Concentrations in Groundwater	EPA/903/8 -91/002	<a href="http://www.epa.gov/reg3hwm/risk/guide5.p">http://www.epa.gov/reg3hwm/risk/guide5.p</a>
1		U. S. Army	1991	Health Risk Assessment Guidance for the Installation Restoration Program and Formerly Used Defense Sites	Pamphlet 40-578	<a href="http://www.army.mil/usapa/epubs/pdf/p40_578.pdf">http://www.army.mil/usapa/epubs/pdf/p40_578.pdf</a>

### **2.1.4 Exposure Assessment**

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1992	Dermal Exposure Assessment: Principles and Applications; Final	EPA/600/8 -91/011bOHEA	<a href="http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?deid=12188">http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?deid=12188</a>
1	Yes	U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk/datause/parta.htm">http://www.epa.gov/superfund/programs/risk/datause/parta.htm</a>
1		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	<a href="http://epa.gov/superfund/programs/risk/datause/partb.htm">http://epa.gov/superfund/programs/risk/datause/partb.htm</a>
1	Yes	U. S. EPA	1992	Guidelines for Exposure Assessment	FR 57: 22887-22938	<a href="http://www.epa.gov/ncea/pdfs/guidline.pdf">http://www.epa.gov/ncea/pdfs/guidline.pdf</a>
1	Yes	U. S. EPA	1992	Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities: Addendum to Interim Final	EPA/530/R-93/003OSWWM	<a href="http://www.epa.gov/epaoswer/hazwaste/ca/resource/guidance/sitechar/gwstats/gritsstat/download/addendum.pdf">http://www.epa.gov/epaoswer/hazwaste/ca/resource/guidance/sitechar/gwstats/gritsstat/download/addendum.pdf</a>
1		U. S. EPA	1992	Supplemental Guidance to RAGS: Calculating the Concentration Term	OSWER Directive 9285.7-081	
1		U. S. EPA Reg. 3	1995	Risk Assessment: Technical Guidance Manual - Assessing Dermal Contact with Soil; Existing Guidance		<a href="http://www.epa.gov/reg3hwmd/risk/solabsg2.htm">http://www.epa.gov/reg3hwmd/risk/solabsg2.htm</a>
1	Yes	ASTM	1995	Standard Guide for Developing Conceptual Site Models for Contaminated Sites	Designation: E 1689 – 95	<a href="http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore">http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore</a>
1		U. S. EPA	1996	Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil		
1		U. S. EPA	1997	Exposure Factors Handbook, Volume 1 – 3 General Factors	EPA/600/P -95/002Fa. NTIS PB98-124255	<a href="http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?deid=12464">http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?deid=12464</a>
1		U. S. EPA	1997	The Lognormal Distribution in Environmental Applications. OSWER	EPA/600/R-97/006	<a href="http://www.epa.gov/nerlesd1/tsc/issue.htm">http://www.epa.gov/nerlesd1/tsc/issue.htm</a>
1		U. S. EPA	1997	To Filter, or Not to Filter; That is the Question	EPA-SAB-EEC-97-011 SAB letter to the EPA Administrator	
1		U. S. EPA Reg. 4	1998	Application of RAGS Part D at Federal Facilities in Region	Memorandum	
1		USAF	1998	Military-Specific Exposure Factors Study	Human Effectiveness Directorate, Wright Patterson Air Force Base	
1		U. S. EPA Reg. 1	1999	EPA Region 1 Risk Updates, Number 5.		<a href="http://www.epa.gov/region1/superfund/resource/guidance.htm">http://www.epa.gov/region1/superfund/resource/guidance.htm</a>

### 2.1.4 Exposure Assessment

## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1	U. S. EPA	1999	Frequently Asked Questions (FAQs) on the Adult Lead	Technical Review Workgroup for Lead	
1	U.S. EPA	1999	IEUBK Model Bioavailability Variable		<a href="http://www.epa.gov/superfund/programs/lead/products/PBBIOSSfinal.pdf">http://www.epa.gov/superfund/programs/lead/products/PBBIOSSfinal.pdf</a>
1	U. S. ACE	1999	Risk Assessment Handbook - Volume I: Human Health Evaluation	Publication Number: EM 200-1-4	<a href="http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm">http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm</a>
1	U.S. EPA Reg. 5	1999	Use of the TRW Interim Adult Lead Methodology in Risk Assessment	Memo from EPA Reg.5 to TRW	<a href="http://www.epa.gov/superfund/programs/lead/products/adultlexplain.pdf">http://www.epa.gov/superfund/programs/lead/products/adultlexplain.pdf</a>
1	U. S. EPA	2000	Child-Specific Exposure Factors Handbook. Draft.	NCEA-W-0853	<a href="http://cfpub.epa.gov/ncea/cfm/efcsefh2.cfm - csefh">http://cfpub.epa.gov/ncea/cfm/efcsefh2.cfm - csefh</a>
1	U. S. Navy	2000	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U. S. Navy and Marine Corps Facilities Part 1: Overview of Metals Bioavailability, User's Guide	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	
1	U. S. Navy	2000	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U. S. Navy and Marine Corps Facilities Part 2: Technical Background Document for Assessing Metals Bioavailability,	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	
1	U. S. EPA Reg. 4	2000	Human Health Risk Assessment Bulletins - Supplement to RAGS		<a href="http://www.epa.gov/region04/waste/ots/heal/tbul.htm">http://www.epa.gov/region04/waste/ots/heal/tbul.htm</a>
1	U. S. EPA	2000	Options for Development of Parametric Probability Distributions for Exposure Factors	EPA/600/R-00/058.	<a href="http://www.epa.gov/ncea/paramprob4ef.htm">http://www.epa.gov/ncea/paramprob4ef.htm</a>
1	U. S. Army	2000	Principles of Environmental Restoration	U.S. Army Environmental Center, Aberdeen Proving Ground, Edgewood Area	<a href="http://aec.army.mil/usaec/restoration/per-manual01.pdf">http://aec.army.mil/usaec/restoration/per-manual01.pdf</a>
1	U. S. EPA	2000	TRW Recommendations for Sampling and Analysis of Soil at Lead (Pb) Sites	EPA 540-F-00-010 OSWER 9285.7-	<a href="http://www.epa.gov/superfund/programs/lead/products/sssiev.pdf">http://www.epa.gov/superfund/programs/lead/products/sssiev.pdf</a>
1	U. S. EPA	2000	User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings (Revised)		
1	U. S. EPA	2001	Risk Assessment Guidance for Superfund, Volume 1 – Human Health Evaluation Manual Part E, Interim Supplemental Guidance for Dermal Risk Assessment, Review Draft for Public Comment	OSWER Directive 9285.7-02EP	<a href="http://www.epa.gov/superfund/programs/risk/rage/">http://www.epa.gov/superfund/programs/risk/rage/</a>

### **2.1.4 Exposure Assessment**



## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note</i>	<i>Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1	Yes	U. S. EPA	2001	Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) Final	Pub. 9285.7-47	<a href="http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm">http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm</a>
1		U.S. EPA	2002	Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites		<a href="http://www.epa.gov/superfund/programs/risk/ragsa/ucl.pdf">http://www.epa.gov/superfund/programs/risk/ragsa/ucl.pdf</a>
1	Yes	U. S. EPA	2002	Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)		<a href="http://www.epa.gov/correctiveaction/eis/vapor.htm">http://www.epa.gov/correctiveaction/eis/vapor.htm</a>
1		U. S. EPA	2002	Estimated Per Capita Fish Consumption in the United States	EPA-821-C-02-003	
1		U.S. EPA	2002	User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Windows« Version	EPA 9285.7-42 EPA 540-K-01-005	<a href="http://www.epa.gov/superfund/programs/lead/products/ugieubk32.pdf">http://www.epa.gov/superfund/programs/lead/products/ugieubk32.pdf</a>
2		U.S. EPA	1985	Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites	EPA/600/8-85/002	<a href="http://www.epa.gov/clariton/clhtml/pubtitleORD.html">http://www.epa.gov/clariton/clhtml/pubtitleORD.html</a>
2		U.S. EPA	1989	RCRA Facility Investigation (RFI) Guidance, Vol. III of IV: Air and Surface Water Releases	EPA 530/SW-89-031	
2		U.S. EPA	1989	Soil Sampling Quality Assurance User's Guide - Second	EPA/600/8-89/045	<a href="http://www.epa.gov/tio/download%2Fchar%2Fsoilsamp.pdf">http://www.epa.gov/tio/download%2Fchar%2Fsoilsamp.pdf</a>
2		U. S. EPA	1991	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors." Interim Final	OSWER Directive 9285.6-03	<a href="http://www.epa.gov/superfund/programs/risk/tooltrad.htm">http://www.epa.gov/superfund/programs/risk/tooltrad.htm</a>
2		U. S. EPA Reg. 3	1991	Risk Assessment: Technical Guidance Manual: EPA Region III Guidance on Handling Chemical Concentration Data Near the Detection Limit in Risk Assessments		<a href="http://www.epa.gov/reg3hwmd/risk/guide3.h">http://www.epa.gov/reg3hwmd/risk/guide3.h</a>
2		U.S. EPA	1992	National Study of Chemical Residue in Fish, Volume 1	EPA 823-R-92_006a	<a href="http://www.epa.gov/waterscience/library/fish/residuevol1.pdf">http://www.epa.gov/waterscience/library/fish/residuevol1.pdf</a>
2		U. S. EPA	1992	National Study of Chemical Residue in Fish, Volume 2	EPA 823-R-92_006b	<a href="http://www.epa.gov/waterscience/library/fish/residuevol2.pdf">http://www.epa.gov/waterscience/library/fish/residuevol2.pdf</a>
2		U. S. EPA Reg. 3	1994	Risk Assessment: Technical Guidance Manual Use of Monte Carlo Simulation in Risk Assessments		<a href="http://www.epa.gov/reg3hwmd/risk/guide1.h">http://www.epa.gov/reg3hwmd/risk/guide1.h</a>
2		U. S. EPA	1994	US EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Reviews		

### **2.1.4 Exposure Assessment**

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2	U. S. EPA Reg. 8	1995	Use of Monte Carlo Simulation in Risk Assessment		
2	U.S. EPA	1996	Bioavailability of Arsenic and Lead in Environmental	EPA 910/R-96-002	<a href="http://www.epa.gov/r10earth/offices/oea/risk/bioavail.pdf">http://www.epa.gov/r10earth/offices/oea/risk/bioavail.pdf</a>
2	U. S. EPA Reg. 1	1996	Groundwater Use and Value Determination Guidance		<a href="http://www.epa.gov/region1/superfund/resource/gwater.pdf">http://www.epa.gov/region1/superfund/resource/gwater.pdf</a>
2	U. S. EPA	1996	PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures	EPA/600/P-96F	<a href="http://www.epa.gov/ORD/WebPubs/pcb/">http://www.epa.gov/ORD/WebPubs/pcb/</a>
2	U. S. EPA Reg. 9	1996	US EPA Region 9 Preliminary Remediation Goals		<a href="http://www.epa.gov/region09/waste/sfund/prg/index.htm">http://www.epa.gov/region09/waste/sfund/prg/index.htm</a>
2	U. S. EPA	1997	Guiding Principles for Monte Carlo Analysis	EPA/630/R-97/001	<a href="http://www.epa.gov/ncea/monnteabs.htm">http://www.epa.gov/ncea/monnteabs.htm</a>
2	U. S. EPA	1997	Human Health Risk Assessment: Current Approaches & Future Directions	Risk Assessment Forum U.S. Environmental Protection Agency Technical Panel	
2	U. S. EPA	1997	Mercury Report to Congress Vols. 1 - 8	EPA-452/R-97-003	
2	U. S. EPA	1998	Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.	EPA/540/F-98/030 OSWER 9200.4-27, PB98-963244	<a href="http://www.epa.gov/superfund/programs/lead/products.htm - guidance">http://www.epa.gov/superfund/programs/lead/products.htm - guidance</a>
2	U.S. EPA	1998	Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities: Volumes 1 - 3	EPA530-D-98-001	<a href="http://www.epa.gov/epaoswer/hazwaste/com bust/riskvol.htm">http://www.epa.gov/epaoswer/hazwaste/com bust/riskvol.htm</a>
2	U.S. EPA	1998	IEUBK Model Mass Fraction of Soil in Indoor Dust (MSD) Variable	EPA 540-F-00-008	<a href="http://www.epa.gov/superfund/programs/lead/products/ssmsdcol.pdf">http://www.epa.gov/superfund/programs/lead/products/ssmsdcol.pdf</a>
2	U.S. EPA	1999	Asian and Pacific Islander Seafood Consumption Study	EPA 910/R-99-003	<a href="http://www.epa.gov/r10earth/offices/oea/risk/a&amp;pi.pdf">http://www.epa.gov/r10earth/offices/oea/risk/a&amp;pi.pdf</a>
2	U.S. EPA	1999	IEUBK Model Soil/Dust Ingestion Rates	EPA 540-F-00-007	<a href="http://www.epa.gov/superfund/programs/lead/products/ssircolo.pdf">http://www.epa.gov/superfund/programs/lead/products/ssircolo.pdf</a>
2	U. S. DOD/EPA	1999	Lead-Based Paint Guidelines for Disposal of Department of Defense Residential Real Property - A Field Guide	Interim Final	
2	U. S. EPA	1999	Risk Assessment Guidance for Superfund, Volume 3 – Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A). Draft	OSWER EPA 000-0-99-000	<a href="http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm">http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm</a>

### 2.1.4 Exposure Assessment

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA	1999	US EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review		
2		U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html_guidance">http://www.epa.gov/quality/qa_docs.html_guidance</a>
2		U. S. EPA	2000	Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related		<a href="http://www.epa.gov/ncea/pdfs/dioxin/dioxreas.htm">http://www.epa.gov/ncea/pdfs/dioxin/dioxreas.htm</a>
2		U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part I: Estimating Exposure to Dioxin -Like Compounds, Volume 3: Properties, Environmental Levels, and Background Exposures	EPA/600/P-00/001Bc DO NOT CITE OR QUOTE Draft Final Report	
2		U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part I: Estimating Exposure to Dioxin -Like Compounds, Volume 4: Site-Specific Assessment Procedures	EPA/600/P-00/001Bd DO NOT CITE OR QUOTE Draft Final Report	
2		U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part III: Integrated Summary and Risk Characterization for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds	EPA/600/P-00/001Bg DO NOT CITE OR QUOTE Preliminary Draft	
2		U. S. EPA	2000	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 2: Risk Assessment and Fish Consumption Limits - Third Edition	Office of Water	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
2		U. S. EPA Reg. 4	2001	EPA Region 4 Human Health Risk Assessment Bulletins-- Supplement to RAGS	U.S. EPA Region 4	
2		U. S. EPA	2001	Lead; Identification of Dangerous Levels of Lead; Final Rule	Fed. Reg. Vol. 66, No. 4	<a href="http://www.epa.gov/superfund/programs/lead/products/rule.pdf">http://www.epa.gov/superfund/programs/lead/products/rule.pdf</a>
2		U. S. EPA	2001	Reuse Assessment: A Tool To Implement The Superfund Land Use Directive Alternative Title: Reuse Assessment Guide	OSWER 9355.7-06.P	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>
2		U. S. EPA	2001	Risk Assessment Guidance for Superfund, Volume 3 - Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A).	EPA 540-R-2-002 OSWER 9285.7-45	<a href="http://www.epa.gov/superfund/RAGS3A/index.htm">http://www.epa.gov/superfund/RAGS3A/index.htm</a>

### 2.1.4 Exposure Assessment

## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2	U. S. EPA	2001	Sources, Emission and Exposure for Trichloroethylene (TCE) and Related Chemicals	National Center for Environmental Assessment	
2	U.S. EPA Reg. 6	2002	Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities - Peer Review Draft		<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/protocol.htm-add">http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/protocol.htm-add</a>
2	U.S. EPA Reg. 6	2002	RCRA Delisting Technical Support Document	EPA906-D-98-001	<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/pd-o/dtsd.htm">http://www.epa.gov/Arkansas/6pd/rcra_c/pd-o/dtsd.htm</a>
3	U. S. EPA	1991	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Part B. Development of Risk-Based Preliminary Remediation Goals, Interim	EPA/540/R 92/003 OSWER Directive 9285.7-01B	<a href="http://www.epa.gov/superfund/programs/risk/ragsb/index.htm">http://www.epa.gov/superfund/programs/risk/ragsb/index.htm</a>
3	U. S. EPA	1993	Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening, US EPA Region III	EPA/903/R 93/001	<a href="http://www.epa.gov/reg3hwmd/risk/guide2.h">http://www.epa.gov/reg3hwmd/risk/guide2.h</a>
3	U. S. EPA	1994	Data Quality Objectives Decision Error Feasibility Trials (DEFT)	EPA Computer Program	
3	U. S. EPA	1999	Estimating Risk from Contaminants Contained in Agricultural Fertilizers - Draft Report	RTI Project No. 92U-7200-017	
3	U. S. EPA	1999	Revised Risk Assessment for the Air Characteristic Study Volume I Overview	EPA 530-R-99-019a	<a href="http://www.epa.gov/epaoswer/hazwaste/id/r99019a.pdf">http://www.epa.gov/epaoswer/hazwaste/id/r99019a.pdf</a>
3	U. S. EPA	1999	Revised Risk Assessment for the Air Characteristic Study Volume II Technical Background document	EPA 530-R-99-019b	<a href="http://www.epa.gov/epaoswer/hazwaste/id/r99019b.pdf">http://www.epa.gov/epaoswer/hazwaste/id/r99019b.pdf</a>
3	U. S. EPA	1999	Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual Supplement to Part A: Community Involvement in Superfund Risk Assessments.	EPA 540/R-98/042 HWC. OSWER 9285.7-01E-P. PB99-963303	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/ci_ra.pdf">http://www.epa.gov/superfund/programs/risk/ragsa/ci_ra.pdf</a>
3	U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part I: Estimating Exposure to Dioxin -Like Compounds, Volume 2: Sources of Dioxin-Like Compounds in the United States	EPA/600/P-00/001Bb DO NOT CITE OR QUOTE Draft Final Report	
3	U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4. EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final">http://www.epa.gov/quality1/qsdocs/g4final</a>
3	U. S. EPA	2000	Lead at Outdoor Firing Ranges	EPA-540-F-00-009	<a href="http://www.epa.gov/superfund/programs/lead/products/ssammoco.pdf">http://www.epa.gov/superfund/programs/lead/products/ssammoco.pdf</a>
3	U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>

### **2.1.4 Exposure Assessment**

## ***2.1 Human Health Risk Assessments***

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
3		U.S. EPA	2003	Draft Final Guidelines for Carcinogen Risk Assessment	EPA/630/P-03/001A	<a href="http://www.epa.gov/ncea/raf/cancer2003.htm">www.epa.gov/ncea/raf/cancer2003.htm</a>

### ***2.1.4 Exposure Assessment***

## 2.1 Human Health Risk Assessments

### 2.1.5 Toxicity Assessment

#### Applicable AFCEE Notes

AFCEE Requirements for Development and Application of Uncertainty Analyses in Risk Assessment

AFCEE Requirements for Risk Characterizations in Human Health Risk Assessments

#### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1	Yes	U. S. EPA	1989	Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final (RAGS, Part A)	EPA/540/1 -89/002 OSWER Directive 9285.7-01A	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/index.htm">http://www.epa.gov/superfund/programs/risk/ragsa/index.htm</a>
1		U. S. EPA	1993	Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons	EPA/600/R-93/089 ORD	
1		ASTM	1994	Standard Guide for Handling Uncertainties in Risk	Committee E-47 E47.13 Subcommittee on Assessment of Risk to Human Health and the Environment from Hazardous Waste Sites	
1		U. S. EPA	1996	PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures	EPA/600/P-96F	<a href="http://www.epa.gov/ORD/WebPubs/pcb/">http://www.epa.gov/ORD/WebPubs/pcb/</a>
1		U. S. EPA	1996	Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil		
1		U. S. EPA Reg. 9	1996	US EPA Region 9 Preliminary Remediation Goals		<a href="http://www.epa.gov/region09/waste/sfund/prg/index.htm">http://www.epa.gov/region09/waste/sfund/prg/index.htm</a>
1		U. S. EPA	1997	Health Effects Assessment Summary Tables (HEAST)		<a href="http://www.epa.gov/radiation/heast/">http://www.epa.gov/radiation/heast/</a>
1		U. S. EPA Reg. 4	1998	Application of RAGS Part D at Federal Facilities in Region	Memorandum	
1		U. S. EPA	1999	Frequently Asked Questions (FAQs) on the Adult Lead	Technical Review Workgroup for Lead	
1		U.S.EPA	1999	Interim Guidance for Perchlorate	Memorandum	
1		U.S. EPA Reg. 5	1999	Use of the TRW Interim Adult Lead Methodology in Risk Assessment	Memo from EPA Reg.5 to TRW	<a href="http://www.epa.gov/superfund/programs/lead/products/adultexplain.pdf">http://www.epa.gov/superfund/programs/lead/products/adultexplain.pdf</a>

### 2.1.5 Toxicity Assessment

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U.S. EPA	1999	Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants; States' Compliance-- Revision of Polychlorinated Biphenyls (PCBs) Criteria	Federal Register, Volume 64, Number 216, page 61181	<a href="http://www.epa.gov/fedrgstr/EPA-WATER/1999/November/Day-09/w25559.htm">http://www.epa.gov/fedrgstr/EPA-WATER/1999/November/Day-09/w25559.htm</a>
1		U. S. EPA Reg. 4	2000	Human Health Risk Assessment Bulletins - Supplement to RAGS		<a href="http://www.epa.gov/region04/waste/ots/healthbul.htm">http://www.epa.gov/region04/waste/ots/healthbul.htm</a>
1	Yes	U. S. EPA	2001	Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) Final	Pub. 9285.7-47	<a href="http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm">http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm</a>
1		U.S. EPA	2002	Blood Lead Concentrations of U.S. Adult Females: Summary Statistics from Phase 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III)	EPA 9285.7-52	<a href="http://www.epa.gov/superfund/programs/lead/products/nhanes.pdf">http://www.epa.gov/superfund/programs/lead/products/nhanes.pdf</a>
1		U.S. EPA	2002	Overview of the IEUBK Model for Lead in Children	EPA 540-R-99-015	<a href="http://www.epa.gov/superfund/programs/lead/products/factsht5.pdf">http://www.epa.gov/superfund/programs/lead/products/factsht5.pdf</a>
1		U. S. EPA	2002	Perchlorate Environmental Contamination: Review and Risk Characterization	External Review Draft - Do Not Cite or Quote NCEA-103	
1		U.S. EPA	2002	Reference Manual: Documentation of Updates for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK)	EPA 9285.7-44	<a href="http://www.epa.gov/superfund/programs/lead/products/rmieubk32.pdf">http://www.epa.gov/superfund/programs/lead/products/rmieubk32.pdf</a>
1		U.S. EPA	2002	System Requirements and Design for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Window« Version	EPA 9285.7-43	<a href="http://www.epa.gov/superfund/programs/lead/products/srdieubk32.pdf">http://www.epa.gov/superfund/programs/lead/products/srdieubk32.pdf</a>
1		U.S. EPA	2002	User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Windows« Version	EPA 9285.7-42 EPA 540-K-01-005	<a href="http://www.epa.gov/superfund/programs/lead/products/ugieubk32.pdf">http://www.epa.gov/superfund/programs/lead/products/ugieubk32.pdf</a>
1		U.S. EPA	2003	Status of EPA's Interim Assessment Guidance for Perchlorate	Memorandum	
2		U. S. EPA	1986	Guidelines for the Health Risk Assessment of Chemical Mixtures	EPA-630/R-98/002	
2		U.S. EPA	1988	Technical Support Document on Risk Assessment of Chemical Mixtures	EPA/600/8-90/064	
2		U. S. EPA	1994	Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry	EPA/600/8-88/066F Environmental Criteria and Assessment Office, Office of Health and Environmental	
2		U. S. Army	1995	Toxicity Summary for 4-Amino-2-Nitrotoluene	U.S. Army Environmental Center	

### 2.1.5 Toxicity Assessment

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2	U. S. EPA	1997	Chapter 8. Dose-Response Modeling for 2,3,7,8-TCDD. Draft.	EPA/600/P-92/001C8	<a href="http://www.epa.gov/ORD/WebPub/dioxin">http://www.epa.gov/ORD/WebPub/dioxin</a>
2	U. S. EPA	1997	Human Health Risk Assessment: Current Approaches & Future Directions	Risk Assessment Forum U.S. Environmental Protection Agency Technical Panel	
2	U. S. EPA	1997	Mercury Report to Congress Vols. 1 - 8	EPA-452/R-97-003	
2	U. S. EPA	1998	Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.	EPA/540/F-98/030 OSWER 9200.4-27, PB98-963244	<a href="http://www.epa.gov/superfund/programs/lead/products.htm - guidance">http://www.epa.gov/superfund/programs/lead/products.htm - guidance</a>
2	U. S. EPA	1998	Proposed TSCA §403 Soil Lead Hazard and OSWER's Lead-in-Soils Policy	EPA 540-F-98-061. OSWER 9200.4-29, PB99-963211	<a href="http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf">http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf</a>
2	U. S. EPA	1998	Summary of the U.S. EPA Workshop on the Relationship Between Exposure Duration and Toxicity.		<a href="http://www.epa.gov/ncea/pdfs/tbexptox.pdf">http://www.epa.gov/ncea/pdfs/tbexptox.pdf</a>
2	U. S. EPA	1998	Toxicological Review of Beryllium and Compounds		
2	U. S. EPA	1999	Guidance for Conducting Health Risk Assessment of Chemical Mixtures. Draft.	NCEA-C-0148	<a href="http://www.epa.gov/ncea/pdfs/mixture.pdf">http://www.epa.gov/ncea/pdfs/mixture.pdf</a>
2	U. S. EPA	1999	Toxicological Review Cadmium and Compounds. Draft. CAS No. 7440-43-9		<a href="http://www.epa.gov/ncea/pdfs/cad/cad1.pdf">http://www.epa.gov/ncea/pdfs/cad/cad1.pdf</a>
2	U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part II: Health Assessment for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related	EPA/600/P-00/001Be DO NOT CITE OR QUOTE Draft Final Report	
2	U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part II: Health Assessment for 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and Related	EPA/600/P-00/001Ae	<a href="http://www.epa.gov/ncea/pdfs/dioxin/">http://www.epa.gov/ncea/pdfs/dioxin/</a>
2	U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part III: Integrated Summary and Risk Characterization for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds	EPA/600/P-00/001Bg DO NOT CITE OR QUOTE Preliminary Draft	
2	U. S. EPA	2000	Supplementary Guidance for Conducting Health Risk Assessment of Chemical Mixtures	EPA/630/R-00?002 Product of the Risk Assessment Forum	

### 2.1.5 Toxicity Assessment



## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2	U. S. EPA Reg. 4	2001	EPA Region 4 Human Health Risk Assessment Bulletins-- Supplement to RAGS	U.S. EPA Region 4	
2	U. S. EPA	2001	Risk Assessment Guidance for Superfund, Volume 1 – Human Health Evaluation Manual Part E, Interim Supplemental Guidance for Dermal Risk Assessment, Review Draft for Public Comment	OSWER Directive 9285.7-02EP	<a href="http://www.epa.gov/superfund/programs/risk/ragse/">http://www.epa.gov/superfund/programs/risk/ragse/</a>
2	U. S. EPA	2001	Water Quality Criterion for the Protection of Human Health: Methylmercury	EPA-823-R-01-001	<a href="http://www.epa.gov/waterscience/criteria/methylmercury/merctitl.pdf">http://www.epa.gov/waterscience/criteria/methylmercury/merctitl.pdf</a>
2	U.S. EPA	2003	Draft Final Guidelines for Carcinogen Risk Assessment	EPA/630/P-03/001A	<a href="http://www.epa.gov/ncea/raf/cancer2003.htm">www.epa.gov/ncea/raf/cancer2003.htm</a>
3	U. S. EPA	1986	Guidelines for Mutagenicity Risk Assessment	EPA-630/R-98/003	
3	U.S. EPA	1989	RCRA Facility Investigation (RFI) Guidance, Vol. I of IV: Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations	EPA 530/SW-89-031	<a href="http://www.hanford.gov/dqo/project/level5/r/rav1.pdf">http://www.hanford.gov/dqo/project/level5/r/rav1.pdf</a>
3	U. S. EPA	1991	Guidelines for Development Toxicity Risk Assessment	Federal Register: 56(234):63798-63826	
3	U. S. Army	1991	Health Risk Assessment Guidance for the Installation Restoration Program and Formerly Used Defense Sites	Pamphlet 40-578	<a href="http://www.army.mil/usapa/epubs/pdf/p40_578.pdf">http://www.army.mil/usapa/epubs/pdf/p40_578.pdf</a>
3	U. S. Army	1994	Toxicity Summary for 2-Amino-4,6-Dinitrotoluene	U.S. Army Environmental Center	
3	U. S. EPA	1995	Proposed Guidelines for Neurotoxicity Risk Assessment;	FR Vol. 60, No. 192	
3	U. S. Army	1995	Toxicity Summary for Nitrobenzene	U.S. Army Environmental Center	
3	U. S. Army	1995	Toxicity Summary for 1,3,5-Trinitrobenzene	U.S. Army Environmental Center	
3	U. S. Army	1995	Toxicity Summary for 1,3,5,7-Tetrazocine (HMX)	U.S. Army Environmental Center	
3	U. S. Army	1995	Toxicity Summary for 1,3-Dinitrobenzene	U.S. Army Environmental Center	
3	U. S. Army	1995	Toxicity Summary for 2,4,6-Trinitrotoluene	U.S. Army Environmental Center	
3	U. S. Army	1995	Toxicity Summary for 2,4-Dinitrotoluene	U.S. Army Environmental Center	
3	U. S. Army	1995	Toxicity Summary for 2,6-Dinitrotoluene	U.S. Army Environmental Center	
3	U. S. Army	1995	Toxicity Summary for 2-Amino-4-Nitrotoluene	U.S. Army Environmental Center	
3	U. S. Army	1995	Toxicity Summary for Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX)	U.S. Army Environmental Center	

### **2.1.5 Toxicity Assessment**

## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
3		U. S. EPA	1996	Reproductive Toxicity Risk Assessment Guidelines	Federal Register: 61(212):56274-56322	
3		U. S. EPA	1997	Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Methyl Tertiary-Butyl Ether	EPA Fact Sheet. EPA-822-F-97-009	<a href="http://www.epa.gov/ost/drinking/mtbefact.pdf">http://www.epa.gov/ost/drinking/mtbefact.pdf</a>
3		U. S. EPA	1997	Fact Sheet: EPA Special Report on Endocrine Disruptors		<a href="http://www.epa.gov/ORD/ WebPubs/endocrine/ endocrine.pdf">http://www.epa.gov/ORD/ WebPubs/endocrine/ endocrine.pdf</a>
3		U. S. EPA	1997	Special Report on Environmental Endocrine Disruption: An Effects Assessment and Analysis	EPA/630/R-96/012	<a href="http://www.epa.gov/ORD/ WebPubs/endocrine/ endocrine.pdf">http://www.epa.gov/ORD/ WebPubs/endocrine/ endocrine.pdf</a>
3		U. S. EPA Reg. 1	1999	EPA Region 1 Risk Updates, Number 5.		<a href="http://www.epa.gov/region1/superfund/resouce/guidance.htm">http://www.epa.gov/region1/superfund/resouce/guidance.htm</a>
3		U. S. EPA	1999	Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual Supplement to Part A: Community Involvement in Superfund Risk Assessments.	EPA 540/R-98/042 HWC. OSWER 9285.7-01E-P. PB99-963303	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/ci_ra.pdf">http://www.epa.gov/superfund/programs/risk/ragsa/ci_ra.pdf</a>
3		U. S. ACE	1999	Risk Assessment Handbook - Volume I: Human Health Evaluation	Publication Number: EM 200-1-4	<a href="http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm">http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm</a>
3		U. S. EPA	2000	Benchmark Dose Technical Guidance Document.	EPA/630/R-00/001	<a href="http://www.epa.gov/ncea/pdfs/bmds/BMD_E xternal_10_13_2000.pdf">http://www.epa.gov/ncea/pdfs/bmds/BMD_E xternal_10_13_2000.pdf</a>
3		U. S. EPA	2000	Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related		<a href="http://www.epa.gov/ncea/pdfs/dioxin/dioxreass.htm">http://www.epa.gov/ncea/pdfs/dioxin/dioxreass.htm</a>

### **2.1.5 Toxicity Assessment**

## ***2.1 Human Health Risk Assessments***

### ***2.1.6 Uncertainty Analysis***

#### **Applicable AFCEE Notes**

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for Evaluation of Vapor Intrusion into Indoor Air

AFCEE Requirements for Risk Characterizations in Human Health Risk Assessments

#### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer.</i></b>	<b><i>Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
1		U. S. EPA	1988	Superfund Exposure Assessment Manual	EPA/540/1 -88/001 OSWER Directive 9285.5-1 NTIS PB89-135859	
1	Yes	U. S. EPA	1989	Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final (RAGS, Part A)	EPA/540/1 -89/002 OSWER Directive 9285.7-01A	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/index.htm">http://www.epa.gov/superfund/programs/risk/ragsa/index.htm</a>
1		U. S. EPA	1992	Dermal Exposure Assessment: Principles and Applications; Final	EPA/600/8 -91/011bOHEA	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12188">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12188</a>
1	Yes	U. S. EPA	1995	Policy for Risk Characterization at the U.S. Environmental Protection Agency		<a href="http://www.epa.gov/superfund/programs/risk/toolth.htm">http://www.epa.gov/superfund/programs/risk/toolth.htm</a>
1		U. S. EPA	1996	Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil		
1		U. S. EPA	1997	Exposure Factors Handbook, Volume 1 – 3 General Factors	EPA/600/P -95/002Fa. NTIS PB98-124255	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12464">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12464</a>
1		U. S. EPA	1997	To Filter, or Not to Filter; That is the Question	EPA-SAB-EEC-97-011 SAB letter to the EPA Administrator	
1		U. S. EPA Reg. 4	1998	Application of RAGS Part D at Federal Facilities in Region	Memorandum	

### ***2.1.6 Uncertainty Analysis***

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		USAF	1998	Military-Specific Exposure Factors Study	Human Effectiveness Directorate, Wright Patterson Air Force Base	
1		U.S.EPA	1999	Interim Guidance for Perchlorate	Memorandum	
1		U. S. ACE	1999	Risk Assessment Handbook - Volume I: Human Health Evaluation	Publication Number: EM 200-1-4	<a href="http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm">http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm</a>
1		U. S. EPA	1999	Toxicological Review Cadmium and Compounds. Draft. CAS No. 7440-43-9		<a href="http://www.epa.gov/ncea/pdfs/cad/cad1.pdf">http://www.epa.gov/ncea/pdfs/cad/cad1.pdf</a>
1		U. S. EPA	2000	Child-Specific Exposure Factors Handbook. Draft.	NCEA-W-0853	<a href="http://cfpub.epa.gov/ncea/cfm/efcsefh2.cfm - csefh">http://cfpub.epa.gov/ncea/cfm/efcsefh2.cfm - csefh</a>
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html - guidance">http://www.epa.gov/quality/qa_docs.html - guidance</a>
1		U. S. EPA	2001	Risk Assessment Guidance for Superfund, Volume 1 – Human Health Evaluation Manual Part E, Interim Supplemental Guidance for Dermal Risk Assessment, Review Draft for Public Comment	OSWER Directive 9285.7-02EP	<a href="http://www.epa.gov/superfund/programs/risk/rage/">http://www.epa.gov/superfund/programs/risk/rage/</a>
1	Yes	U. S. EPA	2001	Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) Final	Pub. 9285.7-47	<a href="http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm">http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm</a>
1		U.S. EPA	2002	Blood Lead Concentrations of U.S. Adult Females: Summary Statistics from Phase 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III)	EPA 9285.7-52	<a href="http://www.epa.gov/superfund/programs/lead/products/nhanes.pdf">http://www.epa.gov/superfund/programs/lead/products/nhanes.pdf</a>
1		U.S. EPA	2002	Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites		<a href="http://www.epa.gov/superfund/programs/risk/ragsa/ucl.pdf">http://www.epa.gov/superfund/programs/risk/ragsa/ucl.pdf</a>
1		U.S. EPA	2002	Overview of the IEUBK Model for Lead in Children	EPA 540-R-99-015	<a href="http://www.epa.gov/superfund/programs/lead/products/factsht5.pdf">http://www.epa.gov/superfund/programs/lead/products/factsht5.pdf</a>
1		U. S. EPA	2002	Perchlorate Environmental Contamination: Review and Risk Characterization	External Review Draft - Do Not Cite or Quote NCEA-103	
2		U. S. EPA	1986	Guidelines for the Health Risk Assessment of Chemical Mixtures	EPA-630/R-98/002	
2		U.S. EPA	1988	Technical Support Document on Risk Assessment of Chemical Mixtures	EPA/600/8-90/064	

### 2.1.6 Uncertainty Analysis

## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2	U. S. EPA	1989	Statistical Analysis of the Ground Water Monitoring Data at RCRA Facilities, Interim Final Guidance	EPA/530/SW -89/026OSW,W MD NTIS PB89-151-047	
2	U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk/datause/parta.htm">http://www.epa.gov/superfund/programs/risk/datause/parta.htm</a>
2	U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	<a href="http://epa.gov/superfund/programs/risk/datause/partb.htm">http://epa.gov/superfund/programs/risk/datause/partb.htm</a>
2	U. S. EPA	1992	Guidelines for Exposure Assessment	FR 57: 22887-22938	<a href="http://www.epa.gov/ncea/pdfs/guidline.pdf">http://www.epa.gov/ncea/pdfs/guidline.pdf</a>
2	U.S. EPA	1992	National Study of Chemical Residue in Fish, Volume 1	EPA 823-R-92_006a	<a href="http://www.epa.gov/waterscience/library/fish/residuevol1.pdf">http://www.epa.gov/waterscience/library/fish/residuevol1.pdf</a>
2	U. S. EPA	1992	National Study of Chemical Residue in Fish, Volume 2	EPA 823-R-92_006b	<a href="http://www.epa.gov/waterscience/library/fish/residuevol2.pdf">http://www.epa.gov/waterscience/library/fish/residuevol2.pdf</a>
2	U. S. EPA	1992	Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities: Addendum to Interim Final	EPA/530/R-93/003OSWWM	<a href="http://www.epa.gov/epaoswer/hazwaste/ca/resource/guidance/sitechar/gwstats/gritsstat/download/addendum.pdf">http://www.epa.gov/epaoswer/hazwaste/ca/resource/guidance/sitechar/gwstats/gritsstat/download/addendum.pdf</a>
2	U. S. EPA	1992	Statistical Training Course for Ground-Water Monitoring Data Analysis	EPA/530/R-93-003	
2	U. S. EPA Reg. 3	1994	Risk Assessment: Technical Guidance Manual Use of Monte Carlo Simulation in Risk Assessments		<a href="http://www.epa.gov/reg3hwmd/risk/guide1.h">http://www.epa.gov/reg3hwmd/risk/guide1.h</a>
2	U. S. EPA	1994	US EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Reviews		
2	U. S. EPA Reg. 8	1995	Use of Monte Carlo Simulation in Risk Assessment		
2	U. S. EPA	1997	Guiding Principles for Monte Carlo Analysis	EPA/630/R-97/001	<a href="http://www.epa.gov/ncea/monnteabs.htm">http://www.epa.gov/ncea/monnteabs.htm</a>
2	U. S. EPA	1997	Human Health Risk Assessment: Current Approaches & Future Directions	Risk Assessment Forum U.S> Environmental Protection Agency Technical Panel	
2	U. S. EPA	1997	Policy for Use of Probabilistic Analysis in Risk Assessment at the U.S. Environmental Protection Agency.		<a href="http://www.epa.gov/ncea/mcpolicy.htm">http://www.epa.gov/ncea/mcpolicy.htm</a>
2	U.S. EPA	1998	Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities: Volumes 1 - 3	EPA530-D-98-001	<a href="http://www.epa.gov/epaoswer/hazwaste/com bust/riskvol.htm">http://www.epa.gov/epaoswer/hazwaste/com bust/riskvol.htm</a>

### **2.1.6 Uncertainty Analysis**

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		USAF	1998	Methods to Quantify Uncertainty in Human Health Risk Assessment	USAF Armstrong Laboratory	
2		U. S. EPA	1999	Frequently Asked Questions (FAQs) on the Adult Lead	Technical Review Work group for Lead	
2		U. S. EPA	1999	Guidance for Conducting Health Risk Assessment of Chemical Mixtures. Draft.	NCEA-C-0148	<a href="http://www.epa.gov/ncea/pdfs/mixture.pdf">http://www.epa.gov/ncea/pdfs/mixture.pdf</a>
2		U. S. EPA	1999	Risk Assessment Guidance for Superfund, Volume 3 – Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A). Draft	OSWER EPA 000-0-99-000	<a href="http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm">http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm</a>
2		U. S. EPA	1999	US EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review		
2		U.S. EPA Reg. 5	1999	Use of the TRW Interim Adult Lead Methodology in Risk Assessment	Memo from EPA Reg.5 to TRW	<a href="http://www.epa.gov/superfund/programs/lead/products/adultlexplain.pdf">http://www.epa.gov/superfund/programs/lead/products/adultlexplain.pdf</a>
2		U.S. EPA	1999	Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants; States' Compliance--Revision of Poly chlorinated Biphenyls (PCBs) Criteria	Federal Register, Volume 64, Number 216, page 61181	<a href="http://www.epa.gov/fedrgstr/EPA-WATER/1999/November/Day-09/w25559.htm">http://www.epa.gov/fedrgstr/EPA-WATER/1999/November/Day-09/w25559.htm</a>
2		U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part I: Estimating Exposure to Dioxin-Like Compounds, Volume 4: Site-Specific Assessment Procedures	EPA/600/P-00/001Bd DO NOT CITE OR QUOTE Draft Final Report	
2		U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part II: Health Assessment for 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and Related	EPA/600/P-00/001Ae	<a href="http://www.epa.gov/ncea/pdfs/dioxin/">http://www.epa.gov/ncea/pdfs/dioxin/</a>
2		U. S. EPA	2000	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 2: Risk Assessment and Fish Consumption Limits - Third Edition	Office of Water	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
2		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4. EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final">http://www.epa.gov/quality1/qsdocs/g4final</a>
2		U. S. Navy	2000	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U. S. Navy and Marine Corps Facilities Part 1: Overview of Metals Bioavailability, User's Guide	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	
2		U. S. EPA	2000	Supplementary Guidance for Conducting Health Risk Assessment of Chemical Mixtures	EPA/630/R-00/002 Product of the Risk Assessment Forum	

### 2.1.6 Uncertainty Analysis

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA	2001	Lead; Identification of Dangerous Levels of Lead; Final Rule	Fed. Reg. Vol. 66, No. 4	<a href="http://www.epa.gov/superfund/programs/lead/products/rule.pdf">http://www.epa.gov/superfund/programs/lead/products/rule.pdf</a>
2		U. S. EPA	2001	Reuse Assessment: A Tool To Implement The Superfund Land Use Directive Alternative Title: Reuse Assessment Guide	OSWER 9355.7-06.P	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>
2		U. S. EPA	2001	Water Quality Criterion for the Protection of Human Health: Methylmercury	EPA-823-R-01-001	<a href="http://www.epa.gov/waterscience/criteria/methylmercury/merctitl.pdf">http://www.epa.gov/waterscience/criteria/methylmercury/merctitl.pdf</a>
2		U. S. EPA	2002	Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)		<a href="http://www.epa.gov/correctiveaction/eis/vapor.htm">http://www.epa.gov/correctiveaction/eis/vapor.htm</a>
2		U.S. EPA	2002	Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites	EPA 540-R-01-003	<a href="http://www.epa.gov/superfund/programs/risk/background.pdf">http://www.epa.gov/superfund/programs/risk/background.pdf</a>
2		U.S. EPA	2002	National Recommended Water Quality Criteria: 2002	EPA-822-R-02-047	<a href="http://www.epa.gov/waterscience/pc/revcom">http://www.epa.gov/waterscience/pc/revcom</a>
2		U.S. EPA Reg. 6	2002	RCRA Delisting Technical Support Document	EPA906-D-98-001	<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/pd-o/dtsd.htm">http://www.epa.gov/Arkansas/6pd/rcra_c/pd-o/dtsd.htm</a>
2		U.S. EPA	2003	Status of EPA's Interim Assessment Guidance for Perchlorate	Memorandum	
3		U.S. EPA	1989	Soil Sampling Quality Assurance User's Guide - Second	EPA/600/8-89/045	<a href="http://www.epa.gov/tio/download%2Fchar%2Fsoilsamp.pdf">http://www.epa.gov/tio/download%2Fchar%2Fsoilsamp.pdf</a>
3		U. S. EPA	1994	Data Quality Objectives Decision Error Feasibility Trials (DEFT)	EPA Computer Program	
3		U. S. EPA Reg. 9	1996	US EPA Region 9 Preliminary Remediation Goals		<a href="http://www.epa.gov/region09/waste/sfund/prg/index.htm">http://www.epa.gov/region09/waste/sfund/prg/index.htm</a>
3		U. S. EPA	1997	Mercury Report to Congress Vols. 1 - 8	EPA-452/R-97-003	
3		U. S. DOD/EPA	1999	Lead-Based Paint Guidelines for Disposal of Department of Defense Residential Real Property - A Field Guide	Interim Final	
3		U. S. EPA	2000	Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related		<a href="http://www.epa.gov/ncea/pdfs/dioxin/dioxreass.htm">http://www.epa.gov/ncea/pdfs/dioxin/dioxreass.htm</a>
3		U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part II: Health Assessment for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related	EPA/600/P-00/001Be DO NOT CITE OR QUOTE Draft Final Report	

### 2.1.6 Uncertainty Analysis

## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
3		U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part III: Integrated Summary and Risk Characterization for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds	EPA/600/P-00/001Bg DO NOT CITE OR QUOTE Preliminary Draft	
3		U. S. EPA	2000	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 1: Fish Sampling and Analysis - Third Edition	EPA 823_B_00-007	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
3		U. S. EPA	2000	Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000).	EPA-822-B-00-004	<a href="http://www.epa.gov/ost/humanhealth/method/complete.pdf">http://www.epa.gov/ost/humanhealth/method/complete.pdf</a>
3		U. S. EPA	2000	Report on the Peer Review of the Dioxin Reassessment Documents: Toxicity Equivalency Factors for Dioxin and Related Compounds (Chapter 9) and Integrated Risk Characterization Document		
3		U. S. EPA	2000	Revisions to the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000); Notice	Fed. Reg. Vol. 65, No. 214, Nov. 3	
3		U.S. EPA Reg. 3	2002	Derivation of Vinyl Chloride RBCs - Memorandum		<a href="http://www.epa.gov/reg3hwmd/risk/vcrbc.P">http://www.epa.gov/reg3hwmd/risk/vcrbc.P</a>
3		U. S. EPA	2002	Role of Background in the CERCLA Cleanup Program	OSWER Dir.: 9285.6-07P	<a href="http://www.epa.gov/superfund/programs/risk/role.pdf">http://www.epa.gov/superfund/programs/risk/role.pdf</a>
3		U.S. EPA	2003	Draft Final Guidelines for Carcinogen Risk Assessment	EPA/630/P-03/001A	<a href="http://www.epa.gov/ncea/raf/cancer2003.htm">www.epa.gov/ncea/raf/cancer2003.htm</a>

### **2.1.6 Uncertainty Analysis**



## ***2.1 Human Health Risk Assessments***

### ***2.1.7 Risk Characterization***

#### **Applicable AFCEE Notes**

AFCEE Requirements for Development and Application of Uncertainty Analyses in Risk Assessment

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments

AFCEE Requirements for Selecting Chemicals of Potential Concern in Human Health and Ecological Risk Assessments

AFCEE Requirements for Evaluation of Vapor Intrusion into Indoor Air

AFCEE Requirements for Risk Characterizations in Human Health Risk Assessments

#### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer.</i></b>	<b><i>Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
1		U. S. EPA	1986	Guidelines for the Health Risk Assessment of Chemical Mixtures	EPA-630/R-98/002	
1		U.S. EPA	1988	Technical Support Document on Risk Assessment of Chemical Mixtures	EPA/600/8-90/064	
1	Yes	U. S. EPA	1989	Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final (RAGS, Part A)	EPA/540/1-89/002 OSWER Directive 9285.7-01A	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/index.htm">http://www.epa.gov/superfund/programs/risk/ragsa/index.htm</a>
1		U. S. EPA	1990	National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Final Rule	40 CFR 300.61-300.81 (Subpart F)	<a href="http://www.epa.gov/oilspill/ncpkeys.htm">http://www.epa.gov/oilspill/ncpkeys.htm</a>
1		U. S. Army	1991	Health Risk Assessment Guidance for the Installation Restoration Program and Formerly Used Defense Sites	Pamphlet 40-578	<a href="http://www.army.mil/usapa/epubs/pdf/p40_578.pdf">http://www.army.mil/usapa/epubs/pdf/p40_578.pdf</a>
1		U. S. EPA	1991	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Part B. Development of Risk-Based Preliminary Remediation Goals, Interim	EPA/540/R 92/003 OSWER Directive 9285.7-01B	<a href="http://www.epa.gov/superfund/programs/risk/ragsb/index.htm">http://www.epa.gov/superfund/programs/risk/ragsb/index.htm</a>
1		U. S. EPA	1992	Guidance on Risk Characterization for Risk Managers and Risk Assessors	EPA Office of the Administrator	

### ***2.1.7 Risk Characterization***

## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1995	EPA Risk Characterization Program		<a href="http://www.epa.gov/osp/spc/rccover.htm">http://www.epa.gov/osp/spc/rccover.htm</a>
1		U. S. EPA	1995	Land Use in CERCLA Remedy Selection Process, OSWER Directive No. 9355.7-04		<a href="http://www.epa.gov/superfund/action/guidance/remedy/landuse.htm">http://www.epa.gov/superfund/action/guidance/remedy/landuse.htm</a>
1	Yes	U. S. EPA	1995	Policy for Risk Characterization at the U.S. Environmental Protection Agency		<a href="http://www.epa.gov/superfund/programs/risk/toolthh.htm">http://www.epa.gov/superfund/programs/risk/toolthh.htm</a>
1		U. S. EPA	1996	Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil		
1		U. S. EPA Reg. 4	1998	Application of RAGS Part D at Federal Facilities in Region	Memorandum	
1		U.S. EPA Reg. 8	1999	Background Concentrations - Use in EPA Risk Assessments		<a href="http://www.epa.gov/Region8/superfund/risksf/backgrd8.pdf">http://www.epa.gov/Region8/superfund/risksf/backgrd8.pdf</a>
1		U. S. EPA	1999	Frequently Asked Questions (FAQs) on the Adult Lead	Technical Review Workgroup for Lead	
1		U. S. EPA	1999	Guidance for Conducting Health Risk Assessment of Chemical Mixtures. Draft.	NCEA-C-0148	<a href="http://www.epa.gov/ncea/pdfs/mixture.pdf">http://www.epa.gov/ncea/pdfs/mixture.pdf</a>
1		U. S. ACE	1999	Risk Assessment Handbook - Volume I: Human Health Evaluation	Publication Number: EM 200-1-4	<a href="http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm">http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm</a>
1		U.S. EPA Reg. 5	1999	Use of the TRW Interim Adult Lead Methodology in Risk Assessment	Memo from EPA Reg.5 to TRW	<a href="http://www.epa.gov/superfund/programs/lead/products/adultlexplain.pdf">http://www.epa.gov/superfund/programs/lead/products/adultlexplain.pdf</a>
1		U. S. EPA Reg. 4	2000	Human Health Risk Assessment Bulletins - Supplement to RAGS		<a href="http://www.epa.gov/region04/waste/ots/healthbul.htm">http://www.epa.gov/region04/waste/ots/healthbul.htm</a>
1	Yes	U. S. EPA	2000	Science Policy Council Handbook: Risk Characterization	EPA 100-B-00-002	<a href="http://www.epa.gov/osp/spc/rchandbk.pdf">http://www.epa.gov/osp/spc/rchandbk.pdf</a>
1		U. S. EPA	2000	Supplementary Guidance for Conducting Health Risk Assessment of Chemical Mixtures	EPA/630/R-00?002 Product of the Risk Assessment Forum	
1	Yes	U. S. EPA	2001	Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) Final	Pub. 9285.7-47	<a href="http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm">http://www.epa.gov/superfund/programs/risk/ragsd/tara.htm</a>
1		U.S. EPA	2002	Blood Lead Concentrations of U.S. Adult Females: Summary Statistics from Phase 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III)	EPA 9285.7-52	<a href="http://www.epa.gov/superfund/programs/lead/products/nhanes.pdf">http://www.epa.gov/superfund/programs/lead/products/nhanes.pdf</a>

### **2.1.7 Risk Characterization**

## **2.1 Human Health Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note</i>	<i>Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1	Yes	U.S. EPA	2002	Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites	EPA 540-R-01-003	<a href="http://www.epa.gov/superfund/programs/risk/background.pdf">http://www.epa.gov/superfund/programs/risk/background.pdf</a>
1		U.S. EPA	2002	Overview of the IEUBK Model for Lead in Children	EPA 540-R-99-015	<a href="http://www.epa.gov/superfund/programs/lead/products/factsht5.pdf">http://www.epa.gov/superfund/programs/lead/products/factsht5.pdf</a>
1		U. S. EPA	2002	Perchlorate Environmental Contamination: Review and Risk Characterization	External Review Draft - Do Not Cite or Quote NCEA-103	
1		U. S. EPA	2002	Role of Background in the CERCLA Cleanup Program	OSWER Dir.: 9285.6-07P	<a href="http://www.epa.gov/superfund/programs/risk/role.pdf">http://www.epa.gov/superfund/programs/risk/role.pdf</a>
1		U.S. EPA	2002	User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Windows« Version	EPA 9285.7-42 EPA 540-K-01-005	<a href="http://www.epa.gov/superfund/programs/lead/products/ugieubk32.pdf">http://www.epa.gov/superfund/programs/lead/products/ugieubk32.pdf</a>
2		U.S. EPA	1989	RCRA Facility Investigation (RFI) Guidance, Vol. I of IV: Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations	EPA 530/SW-89-031	<a href="http://www.hanford.gov/dqo/project/level5/r-crav1.pdf">http://www.hanford.gov/dqo/project/level5/r-crav1.pdf</a>
2		U. S. EPA	1991	Role of Baseline Risk Assessment in Superfund Remedy Selection Decisions	OSWER Directive 9355.0-30	<a href="http://www.epa.gov/superfund/programs/risk/baseline.htm">http://www.epa.gov/superfund/programs/risk/baseline.htm</a>
2		U. S. EPA Reg. 3	1994	Risk Assessment: Technical Guidance Manual Use of Monte Carlo Simulation in Risk Assessments		<a href="http://www.epa.gov/reg3hwmd/risk/guide1.h">http://www.epa.gov/reg3hwmd/risk/guide1.h</a>
2		U. S. EPA	1995	Elements to Consider when Drafting EPA Risk Characterizations	EPA Science Policy Council paper	
2		ASTM	1995	Standard Guide for Developing Conceptual Site Models for Contaminated Sites	Designation: E 1689 – 95	<a href="http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore">http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore</a>
2		U. S. EPA Reg. 8	1995	Use of Monte Carlo Simulation in Risk Assessment		
2		U. S. EPA	1997	Guiding Principles for Monte Carlo Analysis	EPA/630/R-97/001	<a href="http://www.epa.gov/ncea/monnteabs.htm">http://www.epa.gov/ncea/monnteabs.htm</a>
2		U. S. EPA	1997	Human Health Risk Assessment: Current Approaches & Future Directions	Risk Assessment Forum U.S> Environmental Protection Agency Technical Panel	
2		U. S. EPA	1997	Mercury Report to Congress Vols. 1 - 8	EPA-452/R-97-003	
2		U. S. EPA	1997	Policy for Use of Probabilistic Analysis in Risk Assessment at the U.S. Environmental Protection Agency.		<a href="http://www.epa.gov/ncea/mcpolicy.htm">http://www.epa.gov/ncea/mcpolicy.htm</a>

### **2.1.7 Risk Characterization**

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA	1998	Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.	EPA/540/F-98/030 OSWER 9200.4-27, PB98-963244	<a href="http://www.epa.gov/superfund/programs/lead/products.htm - guidance">http://www.epa.gov/superfund/programs/lead/products.htm - guidance</a>
2		U.S. EPA	1998	Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities: Volumes 1 - 3	EPA530-D-98-001	<a href="http://www.epa.gov/epaoswer/hazwaste/com/bust/riskvol.htm">http://www.epa.gov/epaoswer/hazwaste/com/bust/riskvol.htm</a>
2		U. S. EPA	1998	Proposed TSCA §403 Soil Lead Hazard and OSWER's Lead-in-Soils Policy	EPA 540-F-98-061. OSWER 9200.4-29, PB99-963211	<a href="http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf">http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf</a>
2		U. S. DOD/EPA	1999	Lead-Based Paint Guidelines for Disposal of Department of Defense Residential Real Property - A Field Guide	Interim Final	
2		U. S. EPA	1999	Risk Assessment Guidance for Superfund, Volume 3 – Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A). Draft	OSWER EPA 000-0-99-000	<a href="http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm">http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm</a>
2		U. S. EPA	1999	Toxicological Review Cadmium and Compounds. Draft. CAS No. 7440-43-9		<a href="http://www.epa.gov/ncea/pdfs/cad/cad1.pdf">http://www.epa.gov/ncea/pdfs/cad/cad1.pdf</a>
2		U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part III: Integrated Summary and Risk Characterization for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds	EPA/600/P-00/001Bg DO NOT CITE OR QUOTE Preliminary Draft	
2		U. S. EPA	2000	Options for Development of Parametric Probability Distributions for Exposure Factors	EPA/600/R-00/058.	<a href="http://www.epa.gov/ncea/paramprob4ef.htm">http://www.epa.gov/ncea/paramprob4ef.htm</a>
2		U. S. EPA Reg. 4	2001	EPA Region 4 Human Health Risk Assessment Bulletins– Supplement to RAGS	U.S. EPA Region 4	
2		U. S. EPA	2001	Framework for Cumulative Risk Assessment	NECA-F-1098	
2		U. S. EPA	2001	Lead; Identification of Dangerous Levels of Lead; Final Rule	Fed. Reg. Vol. 66, No. 4	<a href="http://www.epa.gov/superfund/programs/lead/products/rule.pdf">http://www.epa.gov/superfund/programs/lead/products/rule.pdf</a>
2		U. S. EPA	2001	Reuse Assessment: A Tool To Implement The Superfund Land Use Directive Alternative Title: Reuse Assessment Guide	OSWER 9355.7-06.P	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>
2		U. S. EPA	2001	Risk Assessment Guidance for Superfund, Volume 1 – Human Health Evaluation Manual Part E, Interim Supplemental Guidance for Dermal Risk Assessment, Review Draft for Public Comment	OSWER Directive 9285.7-02EP	<a href="http://www.epa.gov/superfund/programs/risk/ragse/">http://www.epa.gov/superfund/programs/risk/ragse/</a>

### 2.1.7 Risk Characterization

## 2.1 Human Health Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA	2001	Water Quality Criterion for the Protection of Human Health: Methylmercury	EPA-823-R-01-001	<a href="http://www.epa.gov/waterscience/criteria/methylmercury/merctitl.pdf">http://www.epa.gov/waterscience/criteria/methylmercury/merctitl.pdf</a>
2		U.S. EPA Reg. 3	2002	Derivation of Vinyl Chloride RBCs - Memorandum		<a href="http://www.epa.gov/reg3hwmd/risk/vcrbc.P">http://www.epa.gov/reg3hwmd/risk/vcrbc.P</a>
2		U. S. EPA	2002	Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)		<a href="http://www.epa.gov/correctiveaction/eis/vapor.htm">http://www.epa.gov/correctiveaction/eis/vapor.htm</a>
2		U. S. EPA	2002	Perchlorate Update		
2		U.S. EPA Reg. 6	2002	RCRA Delisting Technical Support Document	EPA906-D-98-001	<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/pd-o/dtsd.htm">http://www.epa.gov/Arkansas/6pd/rcra_c/pd-o/dtsd.htm</a>
3		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk/datause/parta.htm">http://www.epa.gov/superfund/programs/risk/datause/parta.htm</a>
3		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	<a href="http://epa.gov/superfund/programs/risk/datause/partb.htm">http://epa.gov/superfund/programs/risk/datause/partb.htm</a>
3		U.S. EPA	1992	National Study of Chemical Residue in Fish, Volume 1	EPA 823-R-92_006a	<a href="http://www.epa.gov/waterscience/library/fish/residuevol1.pdf">http://www.epa.gov/waterscience/library/fish/residuevol1.pdf</a>
3		U. S. EPA	1992	National Study of Chemical Residue in Fish, Volume 2	EPA 823-R-92_006b	<a href="http://www.epa.gov/waterscience/library/fish/residuevol2.pdf">http://www.epa.gov/waterscience/library/fish/residuevol2.pdf</a>
3		U. S. EPA	1999	Fact Sheet Polychlorinated Biphenyls (PCBs) Update: Impact on Fish Advisories	Office of Water 4305 EPA-823-F-99-	
3		U. S. EPA	1999	Fact Sheet Toxaphene Update: Impact on Fish Advisories	Office of Water 4305 EPA-823-F-99-	
3		U. S. EPA	1999	Revised Risk Assessment for the Air Characteristic Study Volume I Overview	EPA 530-R-99-019a	<a href="http://www.epa.gov/epaoswer/hazwaste/id/r99019a.pdf">http://www.epa.gov/epaoswer/hazwaste/id/r99019a.pdf</a>
3		U. S. EPA	1999	Revised Risk Assessment for the Air Characteristic Study Volume II Technical Background document	EPA 530-R-99-019b	<a href="http://www.epa.gov/epaoswer/hazwaste/id/r99019b.pdf">http://www.epa.gov/epaoswer/hazwaste/id/r99019b.pdf</a>
3		U. S. EPA	1999	Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual Supplement to Part A: Community Involvement in Superfund Risk Assessments.	EPA 540/R-98/042 HWC. OSWER 9285.7-01E-P. PB99-963303	<a href="http://www.epa.gov/superfund/programs/risk/ragsa/ci_ra.pdf">http://www.epa.gov/superfund/programs/risk/ragsa/ci_ra.pdf</a>
3		U. S. EPA	2000	Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related		<a href="http://www.epa.gov/ncea/pdfs/dioxin/dioxreass.htm">http://www.epa.gov/ncea/pdfs/dioxin/dioxreass.htm</a>

### 2.1.7 Risk Characterization

## ***2.1 Human Health Risk Assessments***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer.</i></b>	<b><i>Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
3		U. S. EPA	2000	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 3: Overview of Risk Management	Office of Water	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
3		U. S. EPA	2000	Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000).	EPA-822-B-00-004	<a href="http://www.epa.gov/ost/humanhealth/method/complete.pdf">http://www.epa.gov/ost/humanhealth/method/complete.pdf</a>
3		U. S. EPA	2000	Revisions to the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000); Notice	Fed. Reg. Vol. 65, No. 214, Nov. 3	
3		U. S. EPA	2001	2001 National Listing of Fish and Wildlife Advisories	EPA-823-F-02-010 Office of Water	
3		USEPA	2001	Fact Sheet Mercury Update: Impact on Fish Advisories	Office of Water 4305 EPA-823-F-01-	
3		U. S. EPA	2001	Sources, Emission and Exposure for Trichloroethylene (TCE) and Related Chemicals	National Center for Environmental Assessment	
3		U.S. EPA Reg. 6	2002	Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities - Peer Review Draft		<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/protocol.htm-add">http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/protocol.htm-add</a>
3		U. S. EPA	2002	Update: National Listing of Fish and Wildlife Advisories	EPA-823-F-02-007 Office of Water	
3		U.S. EPA	2003	Draft Final Guidelines for Carcinogen Risk Assessment	EPA/630/P-03/001A	<a href="http://www.epa.gov/ncea/raf/cancer2003.htm">www.epa.gov/ncea/raf/cancer2003.htm</a>

### ***2.1.7 Risk Characterization***

## **2.2 Ecological Risk Assessments**

### **2.2.1 Scoping**

#### **Applicable AFCEE Notes**

AFCEE Requirements for Development and Use of Lines of Evidence in Ecological Risk Assessments

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for the Use of Scientific/Management Decision Points in Ecological Risk Assessments

#### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1991	Ecological Assessment of Superfund Sites: An Overview, Eco Update Intermittent Bulletin Vol. 1, no. 2	OERR, HSED Publ. 9345.0-05I	<a href="http://www.epa.gov/superfund/programs/risk/ecoup/index.htm">http://www.epa.gov/superfund/programs/risk/ecoup/index.htm</a>
1		U. S. EPA	1992	Developing a Work Scope for Ecological Assessments, Eco Update Intermittent Bulletin Vol. 1, no. 4	OERR, HSED Publ.	<a href="http://www.epa.gov/superfund/programs/risk/ecoup/index.htm">http://www.epa.gov/superfund/programs/risk/ecoup/index.htm</a>
1		U. S. EPA	1993	Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objective Process	Issued from Office of Research and Development	
1		U. S. ACE	1996	Risk Assessment Handbook, Volume II: Environmental Evaluation	Publication Number: EM 200-1-4	
1		U. S. EPA	1997	CERCLA Coordination with Natural Resources Trustees	OSWER 9200.4-22A	<a href="http://www.epa.gov/superfund/programs/nrd/fields.pdf">http://www.epa.gov/superfund/programs/nrd/fields.pdf</a>
1		U. S. EPA Reg. 10	1997	EPA Region 10 Supplemental Ecological Risk Assessment Guidance for Superfund	EPA 910-R-97-005	
1	Yes	U. S. EPA	1998	Guidelines for Ecological Risk Assessment. Final.	EPA/630/R-95-002F	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460</a>
1		U. S. ACE	1998	Technical Project Planning (TPP) Process	USACE EM200-1-2	<a href="http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-2/toc.htm">http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-2/toc.htm</a>
1		U. S. Navy	1999	Navy Policy for Conducting Ecological Risk Assessments		<a href="http://web.ead.anl.gov/ecorisk/policy/pdf/policy.pdf">http://web.ead.anl.gov/ecorisk/policy/pdf/policy.pdf</a>

### **2.2.1 Scoping**

## **2.2 Ecological Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. Army	1999	Recommendation for Army Working with the USEPA Region 4 - Policy for Ecological Risk Assessments (ERAs) at Military Bases	USACHPPM	
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html_guidance">http://www.epa.gov/quality/qa_docs.html_guidance</a>
1	Yes	U. S. EPA	2000	Science Policy Council Handbook: Risk Characterization	EPA 100-B-00-002	<a href="http://www.epa.gov/osp/spc/rchandbk.pdf">http://www.epa.gov/osp/spc/rchandbk.pdf</a>
1		U. S. EPA Reg. 4	2001	Ecological Risk Assessment Bulletins - Supplement to RAGS: (1) Ecological Introduction, (2) Ecological Screening Values, (3) Endpoint Selection, (4) Natural Resources		<a href="http://www.epa.gov/Region4/waste/ots/ecolbul.htm">http://www.epa.gov/Region4/waste/ots/ecolbul.htm</a>
1		U. S. EPA	2001	Planning for Ecological Risk Assessment: Developing Management Objectives	[Draft - Do Not Cite Or Quote] EPA/630/R-01/001A External Review Draft	
1		U. S. EPA	2001	The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments, ECO Update Intermittent Bulletin	EPA 540/F-01/014	<a href="http://www.epa.gov/superfund/programs/risk/ecoup/slera0601.pdf">http://www.epa.gov/superfund/programs/risk/ecoup/slera0601.pdf</a>
1		U. S. EPA	2002	Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses:	EPA-823-B-01-002	<a href="http://www.epa.gov/waterscience/cs/collection.html">http://www.epa.gov/waterscience/cs/collection.html</a>
1		U. S. Army	2002	Selection of Assessment and Measurement Endpoints for Ecological Risk Assessments	SFIM-AEC-ER-TR-2002018	
1		U. S. Army	2002	Technical Document for Ecological Risk Assessment: Planning for Data Collection	SFIM-AEC-ER-TR-2002017	
2		U. S. EPA		An SAB Report: A Framework for Assessing and Reporting on Ecological Condition	EPA-SAB-EPEC-02-xxx	<a href="http://www.epa.gov/sab/pdf/ecoframework.pdf">http://www.epa.gov/sab/pdf/ecoframework.pdf</a>
2		U. S. EPA	1991	The Role of Biological Technical Assistance Groups (BTAGs) in Ecological Assessment, Eco Update Intermittent Bulletin Vol. 1, no. 1	OERR, HSED Publ. 9345.0-05I	
2		U. S. EPA	1992	Briefing the BTAG: Initial Description of Setting, History and Ecology of a Site, Eco Update Intermittent Bulletin Vol.	OERR, HSED Publ. 9345.0-05I	
2		U. S. EPA	1992	Guidance for Performing Site Inspections Under CERCLA, Interim Draft		

### **2.2.1 Scoping**



## 2.2 Ecological Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2	U. S. EPA	1993	Superfund Program: Checklist For Ecological Assessment/Sampling - Draft	Environmental Response Branch, Emergency Response Division, Office of Emergency and Remedial Response Office of Solid Waste and Emergency Response	
2	U. S. EPA	1994	Guidance on Accelerating CERCLA Environmental Restoration at Federal Facilities		
2	U. S. EPA	1995	Establishing Background Levels	EPA/540/F-94/030 NTIS PB94-9633 13	<a href="http://www.ertresponse.com/Training/train_pddFiles/Fact_Sheets/75.pdf">http://www.ertresponse.com/Training/train_pddFiles/Fact_Sheets/75.pdf</a>
2	U. S. EPA	1995	Establishing Background Levels, EPA/540/F-94/030	NTIS PB94-9633 13 Number is EPA 540F94030	<a href="http://www.epa.gov/superfund/sites/npl/hrsr/es/fact/bglevels.pdf">http://www.epa.gov/superfund/sites/npl/hrsr/es/fact/bglevels.pdf</a>
2	U. S. EPA	1996	Ecological Significance and Selection of Candidate Assessment Endpoints, Eco Update Intermittent Bulletin	EPA/540/F 95/037 OERR, HSED Publ. 9345.0-11FSI NTIS PB95-963323	
2	U. S. EPA	1997	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Interim Final (ERAGS)	OSWER 9285.7-25, EPA/540/R-	<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm">http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm</a>
2	U. S. EPA	1997	Priorities for Ecological Protection: An Initial List and Discussion Document for EPA.	EPA/600/S-97/002	<a href="http://www.epa.gov/ORD/WebPubs/priorities/priorit.pdf">http://www.epa.gov/ORD/WebPubs/priorities/priorit.pdf</a>
2	U. S. EPA Reg. 4	1998	Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Alternatives, and Inclusion of Stakeholders	Memorandum	
2	U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4, EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final">http://www.epa.gov/quality1/qsdocs/g4final</a>
2	U. S. Army	2000	Principles of Environmental Restoration	U.S. Army Environmental Center, Aberdeen Proving Ground, Edgewood Area	<a href="http://aec.army.mil/usaec/restoration/per-manual101.pdf">http://aec.army.mil/usaec/restoration/per-manual101.pdf</a>
2	U. S. DoD	2000	Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment	SFIM-AEC-ER-200015	<a href="https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html">https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html</a>
2	U. S. EPA Reg 4	2001	Environmental Investigations Standard Operating Procedures and Quality Assurance Manual		<a href="http://www.epa.gov/region4/sesd/eisopqam/eisopqam.pdf">http://www.epa.gov/region4/sesd/eisopqam/eisopqam.pdf</a>
2	U. S. EPA	2001	Guidance for Characterizing Background Chemicals in Soil at Superfund Sites	External Review Draft Office of Emergency and Remedial Response	
3	U.S. Army	1998	US Army Environmental Restoration Programs Guidance Manual		

### 2.2.1 Scoping

## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer. Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
3	U. S. EPA	1999	A Community Guide to Superfund Risk Assessment.	EPA 540-K-99-003. OSWER 9285.7-	<a href="http://www.epa.gov/superfund/programs/risk/commeng.htm">http://www.epa.gov/superfund/programs/risk/commeng.htm</a>
3	U.S. EPA	2000	EPA Quality Manual for Environmental Programs		<a href="http://www.epa.gov/quality/qs-docs/5360.pdf">http://www.epa.gov/quality/qs-docs/5360.pdf</a>
3	U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>

### ***2.2.1 Scoping***

## ***2.2 Ecological Risk Assessments***

### ***2.2.2 Screening Assessment: Problem Formulation and Effects Evaluation***

#### **Applicable AFCEE Notes**

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Development and Use of Lines of Evidence in Ecological Risk Assessments

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments

AFCEE Requirements for Selecting Chemicals of Potential Concern in Human Health and Ecological Risk Assessments

#### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note</i></b>	<b><i>Refer. Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
1		U. S. EPA	1993	Wildlife Exposure Factors Handbook Volume I	EPA/600/R-93/187a ORD	<a href="http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default">http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default</a>
1		U. S. EPA	1993	Wildlife Exposure Factors Handbook Volume II:	EPA/600/R-93/187b ORD	<a href="http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default">http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default</a>
1	Yes	U. S. EPA	1997	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Interim Final (ERAGS)	OSWER 9285.7-25, EPA/540/R-	<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm">http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm</a>
1		U. S. EPA Reg. 10	1997	EPA Region 10 Supplemental Ecological Risk Assessment Guidance for Superfund	EPA 910-R-97-005	
1	Yes	U. S. EPA	1998	Guidelines for Ecological Risk Assessment. Final.	EPA/630/R-95-002F	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460</a>
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html_guidance">http://www.epa.gov/quality/qa_docs.html_guidance</a>
1		U. S. EPA	2000	Ecological Soil Screening Level (Eco-SSL) Guidance. Draft.		<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/ecosl.htm">http://www.epa.gov/superfund/programs/risk/ecorisk/ecosl.htm</a>
1	Yes	U. S. EPA	2000	Science Policy Council Handbook: Risk Characterization	EPA 100-B-00-002	<a href="http://www.epa.gov/osp/spc/rchandbk.pdf">http://www.epa.gov/osp/spc/rchandbk.pdf</a>

### ***2.2.2 Screening Assessment: Problem Formulation and Effects Evaluation***

## **2.2 Ecological Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1	U. S. Army	2000	Standard Practice for Wildlife Toxicity Reference Values	US Army CHPPM Technical Guide No. 254	
1	U. S. EPA Reg. 4	2001	Ecological Risk Assessment Bulletins - Supplement to RAGS: (1) Ecological Introduction, (2) Ecological Screening Values, (3) Endpoint Selection, (4) Natural Resources		<a href="http://www.epa.gov/Region4/waste/ots/ecolbul.htm">http://www.epa.gov/Region4/waste/ots/ecolbul.htm</a>
1	U. S. EPA	2001	Planning for Ecological Risk Assessment: Developing Management Objectives	[Draft - Do Not Cite Or Quote] EPA/630/R-01/001A External Review Draft	
1	U. S. EPA	2001	The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments, ECO Update Intermittent Bulletin	EPA 540/F-01/014	<a href="http://www.epa.gov/superfund/programs/risk/ecoup/slera0601.pdf">http://www.epa.gov/superfund/programs/risk/ecoup/slera0601.pdf</a>
1	U. S. Navy	2002	Critical Issues for Contaminated Sediment Management	MESO-02-TM-01	
1	U.S. EPA	2002	Generic Assessment Endpoints for Ecological Risk	EPA/630/P-02/004A	<a href="http://cfpub.epa.gov/ncea/raf/recordisplay.cfm?deid=54923">http://cfpub.epa.gov/ncea/raf/recordisplay.cfm?deid=54923</a>
1	U.S. EPA	2002	National Recommended Water Quality Criteria: 2002	EPA-822-R-02-047	<a href="http://www.epa.gov/waterscience/pc/revcom">http://www.epa.gov/waterscience/pc/revcom</a>
1	U. S. EPA	2002	Perchlorate Environmental Contamination: Review and Risk Characterization	External Review Draft - Do Not Cite or Quote NCEA-103	
1	U. S. Army	2002	Selection of Assessment and Measurement Endpoints for Ecological Risk Assessments	SFIM-AEC-ER-TR-2002018	
2	U. S. EPA		An SAB Report: A Framework for Assessing and Reporting on Ecological Condition	EPA-SAB-EPEC-02-xxx	<a href="http://www.epa.gov/sab/pdf/ecoframework.pdf">http://www.epa.gov/sab/pdf/ecoframework.pdf</a>
2	U. S. EPA Reg. 3	1991	Risk Assessment: Technical Guidance Manual: EPA Region III Guidance on Handling Chemical Concentration Data Near the Detection Limit in Risk Assessments		<a href="http://www.epa.gov/reg3hwmd/risk/guide3.htm">http://www.epa.gov/reg3hwmd/risk/guide3.h</a>
2	U. S. EPA	1991	The Role of Biological Technical Assistance Groups (BTAGs) in Ecological Assessment, Eco Update Intermittent Bulletin Vol. 1, no. 1	OERR, HSED Publ. 9345.0-05I	
2	U. S. EPA	1993	Superfund Program: Checklist For Ecological Assessment/Sampling - Draft	Environmental Response Branch, Emergency Response Division, Office of Emergency and Remedial Response Office of Solid Waste and Emergency Response	

### **2.2.2 Screening Assessment: Problem Formulation and Effects Evaluation**

## 2.2 Ecological Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2	U. S. Army	1994	Toxicity Summary for 2-Amino-4,6-Dinitrotoluene	U.S. Army Environmental Center	
2	U. S. EPA	1995	Establishing Background Levels	EPA/540/F-94/030 NTIS PB94-9633 13	<a href="http://www.ertresponse.com/Training/train_p dfFiles/Fact_Sheets/75.pdf">http://www.ertresponse.com/Training/train_p dfFiles/Fact_Sheets/75.pdf</a>
2	U. S. EPA	1995	Establishing Background Levels, EPAI540/F-94/030	NTIS PB94-9633 13 Number is EPA 540F94030	<a href="http://www.epa.gov/superfund/sites/npl/hrsr es/fact/bglevels.pdf">http://www.epa.gov/superfund/sites/npl/hrsr es/fact/bglevels.pdf</a>
2	U. S. EPA	1995	Final Water Quality Guidance for the Great Lakes		
2	ASTM	1995	Standard Guide for Developing Conceptual Site Models for Contaminated Sites	Designation: E 1689 – 95	<a href="http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore">http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore</a>
2	U. S. Army	1995	Toxicity Summary for Nitrobenzene	U.S. Army Environmental Center	
2	U. S. EPA	1996	Ecological Significance and Selection of Candidate Assessment Endpoints, Eco Update Intermittent Bulletin	EPA/540/F 95/037 OERR, HSED Publ. 9345.0-11FSI NTIS PB95-963323	
2	U. S. ACE	1996	Risk Assessment Handbook, Volume II: Environmental Evaluation	Publication Number: EM 200-1-4	
2	U. S. EPA	1997	Priorities for Ecological Protection: An Initial List and Discussion Document for EPA.	EPA/600/S-97/002	<a href="http://www.epa.gov/ORD/WebPubs/priorities/priorit.pdf">http://www.epa.gov/ORD/WebPubs/priorities/priorit.pdf</a>
2	U. S. EPA Reg. 4	1998	Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Alternatives, and Inclusion of Stakeholders	Memorandum	
2	U. S. EPA	1999	Fact Sheet Polychlorinated Dibenzo-p-dioxins and Related Compounds Update: Impact on Fish Advisories	EPA-823-F-99-015	
2	U. S. EPA	1999	Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities - Volumes 1, 2, & 3.	EPA 530-D-99-001 (A,B,&C)	<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/slerap.htm">http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/slerap.htm</a>
2	U. S. EPA	2000	Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs	EPA-823-R-00-001 & EPA-823-R-00-002	<a href="http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf">http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf</a>
2	U. S. EPA	2000	Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs.	EPA 823/R-00/001	<a href="http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf">http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf</a>
2	U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4, EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final">http://www.epa.gov/quality1/qsdocs/g4final</a>
2	U. S. EPA	2000	Prediction of Sediment Toxicity Using Consensus-Based Freshwater Sediment Quality Guidelines	Final report of USGS to U. S. EPA	<a href="http://www.msc.nbs.gov/pubs/center/pdfDocs/91126.pdf">http://www.msc.nbs.gov/pubs/center/pdfDocs/91126.pdf</a>

### 2.2.2 Screening Assessment: Problem Formulation and Effects Evaluation

## **2.2 Ecological Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. DoD	2000	Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment	SFIM-AEC-ER-200015	<a href="https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html">https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html</a>
2		U. S. EPA	2001	Guidance for Characterizing Background Chemicals in Soil at Superfund Sites	External Review Draft Office of Emergency and Remedial Response	
3		U. S. EPA	1993	Sediment Quality Criteria for the Protection of Benthic Organisms: Acenaphthene		
3		U. S. EPA	1993	Sediment Quality Criteria for the Protection of Benthic Organisms: Dieldrin		
3		U. S. EPA	1993	Sediment Quality Criteria for the Protection of Benthic Organisms: Endrin		
3		U. S. EPA	1993	Sediment Quality Criteria for the Protection of Benthic Organisms: Fluoranthene		
3		U. S. EPA	1993	Sediment Quality Criteria for the Protection of Benthic Organisms: Phenanthrene		
3		U. S. Army	1994	Field Manual on Environmental Chemistry and Fate of Chemical Warfare Agents	Southwest Research Institute	
3		U. S. EPA	1994	Highlights of the 9th Annual RRAC/6th Annual SEEW, Eco Update Intermittent Bulletin Vol. 4, no.2	EPA/540/F 94/048 OERR, HSED Publ. 9345.0-051 NTIS PB94-963313	
3		U. S. EPA	1994	Selecting and Using Reference Information in Superfund Ecological Risk Assessments, Eco Update Intermittent Bulletin Vol. 2, no. 4	EPA/540/F-94/050 OERR, HSED Publ. 9345.0-051 NTIS PB94-963319	
3		U. S. EPA	1996	Ecotox Thresholds, Eco Update Intermittent Bulletin Vol. 3, no. 2	EPA/540/F-95/038 OERR, HSED Publ. 9345.0-12FSI NTIS PB95-963324	
3		U. S. EPA	1999	Guidance on Environmental Data Verification and Validation	EPA-QA/G8 Peer Review Draft	
3		U.S. EPA	2000	AQUATOX Release 1: A SimA SIMULATION MODEL FOR AQUATIC ECOSYSTEMS (Fact Sheet)	EPA#: 823-F-00-015	<a href="http://www.epa.gov/waterscience/models/aquatox/about.html">http://www.epa.gov/waterscience/models/aquatox/about.html</a>
3		U. S. EPA	2000	Peer Review Workshop Report on Ecological Soil Screening Level (ECO-SSL) Guidance Document.	Contract No. 68-C-99-238	<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/peerrev/pdf">http://www.epa.gov/superfund/programs/risk/ecorisk/peerrev/pdf</a>
3		U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>

### **2.2.2 Screening Assessment: Problem Formulation and Effects Evaluation**

## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer. Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
3	U. S. EPA	2001	Policy for Addressing Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites	DRAFT - 16 July 2001 Review Copy	

### ***2.2.2 Screening Assessment: Problem Formulation and Effects Evaluation***

## ***2.2 Ecological Risk Assessments***

### ***2.2.3 Screening Assessment: Preliminary Exposure and Risk Estimates***

#### **Applicable AFCEE Notes**

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Development and Use of Lines of Evidence in Ecological Risk Assessments

AFCEE Requirements for Development and Application of Uncertainty Analyses in Risk Assessment

AFCEE Requirements for the Use of Scientific/Management Decision Points in Ecological Risk Assessments

AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments

AFCEE Requirements for Selecting Chemicals of Potential Concern in Human Health and Ecological Risk Assessments

#### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA Reg. 3	1991	Risk Assessment: Technical Guidance Manual: EPA Region III Guidance on Handling Chemical Concentration Data Near the Detection Limit in Risk Assessments		<a href="http://www.epa.gov/reg3hwmd/risk/guide3.h">http://www.epa.gov/reg3hwmd/risk/guide3.h</a>
1		U. S. EPA	1993	Wildlife Exposure Factors Handbook Volume I	EPA/600/R-93/187a ORD	<a href="http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default">http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default</a>
1		U. S. EPA	1993	Wildlife Exposure Factors Handbook Volume II:	EPA/600/R-93/187b ORD	<a href="http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default">http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default</a>
1		U. S. ACE	1996	Risk Assessment Handbook, Volume II: Environmental Evaluation	Publication Number: EM 200-1-4	
1	Yes	U. S. EPA	1997	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Interim Final (ERAGS)	OSWER 9285.7-25, EPA/540/R-	<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm">http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm</a>
1		U. S. EPA Reg. 10	1997	EPA Region 10 Supplemental Ecological Risk Assessment Guidance for Superfund	EPA 910-R-97-005	
1	Yes	U. S. EPA	1998	Guidelines for Ecological Risk Assessment. Final.	EPA/630/R-95-002F	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460</a>

### ***2.2.3 Screening Assessment: Preliminary Exposure and Risk Estimates***



## 2.2 Ecological Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	2000	Ecological Soil Screening Level (Eco-SSL) Guidance. Draft.		<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/ecosl.htm">http://www.epa.gov/superfund/programs/risk/ecorisk/ecosl.htm</a>
1		U. S. Army	2000	Standard Practice for Wildlife Toxicity Reference Values	US Army CHPPM Technical Guide No. 254	
1		U. S. EPA Reg. 4	2001	Ecological Risk Assessment Bulletins - Supplement to RAGS: (1) Ecological Introduction, (2) Ecological Screening Values, (3) Endpoint Selection, (4) Natural Resources		<a href="http://www.epa.gov/Region4/waste/ots/ecolbul.htm">http://www.epa.gov/Region4/waste/ots/ecolbul.htm</a>
1		U. S. Army	2002	Bioconcentration, Bioaccumulation and Biomagnification of Nitroaromatic and Nitramine Explosives and their Breakdown Products	U. S. Army CHPPM Toxicology Study No.87-MA-6943-01	
1		U. S. Navy	2002	Critical Issues for Contaminated Sediment Management	MESO-02-TM-01	
1		U.S. EPA	2002	National Recommended Water Quality Criteria: 2002	EPA-822-R-02-047	<a href="http://www.epa.gov/waterscience/pc/revcom">http://www.epa.gov/waterscience/pc/revcom</a>
1		U. S. EPA	2002	Perchlorate Environmental Contamination: Review and Risk Characterization	External Review Draft - Do Not Cite or Quote NCEA-103	
2		U. S. EPA	1995	Engineering Forum Issue: Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites	EPA/540/5-96/500 OSWER	<a href="http://www.epa.gov/swertio1/tsp/download/bckgrnd.pdf">http://www.epa.gov/swertio1/tsp/download/bckgrnd.pdf</a>
2		U. S. EPA	1995	Final Water Quality Guidance for the Great Lakes		
2		ASTM	1995	Standard Guide for Developing Conceptual Site Models for Contaminated Sites	Designation: E 1689 – 95	<a href="http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore">http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore</a>
2		U. S. ACE	1998	Development of a Multimedia Exposure Assessment Model for Evaluating Ecological Risk of Exposure to Military-Related Compounds (MRCs) at Military Sites	Tech. Rpt. IRRP-98-9	
2		U. S. EPA Reg. 4	1998	Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Alternatives, and Inclusion of Stakeholders	Memorandum	
2		U. S. EPA	1998	Guidance for Data Quality Assessment Practical Methods for Data Analysis	EPA/600/R-96/084 EPA QA/G-9	
2		U. S. EPA	1999	Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities - Volumes 1, 2, & 3.	EPA 530-D-99-001 (A,B,&C)	<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/slerap.htm">http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/slerap.htm</a>

### 2.2.3 Screening Assessment: Preliminary Exposure and Risk Estimates

## 2.2 Ecological Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA	2000	Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs	EPA-823-R-00-001 & EPA-823-R-00-002	<a href="http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf">http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf</a>
2		U. S. EPA	2000	Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs.	EPA 823/R-00/001	<a href="http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf">http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf</a>
2		U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html_guidance">http://www.epa.gov/quality/qa_docs.html_guidance</a>
2		U. S. EPA	2000	Prediction of Sediment Toxicity Using Consensus-Based Freshwater Sediment Quality Guidelines	Final report of USGS to U. S. EPA	<a href="http://www.msc.nbs.gov/pubs/center/pdfDocs/91126.pdf">http://www.msc.nbs.gov/pubs/center/pdfDocs/91126.pdf</a>
2		U. S. Army	2000	Principles of Environmental Restoration	U.S. Army Environmental Center, Aberdeen Proving Ground, Edgewood Area	<a href="http://aec.army.mil/usaec/restoration/per-manual101.pdf">http://aec.army.mil/usaec/restoration/per-manual101.pdf</a>
2		U. S. DoD	2000	Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment	SFIM-AEC-ER-200015	<a href="https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html">https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html</a>
3		U. S. EPA	1992	Guidelines for Exposure Assessment	FR 57: 22887-22938	<a href="http://www.epa.gov/ncea/pdfs/guidline.pdf">http://www.epa.gov/ncea/pdfs/guidline.pdf</a>
3		U.S. EPA	1992	National Study of Chemical Residue in Fish, Volume 1	EPA 823-R-92_006a	<a href="http://www.epa.gov/waterscience/library/fish/residuevol1.pdf">http://www.epa.gov/waterscience/library/fish/residuevol1.pdf</a>
3		U. S. EPA	1992	National Study of Chemical Residue in Fish, Volume 2	EPA 823-R-92_006b	<a href="http://www.epa.gov/waterscience/library/fish/residuevol2.pdf">http://www.epa.gov/waterscience/library/fish/residuevol2.pdf</a>
3		U. S. EPA	1994	Selecting and Using Reference Information in Superfund Ecological Risk Assessments, Eco Update Intermittent Bulletin Vol. 2, no. 4	EPA/540/F-94/050 OERR, HSED Publ. 9345.0-051 NTIS PB94-963319	
3		U. S. EPA	1996	Ecotox Thresholds, Eco Update Intermittent Bulletin Vol. 3, no. 2	EPA/540/F-95/038 OERR, HSED Publ. 9345.0-12FSI NTIS PB95-963324	
3		U.S. EPA	2000	AQUATOX Release 1: A SimA SIMULATION MODEL FOR AQUATIC ECOSYSTEMS (Fact Sheet)	EPA#: 823-F-00-015	<a href="http://www.epa.gov/waterscience/models/aquatox/about.html">http://www.epa.gov/waterscience/models/aquatox/about.html</a>
3		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4. EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final">http://www.epa.gov/quality1/qsdocs/g4final</a>
3		U. S. EPA	2000	Lead at Outdoor Firing Ranges	EPA-540-F-00-009	<a href="http://www.epa.gov/superfund/programs/lead/products/ssammoco.pdf">http://www.epa.gov/superfund/programs/lead/products/ssammoco.pdf</a>
3		U. S. EPA	2000	Peer Review Workshop Report on Ecological Soil Screening Level (ECO-SSL) Guidance Document.	Contract No. 68-C-99-238	<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/peerrev/pdf">http://www.epa.gov/superfund/programs/risk/ecorisk/peerrev/pdf</a>

### 2.2.3 Screening Assessment: Preliminary Exposure and Risk Estimates

## 2.2 Ecological Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
3		U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>
3		U. S. ACE	2002	Guide for Characterizing Sites Contaminated with Energetic Materials	EDRC/CRREL TR02-1US ACE Engineer Research and Development Center	

### 2.2.3 Screening Assessment: Preliminary Exposure and Risk Estimates

## ***2.2 Ecological Risk Assessments***

### ***2.2.4 Baseline Assessment: Problem Formulation***

#### **Applicable AFCEE Notes**

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Development and Use of Lines of Evidence in Ecological Risk Assessments

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for the Use of Scientific/Management Decision Points in Ecological Risk Assessments

AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments

AFCEE Requirements for Selecting Chemicals of Potential Concern in Human Health and Ecological Risk Assessments

#### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note</i>	<i>Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1	Yes	U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk/datause/parta.htm">http://www.epa.gov/superfund/programs/risk/datause/parta.htm</a>
1		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	<a href="http://epa.gov/superfund/programs/risk/datause/partb.htm">http://epa.gov/superfund/programs/risk/datause/partb.htm</a>
1		U. S. EPA	1993	Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objective Process	Issued from Office of Research and Development	
1		U. S. EPA	1994	Ecological Risk Assessment Issue Papers	EPA/630/R-94/009	
1		U. S. EPA	1994	Field Studies for Ecological Risk Assessment, Eco Update Intermittent Bulletin Vol. 2, no. 3	EPA/540/F 94/014 OERR, HSED Publ. 9345.0-051 NTIS PB94-963305	<a href="http://www.epa.gov/superfund/programs/risk/ecoup/index.htm">http://www.epa.gov/superfund/programs/risk/ecoup/index.htm</a>
1	Yes	U. S. EPA	1995	Engineering Forum Issue: Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites	EPA/540/5-96/500 OSWER	<a href="http://www.epa.gov/swertio1/tsp/download/bckgrnd.pdf">http://www.epa.gov/swertio1/tsp/download/bckgrnd.pdf</a>
1		U. S. ACE	1996	Risk Assessment Handbook, Volume II: Environmental Evaluation	Publication Number: EM 200-1-4	

### ***2.2.4 Baseline Assessment: Problem Formulation***

## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer.</i></b>	<b><i>Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
1		U. S. EPA	1996	Soil Screening Guidance: Technical Background Document	EPA/540/R 95/128 OSWER Publ. 9355.4-17A NTIS PB94-963502	<a href="http://www.epa.gov/superfund/resources/soil/introtbd.htm">http://www.epa.gov/superfund/resources/soil/introtbd.htm</a>
1	Yes	U. S. EPA	1997	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Interim Final (ERAGS)	OSWER 9285.7-25, EPA/540/R-	<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm">http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm</a>
1		U. S. EPA Reg. 10	1997	EPA Region 10 Supplemental Ecological Risk Assessment Guidance for Superfund	EPA 910-R-97-005	
1	Yes	U. S. EPA	1998	Guidelines for Ecological Risk Assessment. Final.	EPA/630/R-95-002F	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460</a>
1		U. S. Navy	1998	Procedural Guidance for Statistically Analyzing Environmental Background Data		
1		U.S. EPA Reg. 8	1999	Background Concentrations - Use in EPA Risk Assessments		<a href="http://www.epa.gov/Region8/superfund/risksf/backgrd8.pdf">http://www.epa.gov/Region8/superfund/risksf/backgrd8.pdf</a>
1		U. S. Navy	1999	Handbook for Statistical Analysis of Environmental Background Data	SWDIV and EFA West of Navel Engineering Command	
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html_guidance">http://www.epa.gov/quality/qa_docs.html_guidance</a>
1	Yes	U. S. EPA	2000	Science Policy Council Handbook: Risk Characterization	EPA 100-B-00-002	<a href="http://www.epa.gov/osp/spc/rchandbk.pdf">http://www.epa.gov/osp/spc/rchandbk.pdf</a>
1		U. S. EPA	2001	Planning for Ecological Risk Assessment: Developing Management Objectives	[Draft - Do Not Cite Or Quote] EPA/630/R-01/001A External Review Draft	
1		U. S. Navy	2002	Critical Issues for Contaminated Sediment Management	MESO-02-TM-01	
1		U.S. EPA	2002	Generic Assessment Endpoints for Ecological Risk	EPA/630/P-02/004A	<a href="http://cfpub.epa.gov/ncea/raf/recordisplay.cfm?deid=54923">http://cfpub.epa.gov/ncea/raf/recordisplay.cfm?deid=54923</a>
1		U. S. EPA	2002	Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses:	EPA-823-B-01-002	<a href="http://www.epa.gov/waterscience/cs/collecti on.html">http://www.epa.gov/waterscience/cs/collecti on.html</a>
1		U. S. Army	2002	Selection of Assessment and Measurement Endpoints for Ecological Risk Assessments	SFIM-AEC-ER-TR-2002018	
2		U. S. EPA		An SAB Report: A Framework for Assessing and Reporting on Ecological Condition	EPA-SAB-EPEC-02-xxx	<a href="http://www.epa.gov/sab/pdf/ecoframework.pdf">http://www.epa.gov/sab/pdf/ecoframework.pdf</a>

### ***2.2.4 Baseline Assessment: Problem Formulation***

## 2.2 Ecological Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA	1991	The Role of Biological Technical Assistance Groups (BTAGs) in Ecological Assessment, Eco Update Intermittent Bulletin Vol. 1, no. 1	OERR, HSED Publ. 9345.0-05I	
2		U. S. EPA	1994	Assessment and Remediation of Contaminated Sediments (ARCS) Program - Final Summary Report.	EPA 905-S-94-001	<a href="http://www.epa.gov/glnpo/arcs/EPA-905-S94-001/EPA-905-S94-001.html">http://www.epa.gov/glnpo/arcs/EPA-905-S94-001/EPA-905-S94-001.html</a> - ToC8
2		U. S. EPA	1995	Establishing Background Levels	EPA/54O/F-94/030 NTIS PB94-9633 13	<a href="http://www.ertresponse.com/Training/train_pdfFiles/Fact_Sheets/75.pdf">http://www.ertresponse.com/Training/train_pdfFiles/Fact_Sheets/75.pdf</a>
2		U. S. EPA	1995	Establishing Background Levels, EPA/54O/F-94/030	NTIS PB94-9633 13 Number is EPA 540F94030	<a href="http://www.epa.gov/superfund/sites/npl/hrsr/es/fact/bglevels.pdf">http://www.epa.gov/superfund/sites/npl/hrsr/es/fact/bglevels.pdf</a>
2		ASTM	1995	Standard Guide for Developing Conceptual Site Models for Contaminated Sites	Designation: E 1689 – 95	<a href="http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore">http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore</a>
2		U. S. EPA Reg. 4	1998	Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Alternatives, and Inclusion of Stakeholders	Memorandum	
2		U. S. Navy	1999	Navy Policy for Conducting Ecological Risk Assessments		<a href="http://web.ead.anl.gov/ecorisk/policy/pdf/policy.pdf">http://web.ead.anl.gov/ecorisk/policy/pdf/policy.pdf</a>
2		U. S. EPA	2000	Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs.	EPA 823/R-00/001	<a href="http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf">http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf</a>
2		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4. EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final">http://www.epa.gov/quality1/qsdocs/g4final</a>
2		U. S. Navy	2000	Navy Interim Final Policy on the Use of Background Chemical Levels		<a href="http://web.ead.anl.gov/ecorisk/policy/pdf/bkgpolicy.pdf">http://web.ead.anl.gov/ecorisk/policy/pdf/bkgpolicy.pdf</a>
2		U. S. DoD	2000	Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment	SFIM-AEC-ER-200015	<a href="https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html">https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html</a>
2		U. S. EPA Reg. 4	2001	Ecological Risk Assessment Bulletins - Supplement to RAGS: (1) Ecological Introduction, (2) Ecological Screening Values, (3) Endpoint Selection, (4) Natural Resources		<a href="http://www.epa.gov/Region4/waste/ots/ecolbul.htm">http://www.epa.gov/Region4/waste/ots/ecolbul.htm</a>
2		U. S. EPA	2001	Framework for Cumulative Risk Assessment	NECA-F-1098	
2		U. S. EPA	2001	Guidance for Characterizing Background Chemicals in Soil at Superfund Sites	External Review Draft Office of Emergency and Remedial Response	

### 2.2.4 Baseline Assessment: Problem Formulation

## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer. Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
2	U. S. EPA	2001	Risk Assessment Guidance for Superfund, Volume 3 - Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A).	EPA 540-R-2-002 OSWER 9285.7-45	<a href="http://www.epa.gov/superfund/RAGS3A/index.htm">http://www.epa.gov/superfund/RAGS3A/index.htm</a>
3	U. S. EPA	1994	Selecting and Using Reference Information in Superfund Ecological Risk Assessments, Eco Update Intermittent Bulletin Vol. 2, no. 4	EPA/540/F-94/050 OERR, HSED Publ. 9345.0-051 NTIS PB94-963319	
3	U. S. EPA	1997	Guiding Principles for Monte Carlo Analysis	EPA/630/R-97/001	<a href="http://www.epa.gov/ncea/monnteabs.htm">http://www.epa.gov/ncea/monnteabs.htm</a>
3	U.S. EPA	2000	EPA Quality Manual for Environmental Programs		<a href="http://www.epa.gov/quality/qs-docs/5360.pdf">http://www.epa.gov/quality/qs-docs/5360.pdf</a>
3	U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>

### ***2.2.4 Baseline Assessment: Problem Formulation***

## 2.2 Ecological Risk Assessments

### 2.2.5 Baseline Assessment: Study Design and Data Quality Objective Process

#### Applicable AFCEE Notes

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Development and Use of Lines of Evidence in Ecological Risk Assessments

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for the Use of Scientific/Management Decision Points in Ecological Risk Assessments

AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments

#### Applicable Guidance

<i>Relev. Rank</i>	<i>Note</i>	<i>Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1	Yes	U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk/datause/parta.htm">http://www.epa.gov/superfund/programs/risk/datause/parta.htm</a>
1		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	<a href="http://epa.gov/superfund/programs/risk/datause/partb.htm">http://epa.gov/superfund/programs/risk/datause/partb.htm</a>
1		U. S. EPA	1994	Field Studies for Ecological Risk Assessment, Eco Update Intermittent Bulletin Vol. 2, no. 3	EPA/540/F 94/014 OERR, HSED Publ. 9345.0-051 NTIS PB94-963305	<a href="http://www.epa.gov/superfund/programs/risk/ecoup/index.htm">http://www.epa.gov/superfund/programs/risk/ecoup/index.htm</a>
1		U. S. EPA	1994	Using Toxicity Tests in Ecological Risk Assessment, Eco Update Intermittent Bulletin Vol. 2, no. 1	EPA/540/F 95/012 OERR, HSED Publ. 9345.0-051 NTIS PB94-963303	<a href="http://www.epa.gov/superfund/programs/risk/ecoup/index.htm">http://www.epa.gov/superfund/programs/risk/ecoup/index.htm</a>
1	Yes	U. S. EPA	1995	Engineering Forum Issue: Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites	EPA/540/5-96/500 OSWER	<a href="http://www.epa.gov/swertio1/tsp/download/bckgrnd.pdf">http://www.epa.gov/swertio1/tsp/download/bckgrnd.pdf</a>
1		U. S. ACE	1996	Risk Assessment Handbook, Volume II: Environmental Evaluation	Publication Number: EM 200-1-4	
1		U. S. EPA	1996	Soil Screening Guidance: Technical Background Document	EPA/540/R 95/128 OSWER Publ. 9355.4-17A NTIS PB94-963502	<a href="http://www.epa.gov/superfund/resources/soil/introtbd.htm">http://www.epa.gov/superfund/resources/soil/introtbd.htm</a>
1	Yes	U. S. EPA	1997	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Interim Final (ERAGS)	OSWER 9285.7-25, EPA/540/R-	<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm">http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm</a>

### 2.2.5 Baseline Assessment: Study Design and Data Quality Objective Process



## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer.</i></b>	<b><i>Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
1		U. S. EPA Reg. 10	1997	EPA Region 10 Supplemental Ecological Risk Assessment Guidance for Superfund	EPA 910-R-97-005	
1	Yes	U. S. EPA	1998	Guidelines for Ecological Risk Assessment. Final.	EPA/630/R-95-002F	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460</a>
1		U. S. Navy	1998	Procedural Guidance for Statist ically Analyzing Environmental Background Data		
1		U. S. Navy	1999	Handbook for Statistical Analysis of Environmental Background Data	SWDIV and EFA West of Navel Engineering Command	
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html_guidance">http://www.epa.gov/quality/qa_docs.html_guidance</a>
1	Yes	U. S. EPA	2000	Guidance for Data Quality Assessment: Practical Methods for Data Analysis	EPA/600/R 96/084 EPA/QA/G-9	<a href="http://www.epa.gov/quality/qa_docs.html_guidance">http://www.epa.gov/quality/qa_docs.html_guidance</a>
1		DOD	2001	Policy on Land Use Controls Associated with Environmental Restoration Activities	Memorandum	
1		U. S. Navy	2002	Critical Issues for Contaminated Sediment Management	MESO-02-TM-01	
1		U. S. EPA Reg. 4	2002	Ecological Assessment Standard Operating Procedures and Quality Assurance Manual	U. S. EPA Region 4 SEED-EAB	<a href="http://www.epa.gov/region4/sesd/eabsop/eab_sop.pdf">http://www.epa.gov/region4/sesd/eabsop/eab_sop.pdf</a>
1		U.S. EPA	2002	Generic Assessment Endpoints for Ecological Risk	EPA/630/P-02/004A	<a href="http://cfpub.epa.gov/ncea/raf/recordisplay.cfm?deid=54923">http://cfpub.epa.gov/ncea/raf/recordisplay.cfm?deid=54923</a>
1		U. S. EPA	2002	Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses:	EPA-823-B-01-002	<a href="http://www.epa.gov/waterscience/cs/collecti on.html">http://www.epa.gov/waterscience/cs/collecti on.html</a>
1		U. S. Army	2002	Selection of Assessment and Measurement Endpoints for Ecological Risk Assessments	SFIM-AEC-ER-TR-2002018	
1		U. S. Army	2002	Technical Document for Ecological Risk Assessment: Planning for Data Collection	SFIM-AEC-ER-TR-2002017	
2		U. S. EPA		An SAB Report: A Framework for Assessing and Reporting on Ecological Condition	EPA-SAB-EPEC-02-xxx	<a href="http://www.epa.gov/sab/pdf/ecoframework.pdf">http://www.epa.gov/sab/pdf/ecoframework.pdf</a>
2		U. S. EPA	1992	National Study of Chemical Residue in Fish, Volume 2	EPA 823-R-92_006b	<a href="http://www.epa.gov/waterscience/library/fish/residuevol2.pdf">http://www.epa.gov/waterscience/library/fish/residuevol2.pdf</a>
2		U. S. EPA	1993	Wildlife Exposure Factors Handbook Volume I	EPA/600/R-93/187a ORD	<a href="http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default">http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default</a>

### ***2.2.5 Baseline Assessment: Study Design and Data Quality Objective Process***

## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA	1993	Wildlife Exposure Factors Handbook Volume II:	EPA/600/R-93/187b ORD	<a href="http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default">http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default</a>
2		U. S. EPA	1994	Catalogue of Standard Toxicity Tests for Ecological Risk Assessment, Eco Update Intermittent Bulletin	EPA/540/F 94/013 OERR,HSED Publ. 9345.0-051 NTIS PB94-963304	
2		U. S. EPA	1994	Data Quality Objectives Decision Error Feasibility Trials (DEFT)	EPA Computer Program	
2		U. S. EPA	1994	US EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Reviews		
2		U. S. EPA	1995	Establishing Background Levels	EPA/540/F-94/030 NTIS PB94-9633 13	<a href="http://www.ertresponse.com/Training/train_pdfFiles/Fact_Sheets/75.pdf">http://www.ertresponse.com/Training/train_pdfFiles/Fact_Sheets/75.pdf</a>
2		U. S. EPA	1995	Establishing Background Levels, EPA/540/F-94/03 0	NTIS PB94-9633 13 Number is EPA 540F94030	<a href="http://www.epa.gov/superfund/sites/npl/hrsres/fact/bglevels.pdf">http://www.epa.gov/superfund/sites/npl/hrsres/fact/bglevels.pdf</a>
2		U. S. EPA Reg. 4	1998	Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Alternatives, and Inclusion of Stakeholders	Memorandum	
2		U. S. EPA	1999	Guidance on Environmental Data Verification and Validation	EPA-QA/G8 Peer Review Draft	
2		U. S. EPA	1999	Risk Assessment Guidance for Superfund, Volume 3 – Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A). Draft	OSWER EPA 000-0-99-000	<a href="http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm">http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm</a>
2		U. S. EPA	1999	Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities - Volumes 1, 2, & 3.	EPA 530-D-99-001 (A,B,&C)	<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/slerap.htm">http://www.epa.gov/Arkansas/6pd/rcra_c/protocol/slerap.htm</a>
2		U. S. EPA	1999	US EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review		
2		U. S. EPA	2000	Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs	EPA-823-R-00-001 & EPA-823-R-00-002	<a href="http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf">http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf</a>
2		U. S. EPA	2000	Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs.	EPA 823/R-00/001	<a href="http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf">http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf</a>
2		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4. EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qdocs/g4final">http://www.epa.gov/quality1/qdocs/g4final</a>
2		U. S. EPA	2000	Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates - Second Edition.	EPA 600/R- 99/064	<a href="http://www.epa.gov/ost/cs/freshfact/html">http://www.epa.gov/ost/cs/freshfact/html</a>

### ***2.2.5 Baseline Assessment: Study Design and Data Quality Objective Process***

## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer. Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
2	U. S. DoD	2000	Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment	SFIM-AEC-ER-200015	<a href="https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html">https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html</a>
2	U. S. EPA	2001	Guidance for Characterizing Background Chemicals in Soil at Superfund Sites	External Review Draft Office of Emergency and Remedial Response	
3	U.S. EPA	1992	National Study of Chemical Residue in Fish, Volume 1	EPA 823-R-92_006a	<a href="http://www.epa.gov/waterscience/library/fish/residuevol1.pdf">http://www.epa.gov/waterscience/library/fish/residuevol1.pdf</a>
3	U. S. EPA	1994	Selecting and Using Reference Information in Superfund Ecological Risk Assessments, Eco Update Intermittent Bulletin Vol. 2, no. 4	EPA/540/F-94/050 OERR, HSED Publ. 9345.0-051 NTIS PB94-963319	
3	U. S. EPA Reg. 1	1996	Immunoassay Guidelines for Planning Environmental Projects		
3	U. S. EPA U. S. DoD U. S. DOE	2000	Uniform Federal Policy for Implementing Environmental Quality Systems – Evaluating, Assessing, and Documenting Environmental Data Collection/Use and Technology	Intergovernmental Data Quality Task Force	
3	U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>

### ***2.2.5 Baseline Assessment: Study Design and Data Quality Objective Process***

## 2.2 Ecological Risk Assessments

### 2.2.6 Baseline Assessment: Site Investigation and Analysis of Exposure and Effects

#### Applicable AFCEE Notes

AFCEE Requirements for the Use of Scientific/Management Decision Points in Ecological Risk Assessments

AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments

AFCEE Requirements for Selecting Chemicals of Potential Concern in Human Health and Ecological Risk Assessments

#### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1988	Superfund Exposure Assessment Manual	EPA/540/1 -88/001 OSWER Directive 9285.5-1 NTIS PB89-135859	
1		U. S. EPA	1992	Dermal Exposure Assessment: Principles and Applications; Final	EPA/600/8 -91/011bOHEA	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12188">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12188</a>
1	Yes	U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk/datause/parta.htm">http://www.epa.gov/superfund/programs/risk/datause/parta.htm</a>
1		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	<a href="http://epa.gov/superfund/programs/risk/datause/partb.htm">http://epa.gov/superfund/programs/risk/datause/partb.htm</a>
1		U. S. EPA	1992	Supplemental Guidance to RAGS: Calculating the Concentration Term	OSWER Directive 9285.7-081	
1		U. S. EPA	1994	Ecological Risk Assessment Issue Papers	EPA/630/R-94/009	
1		U. S. EPA	1994	Field Studies for Ecological Risk Assessment, Eco Update Intermittent Bulletin Vol. 2, no. 3	EPA/540/F 94/014 OERR, HSED Publ. 9345.0-051 NTIS PB94-963305	<a href="http://www.epa.gov/superfund/programs/risk/ecoup/index.htm">http://www.epa.gov/superfund/programs/risk/ecoup/index.htm</a>
1		U. S. EPA	1994	Methods for Assessing the Toxicity of Sediment-Associated Contaminants with Estuarine and Marine Amphipods	EPA/600/R-94/025	
1		U. S. EPA	1994	Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Fresh Water Invertebrates.	EPA/600/R-94/024	

### 2.2.6 Baseline Assessment: Site Investigation and Analysis of Exposure and Effects

## 2.2 Ecological Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		ASTM	1994	Standard Guide for Handling Uncertainties in Risk	Committee E-47 E47.13 Subcommittee on Assessment of Risk to Human Health and the Environment from Hazardous Waste Sites	
1		U. S. EPA	1994	Using Toxicity Tests in Ecological Risk Assessment, Eco Update Intermittent Bulletin Vol. 2, no. 1	EPA/540/F 95/012 OERR, HSED Publ. 9345.0-051 NTIS PB94-963303	<a href="http://www.epa.gov/superfund/programs/risk/ecoup/index.htm">http://www.epa.gov/superfund/programs/risk/ecoup/index.htm</a>
1		U. S. ACE	1996	Risk Assessment Handbook, Volume II: Environmental Evaluation	Publication Number: EM 200-1-4	
1	Yes	U. S. EPA	1997	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Interim Final (ERAGS)	OSWER 9285.7-25, EPA/540/R-	<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm">http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm</a>
1		U. S. EPA Reg. 10	1997	EPA Region 10 Supplemental Ecological Risk Assessment Guidance for Superfund	EPA 910-R-97-005	
1		U. S. EPA	1997	The Lognormal Distribution in Environmental Applications. OSWER	EPA/600/R-97/006	<a href="http://www.epa.gov/nerlesd1/tsc/issue.htm">http://www.epa.gov/nerlesd1/tsc/issue.htm</a>
1	Yes	U. S. EPA	1998	Guidelines for Ecological Risk Assessment. Final.	EPA/630/R-95-002F	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460</a>
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html-guidance">http://www.epa.gov/quality/qa_docs.html-guidance</a>
1	Yes	U. S. EPA	2000	Guidance for Data Quality Assessment: Practical Methods for Data Analysis	EPA/600/R 96/084 EPA/QA/G-9	<a href="http://www.epa.gov/quality/qa_docs.html-guidance">http://www.epa.gov/quality/qa_docs.html-guidance</a>
1		U. S. Navy	2000	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U. S. Navy and Marine Corps Facilities Part 1: Overview of Metals Bioavailability, User's Guide	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	
1		U. S. Navy	2000	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U. S. Navy and Marine Corps Facilities Part 2: Technical Background Document for Assessing Metals Bioavailability,	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	
1		U. S. Navy	2000	Navy Interim Final Policy on the Use of Background Chemical Levels		<a href="http://web.ead.anl.gov/ecorisk/policy/pdf/bkgpolicy.pdf">http://web.ead.anl.gov/ecorisk/policy/pdf/bkgpolicy.pdf</a>
1		U. S. EPA	2000	Options for Development of Parametric Probability Distributions for Exposure Factors	EPA/600/R-00/058.	<a href="http://www.epa.gov/ncea/paramprob4ef.htm">http://www.epa.gov/ncea/paramprob4ef.htm</a>

### 2.2.6 Baseline Assessment: Site Investigation and Analysis of Exposure and Effects

## 2.2 Ecological Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	2001	Method for Assessing the Chronic Toxicity of Marine and Estuarine Sediment-associated Contaminants with the Amphipod <i>Leptocheirus plumulosus</i> , First Edition	EPA 600/R-01/020	<a href="http://www.epa.gov/waterscience/cs/guidancemanual.pdf">http://www.epa.gov/waterscience/cs/guidancemanual.pdf</a>
1		U.S. EPA	2002	Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites		<a href="http://www.epa.gov/superfund/programs/risk/ragsa/ucl.pdf">http://www.epa.gov/superfund/programs/risk/ragsa/ucl.pdf</a>
1		U. S. Navy	2002	Critical Issues for Contaminated Sediment Management	MESO-02-TM-01	
1		U. S. EPA Reg. 4	2002	Ecological Assessment Standard Operating Procedures and Quality Assurance Manual	U. S. EPA Region 4 SEED-EAB	<a href="http://www.epa.gov/region4/sesd/eabsop/eabsop.pdf">http://www.epa.gov/region4/sesd/eabsop/eabsop.pdf</a>
1		U. S. EPA	2002	Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses:	EPA-823-B-01-002	<a href="http://www.epa.gov/waterscience/cs/collecti on.html">http://www.epa.gov/waterscience/cs/collecti on.html</a>
1		U. S. EPA	2002	Role of Background in the CERCLA Cleanup Program	OSWER Dir.: 9285.6-07P	<a href="http://www.epa.gov/superfund/programs/risk/role.pdf">http://www.epa.gov/superfund/programs/risk/role.pdf</a>
1		U. S. Army	2002	Selection of Assessment and Measurement Endpoints for Ecological Risk Assessments	SFIM-AEC-ER-TR-2002018	
2		U.S. EPA	1989	RCRA Facility Investigation (RFI) Guidance, Vol. II of IV: Soil, Ground Water and Subsurface Gas Releases	EPA 530/SW-89-031	<a href="http://www.hanford.gov/dqo/project/level5/rcrav2.pdf">http://www.hanford.gov/dqo/project/level5/rcrav2.pdf</a>
2		U.S. EPA	1989	Soil Sampling Quality Assurance User's Guide - Second	EPA/600/8-89/045	<a href="http://www.epa.gov/tio/download%2Fchar%2Fsoilsamp.pdf">http://www.epa.gov/tio/download%2Fchar%2Fsoilsamp.pdf</a>
2		U. S. EPA	1991	Guidelines for Development Toxicity Risk Assessment	Federal Register: 56(234):63798-63826	
2		U.S. EPA	1992	National Study of Chemical Residue in Fish, Volume 1	EPA 823-R-92_006a	<a href="http://www.epa.gov/waterscience/library/fish/residuevol1.pdf">http://www.epa.gov/waterscience/library/fish/residuevol1.pdf</a>
2		U.S. EPA	1993	Methods for Aquatic Toxicity Identification Evaluations ? Phase II: Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity	EPA/600/R-92/080	
2		U.S. EPA	1993	Methods for Aquatic Toxicity Identification Evaluations ? Phase III: Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity	EPA/600/R-92/081	
2		U. S. EPA	1993	Wildlife Exposure Factors Handbook Volume I	EPA/600/R-93/187a ORD	<a href="http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default">http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default</a>
2		U. S. EPA	1993	Wildlife Exposure Factors Handbook Volume II:	EPA/600/R-93/187b ORD	<a href="http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default">http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActType=default</a>

### 2.2.6 Baseline Assessment: Site Investigation and Analysis of Exposure and Effects

## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer. Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
2	U. S. EPA	1994	Catalogue of Standard Toxicity Tests for Ecological Risk Assessment, Eco Update Intermittent Bulletin	EPA/540/F 94/013 OERR,HSED Publ. 9345.0-051 NTIS PB94-963304	
2	U. S. EPA	1994	US EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Reviews		
2	U. S. EPA	1995	Science Advisory Board (SAB) Review of the Agency's Approach for Developing Sediment Criteria for Five Metals (cadmium, copper, lead, nickel, and zinc)	EPA-SAB-EPEC-95-020 SAB letter to the Administrator	
2	ASTM	1995	Standard Guide for Developing Conceptual Site Models for Contaminated Sites	Designation: E 1689 – 95	<a href="http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore">http://www.astm.org/cgi-bin/SoftCart.exe/DATABASE.CART/PAGES/E1689.htm?E+mystore</a>
2	U. S. Army	1995	Toxicity Summary for 1,3,5-Trinitrobenzene	U.S. Army Environmental Center	
2	U. S. Army	1995	Toxicity Summary for 1,3,5,7-Tetrazocine (HMX)	U.S. Army Environmental Center	
2	U. S. Army	1995	Toxicity Summary for 1,3-Dinitrobenzene	U.S. Army Environmental Center	
2	U. S. Army	1995	Toxicity Summary for 2,4,6-Trinitrotoluene	U.S. Army Environmental Center	
2	U. S. Army	1995	Toxicity Summary for 2,4-Dinitrotoluene	U.S. Army Environmental Center	
2	U. S. Army	1995	Toxicity Summary for 2,6-Dinitrotoluene	U.S. Army Environmental Center	
2	U. S. Army	1995	Toxicity Summary for 2-Amino-4-Nitrotoluene	U.S. Army Environmental Center	
2	U. S. Army	1995	Toxicity Summary for 4-Amino-2-Nitrotoluene	U.S. Army Environmental Center	
2	U. S. Army	1995	Toxicity Summary for Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX)	U.S. Army Environmental Center	
2	U. S. EPA Reg. 1	1996	Immunoassay Guidelines for Planning Environmental Projects		
2	U. S. EPA Reg. 4	1998	Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Alternatives, and Inclusion of Stakeholders	Memorandum	
2	U. S. EPA	1998	Guidance for Data Quality Assessment Practical Methods for Data Analysis	EPA/600/R-96/084 EPA QA/G-9	
2	U. S. EPA	1998	Summary of the U.S. EPA Workshop on the Relationship Between Exposure Duration and Toxicity.		<a href="http://www.epa.gov/ncea/pdfs/tbexptox.pdf">http://www.epa.gov/ncea/pdfs/tbexptox.pdf</a>

### ***2.2.6 Baseline Assessment: Site Investigation and Analysis of Exposure and Effects***

## 2.2 Ecological Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA	1999	Risk Assessment Guidance for Superfund, Volume 3 – Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A). Draft	OSWER EPA 000-0-99-000	<a href="http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm">http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm</a>
2		U. S. EPA	1999	Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities - Volumes 1, 2, & 3.	EPA 530-D-99-001 (A,B,&C)	<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/proTOCOL/slerap.htm">http://www.epa.gov/Arkansas/6pd/rcra_c/proTOCOL/slerap.htm</a>
2		U. S. EPA	1999	Toxicological Review Cadmium and Compounds. Draft. CAS No. 7440-43-9		<a href="http://www.epa.gov/ncea/pdfs/cad/cad1.pdf">http://www.epa.gov/ncea/pdfs/cad/cad1.pdf</a>
2		U. S. EPA	1999	US EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review		
2		U. S. EPA	2000	Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs	EPA-823-R-00-001 & EPA-823-R-00-002	<a href="http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf">http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf</a>
2		U. S. EPA	2000	Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs.	EPA 823/R-00/001	<a href="http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf">http://www.epa.gov/ost/cs/biotesting/bioaccum.pdf</a>
2		U. S. EPA	2000	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part I: Estimating Exposure to Dioxin -Like Compounds, Volume 3: Properties, Environmental Levels, and Background Exposures	EPA/600/P-00/001Bc DO NOT CITE OR QUOTE Draft Final Report	
2		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4. EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final">http://www.epa.gov/quality1/qsdocs/g4final</a>
2		U. S. EPA	2000	Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates - Second Edition.	EPA 600/R- 99/064	<a href="http://www.epa.gov/ost/cs/freshfact/html">http://www.epa.gov/ost/cs/freshfact/html</a>
2		U. S. DoD	2000	Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment	SFIM-AEC-ER-200015	<a href="https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html">https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html</a>
2		U. S. EPA	2001	Risk Assessment Guidance for Superfund, Volume 3 - Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A).	EPA 540-R-2-002 OSWER 9285.7-45	<a href="http://www.epa.gov/superfund/RAGS3A/index.htm">http://www.epa.gov/superfund/RAGS3A/index.htm</a>
2		U. S. EPA	2002	Handbook on the Management of Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites	Interim Final Draft	
3		U.S. EPA	1989	RCRA Facility Investigation (RFI) Guidance, Vol. III of IV: Air and Surface Water Releases	EPA 530/SW-89-031	
3		U.S. EPA	1989	RCRA Facility Investigation (RFI) Guidance, Vol. IV of IV: Case Study Examples	EPA 530/SW-89-031	

### 2.2.6 Baseline Assessment: Site Investigation and Analysis of Exposure and Effects



## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer. Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
3	USAF	1989	The Installation Restoration Program Toxicology Guide, Volumes 1 -4	Harry G. Armstrong Aerospace Medical Research Laboratory	
3	USAF	1990	The Installation Restoration Program Toxicology Guide, Volume 5	Harry G. Armstrong Aerospace Medical Research Laboratory	
3	U. S. EPA	1994	Data Quality Objectives Decision Error Feasibility Trials (DEFT)	EPA Computer Program	
3	U. S. EPA	1994	Selecting and Using Reference Information in Superfund Ecological Risk Assessments, Eco Update Intermittent Bulletin Vol. 2, no. 4	EPA/540/F-94/050 OERR, HSED Publ. 9345.0-051 NTIS PB94-963319	
3	U. S. EPA	1995	Proposed Guidelines for Neurotoxicity Risk Assessment;	FR Vol. 60, No. 192	
3	U. S. EPA	1996	Reproductive Toxicity Risk Assessment Guidelines	Federal Register: 61(212):56274-56322	
3	U. S. EPA	1997	Fact Sheet: EPA Special Report on Endocrine Disruptors		
3	U. S. EPA	1997	Guiding Principles for Monte Carlo Analysis	EPA/630/R-97/001	<a href="http://www.epa.gov/ncea/monnteabs.htm">http://www.epa.gov/ncea/monnteabs.htm</a>
3	U. S. EPA	1997	Special Report on Environmental Endocrine Disruption: An Effects Assessment and Analysis	EPA/630/R-96/012	<a href="http://www.epa.gov/ORD/WebPubs/endocrine/endocrine.pdf">http://www.epa.gov/ORD/WebPubs/endocrine/endocrine.pdf</a>
3	U.S. EPA	1998	Viewpoints on Bioavailability for Wildlife		<a href="http://www.epa.gov/Region8/superfund/risks/wildlife.PDF">http://www.epa.gov/Region8/superfund/risks/wildlife.PDF</a>
3	U. S. EPA	2000	Lead at Outdoor Firing Ranges	EPA-540-F-00-009	<a href="http://www.epa.gov/superfund/programs/lead/products/ssammoco.pdf">http://www.epa.gov/superfund/programs/lead/products/ssammoco.pdf</a>
3	U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>
3	U. S. ACE	2002	Guide for Characterizing Sites Contaminated with Energetic Materials	EDRC/CRREL TR02-1US ACE Engineer Research and Development Center	

### ***2.2.6 Baseline Assessment: Site Investigation and Analysis of Exposure and Effects***

## 2.2 Ecological Risk Assessments

### 2.2.7 Baseline Assessment: Verification and Acceptance of Sampling Design

#### Applicable AFCEE Notes

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Development and Application of Uncertainty Analyses in Risk Assessment

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for the Use of Scientific/Management Decision Points in Ecological Risk Assessments

#### Applicable Guidance

<i>Relev. Rank</i>	<i>Note</i>	<i>Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1	Yes	U. S. EPA	1997	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Interim Final (ERAGS)	OSWER 9285.7-25, EPA/540/R-	<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm">http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm</a>
1		U. S. EPA Reg. 10	1997	EPA Region 10 Supplemental Ecological Risk Assessment Guidance for Superfund	EPA 910-R-97-005	
1	Yes	U. S. EPA	1998	Guidelines for Ecological Risk Assessment. Final.	EPA/630/R-95-002F	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460</a>
1		U.S. EPA Reg. 8	1999	Background Concentrations - Use in EPA Risk Assessments		<a href="http://www.epa.gov/Region8/superfund/risks/f/backgrd8.pdf">http://www.epa.gov/Region8/superfund/risks/f/backgrd8.pdf</a>
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html - guidance">http://www.epa.gov/quality/qa_docs.html - guidance</a>
1	Yes	U. S. EPA	2000	Guidance for Data Quality Assessment: Practical Methods for Data Analysis	EPA/600/R 96/084 EPA/QA/G-9	<a href="http://www.epa.gov/quality/qa_docs.html - guidance">http://www.epa.gov/quality/qa_docs.html - guidance</a>
1		U. S. EPA	2002	Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses:	EPA-823-B-01-002	<a href="http://www.epa.gov/waterscience/cs/collection.html">http://www.epa.gov/waterscience/cs/collection.html</a>
2		U. S. EPA	1991	The Role of Biological Technical Assistance Groups (BTAGs) in Ecological Assessment, Eco Update Intermittent Bulletin Vol. 1, no. 1	OERR, HSED Publ. 9345.0-05I	
2		U. S. ACE	1996	Risk Assessment Handbook, Volume II: Environmental Evaluation	Publication Number: EM 200-1-4	

### 2.2.7 Baseline Assessment: Verification and Acceptance of Sampling Design

## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA Reg. 4	1998	Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Alternatives, and Inclusion of Stakeholders	Memorandum	
2		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4, EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final">http://www.epa.gov/quality1/qsdocs/g4final</a>
2		U. S. EPA	2000	Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates - Second Edition.	EPA 600/R- 99/064	<a href="http://www.epa.gov/ost/cs/freshfact/html">http://www.epa.gov/ost/cs/freshfact/html</a>
2		U. S. DoD	2000	Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment	SFIM-AEC-ER-200015	<a href="https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html">https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html</a>
3		U. S. EPA	1994	Selecting and Using Reference Information in Superfund Ecological Risk Assessments, Eco Update Intermittent Bulletin Vol. 2, no. 4	EPA/540/F-94/050 OERR, HSED Publ. 9345.0-051 NTIS PB94-963319	
3		U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>

### ***2.2.7 Baseline Assessment: Verification and Acceptance of Sampling Design***

## ***2.2 Ecological Risk Assessments***

### ***2.2.8 Uncertainty Analysis***

#### **Applicable AFCEE Notes**

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Development and Use of Lines of Evidence in Ecological Risk Assessments

AFCEE Requirements for Development and Application of Uncertainty Analyses in Risk Assessment

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments

AFCEE Requirements for Selecting Chemicals of Potential Concern in Human Health and Ecological Risk Assessments

#### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note</i>	<i>Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1988	Superfund Exposure Assessment Manual	EPA/540/1 -88/001 OSWER Directive 9285.5-1 NTIS PB89-135859	
1		U. S. EPA	1992	Dermal Exposure Assessment: Principles and Applications; Final	EPA/600/8 -91/011bOHEA	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12188">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12188</a>
1		U. S. EPA	1994	Ecological Risk Assessment Issue Papers	EPA/630/R-94/009	
1		ASTM	1994	Standard Guide for Handling Uncertainties in Risk	Committee E-47 E47.13 Subcommittee on Assessment of Risk to Human Health and the Environment from Hazardous Waste Sites	
1	Yes	U. S. EPA	1995	Policy for Risk Characterization at the U.S. Environmental Protection Agency		<a href="http://www.epa.gov/superfund/programs/risk/toolthh.htm">http://www.epa.gov/superfund/programs/risk/toolthh.htm</a>
1		U. S. EPA Reg. 10	1997	EPA Region 10 Supplemental Ecological Risk Assessment Guidance for Superfund	EPA 910-R-97-005	
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html_guidance">http://www.epa.gov/quality/qa_docs.html_guidance</a>

### ***2.2.8 Uncertainty Analysis***

## 2.2 Ecological Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. Army	2002	Bioconcentration, Bioaccumulation and Biomagnification of Nitroaromatic and Nitramine Explosives and their Breakdown Products	U. S. Army CHPPM Toxicology Study No.87-MA-6943-01	
1		U.S. EPA	2002	Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites		<a href="http://www.epa.gov/superfund/programs/risk/ragsa/ucl.pdf">http://www.epa.gov/superfund/programs/risk/ragsa/ucl.pdf</a>
1		U.S. EPA	2002	National Recommended Water Quality Criteria: 2002	EPA-822-R-02-047	<a href="http://www.epa.gov/waterscience/pc/revcom">http://www.epa.gov/waterscience/pc/revcom</a>
2		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk/datause/parta.htm">http://www.epa.gov/superfund/programs/risk/datause/parta.htm</a>
2		U. S. EPA	1992	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	<a href="http://epa.gov/superfund/programs/risk/datause/partb.htm">http://epa.gov/superfund/programs/risk/datause/partb.htm</a>
2		U. S. EPA	1994	US EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Reviews		
2		U. S. EPA	1997	Policy for Use of Probabilistic Analysis in Risk Assessment at the U.S. Environmental Protection Agency.		<a href="http://www.epa.gov/ncea/mcpolicy.htm">http://www.epa.gov/ncea/mcpolicy.htm</a>
2		U. S. EPA	1997	The Incidence and Severity of Sediment Contamination in Surface Waters of the United States (Volumes 1-3)	EPA 8230R-97-006	
2		U. S. EPA	1998	Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Alternatives, and Inclusion of Stakeholders	EPA 8230R-97-006 EPA 8230R-97-Memorandum	
2		U. S. EPA	1998	Guidelines for Ecological Risk Assessment. Final.	EPA/630/R-95-002F	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460</a>
2		U. S. EPA	1999	Risk Assessment Guidance for Superfund, Volume 3 – Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A). Draft	OSWER EPA 000-0-99-000	<a href="http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm">http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm</a>
2		U. S. EPA	1999	US EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review		
2		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4. EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsdocs/g4final">http://www.epa.gov/quality1/qsdocs/g4final</a>
2		U. S. Navy	2000	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U. S. Navy and Marine Corps Facilities Part 1: Overview of Metals Bioavailability, User's Guide	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	

### 2.2.8 Uncertainty Analysis

## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer. Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
2	U. S. DoD	2000	Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment	SFIM-AEC-ER-200015	<a href="https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html">https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html</a>
3	U.S. EPA	1989	Soil Sampling Quality Assurance User's Guide - Second	EPA/600/8 -89/045	<a href="http://www.epa.gov/tio/download%2Fchar%2Fsoilsamp.pdf">http://www.epa.gov/tio/download%2Fchar%2Fsoilsamp.pdf</a>
3	U.S. EPA	1992	National Study of Chemical Residue in Fish, Volume 1	EPA 823-R-92_006a	<a href="http://www.epa.gov/waterscience/library/fish/residuevol1.pdf">http://www.epa.gov/waterscience/library/fish/residuevol1.pdf</a>
3	U. S. EPA	1992	National Study of Chemical Residue in Fish, Volume 2	EPA 823-R-92_006b	<a href="http://www.epa.gov/waterscience/library/fish/residuevol2.pdf">http://www.epa.gov/waterscience/library/fish/residuevol2.pdf</a>
3	U. S. EPA	1994	Data Quality Objectives Decision Error Feasibility Trials (DEFT)	EPA Computer Program	
3	U. S. EPA	1997	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Interim Final (ERAGS)	OSWER 9285.7-25, EPA/540/R-	<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm">http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm</a>
3	U. S. EPA	1997	Guiding Principles for Monte Carlo Analysis	EPA/630/R-97/001	<a href="http://www.epa.gov/ncea/monnteabs.htm">http://www.epa.gov/ncea/monnteabs.htm</a>

### ***2.2.8 Uncertainty Analysis***

## ***2.2 Ecological Risk Assessments***

### ***2.2.9 Baseline Assessment: Risk Characterization***

#### **Applicable AFCEE Notes**

AFCEE Requirements for Development and Application of Conceptual Site Models

AFCEE Requirements for Development and Use of Lines of Evidence in Ecological Risk Assessments

AFCEE Requirements for Development and Application of Uncertainty Analyses in Risk Assessment

AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments

AFCEE Requirements for the Use of Scientific/Management Decision Points in Ecological Risk Assessments

AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments

AFCEE Requirements for Selecting Chemicals of Potential Concern in Human Health and Ecological Risk Assessments

#### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer.</i></b>	<b><i>Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
1		U. S. EPA	1992	Guidance on Risk Characterization for Risk Managers and Risk Assessors	EPA Office of the Administrator	
1		U. S. EPA	1995	Land Use in CERCLA Remedy Selection Process, OSWER Directive No. 9355.7-04		<a href="http://www.epa.gov/superfund/action/guidance/remedy/landuse.htm">http://www.epa.gov/superfund/action/guidance/remedy/landuse.htm</a>
1	Yes	U. S. EPA	1995	Policy for Risk Characterization at the U.S. Environmental Protection Agency		<a href="http://www.epa.gov/superfund/programs/risk/toolth.htm">http://www.epa.gov/superfund/programs/risk/toolth.htm</a>
1	Yes	U. S. EPA	1997	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Interim Final (ERAGS)	OSWER 9285.7-25, EPA/540/R-	<a href="http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm">http://www.epa.gov/superfund/programs/risk/ecorisk/ecorisk.htm</a>
1		U. S. EPA Reg. 10	1997	EPA Region 10 Supplemental Ecological Risk Assessment Guidance for Superfund	EPA 910-R-97-005	
1	Yes	U. S. EPA	1998	Guidelines for Ecological Risk Assessment. Final.	EPA/630/R-95-002F	<a href="http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460">http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12460</a>

### ***2.2.9 Baseline Assessment: Risk Characterization***

## **2.2 Ecological Risk Assessments**

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U.S. EPA Reg. 8	1999	Background Concentrations - Use in EPA Risk Assessments		<a href="http://www.epa.gov/Region8/superfund/risksf/backgrd8.pdf">http://www.epa.gov/Region8/superfund/risksf/backgrd8.pdf</a>
1	Yes	U. S. EPA	2000	Science Policy Council Handbook: Risk Characterization	EPA 100-B-00-002	<a href="http://www.epa.gov/osp/spc/rchandbk.pdf">http://www.epa.gov/osp/spc/rchandbk.pdf</a>
1		U. S. Army	2002	Bioconcentration, Bioaccumulation and Biomagnification of Nitroaromatic and Nitramine Explosives and their Breakdown Products	U. S. Army CHPPM Toxicology Study No.87-MA-6943-01	
1		U. S. Navy	2002	Critical Issues for Contaminated Sediment Management	MESO-02-TM-01	
1		U. S. EPA	2002	Role of Background in the CERCLA Cleanup Program	OSWER Dir.: 9285.6-07P	<a href="http://www.epa.gov/superfund/programs/risk/role.pdf">http://www.epa.gov/superfund/programs/risk/role.pdf</a>
1		U. S. Army	2002	Selection of Assessment and Measurement Endpoints for Ecological Risk Assessments	SFIM-AEC-ER-TR-2002018	
2		U. S. EPA	1991	The Role of Biological Technical Assistance Groups (BTAGs) in Ecological Assessment, Eco Update Intermittent Bulletin Vol. 1, no. 1	OERR, HSED Publ. 9345.0-05I	
2		U. S. EPA	1994	Assessment and Remediation of Contaminated Sediments (ARCS) Program - Final Summary Report.	EPA 905-S-94-001	<a href="http://www.epa.gov/glnpo/arcs/EPA-905-S94-001/EPA-905-S94-001.html">http://www.epa.gov/glnpo/arcs/EPA-905-S94-001/EPA-905-S94-001.html</a> - ToC8
2		U. S. EPA	1995	Elements to Consider when Drafting EPA Risk Characterizations	EPA Science Policy Council paper	
2		U. S. EPA	1996	Ecological Significance and Selection of Candidate Assessment Endpoints, Eco Update Intermittent Bulletin	EPA/540/F 95/037 OERR, HSED Publ. 9345.0-11FSI NTIS PB95-963323	
2		U. S. EPA	1997	Policy for Use of Probabilistic Analysis in Risk Assessment at the U.S. Environmental Protection Agency.		<a href="http://www.epa.gov/ncea/mcpolicy.htm">http://www.epa.gov/ncea/mcpolicy.htm</a>
2		U. S. EPA	1997	The Incidence and Severity of Sediment Contamination in Surface Waters of the United States (Volumes 1-3)	EPA 8230R-97-006 EPA 8230R-97-006	
2		U. S. EPA Reg. 4	1998	Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Alternatives, and Inclusion of Stakeholders	Memorandum	
2		U. S. EPA	1998	Marine Toxicity Identification Evaluation (TIE), Phase I Guidance Document	EPA/600/R-096/054	
2		U. S. EPA	1999	Risk Assessment Guidance for Superfund, Volume 3 – Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A). Draft	OSWER EPA 000-0-99-000	<a href="http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm">http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm</a>

### **2.2.9 Baseline Assessment: Risk Characterization**



## ***2.2 Ecological Risk Assessments***

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2	U. S. EPA	2000	Options for Development of Parametric Probability Distributions for Exposure Factors	EPA/600/R-00/058.	<a href="http://www.epa.gov/ncea/paramprob4ef.htm">http://www.epa.gov/ncea/paramprob4ef.htm</a>
2	U. S. DoD	2000	Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment	SFIM-AEC-ER-200015	<a href="https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html">https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html</a>
2	U. S. EPA	2001	Framework for Cumulative Risk Assessment	NECA-F-1098	
3	U. S. EPA	1994	Selecting and Using Reference Information in Superfund Ecological Risk Assessments, Eco Update Intermittent Bulletin Vol. 2, no. 4	EPA/540/F-94/050 OERR, HSED Publ. 9345.0-051 NTIS PB94-963319	
3	U. S. EPA	1997	Guiding Principles for Monte Carlo Analysis	EPA/630/R-97/001	<a href="http://www.epa.gov/ncea/monnteabs.htm">http://www.epa.gov/ncea/monnteabs.htm</a>
3	U. S. EPA	2000	Workshop Report on Characterizing Ecological Risk at the Watershed Scale.	EPA/600/R-99/111	<a href="http://www.epa.gov/ncea/pdfs/ecorisk/ecorisk.pdf">http://www.epa.gov/ncea/pdfs/ecorisk/ecorisk.pdf</a>

### ***2.2.9 Baseline Assessment: Risk Characterization***

## 2.3 Tiered Approaches to Risk Assessments

### Applicable AFCEE Notes

AFCEE Requirements for Evaluation of Vapor Intrusion into Indoor Air

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1996	Soil Screening Guidance: Technical Background Document	EPA/540/R 95/128 OSWER Publ. 9355.4-17A NTIS PB94-963502	<a href="http://www.epa.gov/superfund/resources/soil/introtbd.htm">http://www.epa.gov/superfund/resources/soil/introtbd.htm</a>
1	Yes	U. S. EPA	1996	Soil Screening Guidance: User's Guide	EPA/540/R 96/018 OSWER Publ. 9355.4-23 NTIS PB94-963505	<a href="http://www.epa.gov/superfund/resources/soil/">http://www.epa.gov/superfund/resources/soil/</a>
1		U. S. EPA	1996	Soil Screening Guidance: Fact Sheet	EPA/540/F-95/041	<a href="http://www.epa.gov/superfund/resources/soil/fact_sht.pdf">http://www.epa.gov/superfund/resources/soil/fact_sht.pdf</a>
1		U. S. Navy	2001	U.S. Navy Human Health Risk Assessment Guidance		<a href="http://www-nehc.med.navy.mil/hhra/guidancedocuments/process/pdf/introduction.pdf">http://www-nehc.med.navy.mil/hhra/guidancedocuments/process/pdf/introduction.pdf</a>
1		U.S. EPA	2002	Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites		<a href="http://www.epa.gov/superfund/programs/risk/toolthh.htm">http://www.epa.gov/superfund/programs/risk/toolthh.htm</a>
2		U. S. EPA	1996	PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures	EPA/600/P-96F	<a href="http://www.epa.gov/ORD/WebPubs/pcb/">http://www.epa.gov/ORD/WebPubs/pcb/</a>
2		U. S. EPA	1997	Policy for Use of Probabilistic Analysis in Risk Assessment at the U.S. Environmental Protection Agency.		<a href="http://www.epa.gov/ncea/mcpolicy.htm">http://www.epa.gov/ncea/mcpolicy.htm</a>
2		U. S. EPA	1999	Risk Assessment Guidance for Superfund, Volume 3 – Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A). Draft	OSWER EPA 000-0-99-000	<a href="http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm">http://www.epa.gov/superfund/programs/risk/rags3adt/index.htm</a>
2		U. S. DoD	2000	Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment	SFIM-AEC-ER-200015	<a href="https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html">https://www.denix.osd.mil/denix/Public/Library/ERA/Triservguide/triservicetoc.html</a>
2		U. S. Navy	2001	Navy Guidance for Conducting Ecological Risk Assessments		<a href="http://web.ead.anl.gov/ecorisk/process/pdf/index.cfm">http://web.ead.anl.gov/ecorisk/process/pdf/index.cfm</a>
2		U. S. Navy	2001	Navy Policy for Conducting Human Health Risk Assessments Under the Environmental Restoration Program	Memorandum 5090 Ser N453E/1U595168	<a href="http://www-nehc.med.navy.mil/hhra/guidancedocuments/policy/pdf/hrapolicy.pdf">http://www-nehc.med.navy.mil/hhra/guidancedocuments/policy/pdf/hrapolicy.pdf</a>

## 2.3 Tiered Approaches to Risk Assessments

## 2.3 Tiered Approaches to Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
3		U. S. EPA	1997	Guiding Principles for Monte Carlo Analysis	EPA/630/R-97/001	<a href="http://www.epa.gov/ncea/monnteabs.htm">http://www.epa.gov/ncea/monnteabs.htm</a>
3		U. S. EPA	1998	Guidelines for Ecological Risk Assessment. Final.	EPA/630/R-95-002F	<a href="http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?deid=12460">http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?deid=12460</a>

## 2.3 Tiered Approaches to Risk Assessments

## 2.4 Radionuclide Risk Assessment and Remediation

### Applicable AFCEE Notes

There are no applicable notes.

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1991	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Part C, Risk Evaluation of Remedial Alternatives, Interim	EPA/540/R-92/004 OSWER Directive 9285.7-01C	<a href="http://www.epa.gov/superfund/programs/risk/ragsc/index.htm">http://www.epa.gov/superfund/programs/risk/ragsc/index.htm</a>
1		U. S. EPA	1993	Approaches for the Remediation of Federal Facility Sites Contaminated with Explosive or Radioactive Wastes (Handbook)	EPA625/R-93/013	
1		U. S. EPA	1997	Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination	OSWER 9200.4-18	<a href="http://www.epa.gov/oerrpage/superfund/resources/radiation/radarars.htm">http://www.epa.gov/oerrpage/superfund/resources/radiation/radarars.htm</a>
1		U. S. EPA	1997	Health Effects Assessment Summary Tables (HEAST)		<a href="http://www.epa.gov/radiation/heat/">http://www.epa.gov/radiation/heat/</a>
1		U. S. EPA	1998	Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites.	OSWER 9200.4-25	<a href="http://www.epa.gov/superfund/resources/soil/cleanup.htm">http://www.epa.gov/superfund/resources/soil/cleanup.htm</a>
1		U. S. EPA	1999	Cancer Risk Coefficients for Environmental Exposure to Radionuclides	EPA 402-R-99-001 Air and Radiation	
1		U. S. EPA	1999	Radiation Risk Assessment at CERCLA Sites: Q&A.	OSWER 9200.4-31P	<a href="http://www.epa.gov/superfund/resources/radiation/radrisk.htm">http://www.epa.gov/superfund/resources/radiation/radrisk.htm</a>
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html_guidance">http://www.epa.gov/quality/qa_docs.html_guidance</a>
1		U. S. EPA	2000	Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). Revision	EPA 402-R-97-016	<a href="http://www.epa.gov/radiation/marssim">http://www.epa.gov/radiation/marssim</a>
1		U. S. EPA	2000	Remediation Goals for Radioactively Contaminated CERCLA Sites Using the Benchmark Dose Cleanup Criterion in 10 CFR Part 40 – Appendix A, I, Criterion 6(6).	OSWER 9200.4-35P	<a href="http://www.epa.gov/superfund/resources/radiation/radarars.htm">http://www.epa.gov/superfund/resources/radiation/radarars.htm</a>
1		U. S. EPA	2000	Soil Screening Guidance for Radionuclides: Technical Background Document	EPA/540-R-00-006	<a href="http://www.epa.gov/superfund/resources/radiation/radssg.htm">http://www.epa.gov/superfund/resources/radiation/radssg.htm</a>
1		U. S. EPA	2000	Soil Screening Guidance for Radionuclides: User's Guide	EPA/540-R-00-007, PB2000 963307	<a href="http://www.epa.gov/superfund/resources/radiation/radssg.htm">http://www.epa.gov/superfund/resources/radiation/radssg.htm</a>

## 2.4 Radionuclide Risk Assessment and Remediation

## 2.4 Radionuclide Risk Assessment and Remediation

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U.S. EPA	2002	Common Radionuclide Found at Superfund Sites	EPA 540?R-00-004	<a href="http://www.epa.gov/superfund/resources/radiation/pdf/introglos.pdf">http://www.epa.gov/superfund/resources/radiation/pdf/introglos.pdf</a>
1		U. S. EPA	2002	Distribution of OSWER of Radionuclide Preliminary Remediation Goals (PRGs) for Superfund Electronic	OSWER Dir. #: 9355.01 -83A	<a href="http://epa.gov/superfund/resources/radiation/pdf/rad.pdf">http://epa.gov/superfund/resources/radiation/pdf/rad.pdf</a>
1		U. S. EPA	2002	Radionuclide Preliminary Remediation Goals (PRGs) for Superfund	OSWER Dir.: 9285.6-08	
2		U. S. EPA	1988	Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion	EPA 520/1 -88-020	
2		U. S. EPA	1992	Guidance for Performing Site Inspections Under CERCLA, Interim Draft		
2		U. S. EPA	1992	Guidelines for Exposure Assessment	FR 57: 22887-22938	<a href="http://www.epa.gov/ncea/pdfs/guidline.pdf">http://www.epa.gov/ncea/pdfs/guidline.pdf</a>
2		U. S. EPA	1993	External Exposure to Radionuclides in Air, Water, and Soil	Fed. Guidance Report No. 12 EPA-402-R-93-081	
2		U. S. ACE	1998	Development of a Multimedia Exposure Assessment Model for Evaluating Ecological Risk of Exposure to Military-Related Compounds (MRCs) at Military Sites	Tech. Rpt. IRRP -98-9	
2		U. S. EPA	1999	Part II. Environmental Protection Agency: National Primary Drinking Water Regulations; Radon-222; Proposed Rule.	Federal Register	<a href="http://www.epa.gov/safewater/radon/proposal.html">http://www.epa.gov/safewater/radon/proposal.html</a>
2		U. S. EPA	2000	Guidance for Data Quality Assessment: Practical Methods for Data Analysis	EPA/600/R 96/084 EPA/QA/G-9	<a href="http://www.epa.gov/quality/qa_docs.html_guidance">http://www.epa.gov/quality/qa_docs.html_guidance</a>
2		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4, EPA 600/R 96/055	<a href="http://www.epa.gov/quality/1/qsdocs/g4final">http://www.epa.gov/quality/1/qsdocs/g4final</a>
2		U. S. EPA	2000	Part II. Environmental Protection Agency: National Primary Drinking Water Regulations; Radionuclides; Final Rule.		<a href="http://www.epa.gov/safewater/rads/radfr.pdf">http://www.epa.gov/safewater/rads/radfr.pdf</a>
2		U. S. ACE	2002	White Paper: Using RESRAD in a CERCLA Radiological Risk Assessment		
3		U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>

## 2.4 Radionuclide Risk Assessment and Remediation

## 2.5 Risk Assessments after the Feasibility Study

### Applicable AFCEE Notes

There are no applicable notes.

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1987	Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements	OSWER Directive 9234.0-05	
1		U. S. EPA	1991	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Part C, Risk Evaluation of Remedial Alternatives, Interim	EPA/540/R-92/004 OSWER Directive 9285.7-01C	<a href="http://www.epa.gov/superfund/programs/risk/ragsc/index.htm">http://www.epa.gov/superfund/programs/risk/ragsc/index.htm</a>
1		U. S. EPA	1995	Land Use in CERCLA Remedy Selection Process, OSWER Directive No. 9355.7-04		<a href="http://www.epa.gov/superfund/action/guidance/remedy/landuse.htm">http://www.epa.gov/superfund/action/guidance/remedy/landuse.htm</a>
1		U. S. EPA Reg. 4	1998	Application of RAGS Part D at Federal Facilities in Region	Memorandum	
1	Yes	U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html - guidance">http://www.epa.gov/quality/qa_docs.html - guidance</a>
2		U. S. EPA	1993	Selecting Remediation Techniques for Contaminated	EPA-823-B93-001	<a href="http://www.epa.gov/waterscience/library/segment/remediation.pdf">http://www.epa.gov/waterscience/library/segment/remediation.pdf</a>
2		U. S. EPA	1995	QA/QC Guidance for Sampling and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluation: Chemical Evaluations	EPA 823-B-95-001	<a href="http://www.epa.gov/waterscience/library/segment/evaluationguide.pdf">http://www.epa.gov/waterscience/library/segment/evaluationguide.pdf</a>
2		U. S. EPA	1997	Human Health Risk Assessment: Current Approaches & Future Directions	Risk Assessment Forum U.S> Environmental Protection Agency Technical Panel	
2		U. S. EPA	1998	Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.	EPA/540/F-98/030 OSWER9200.4-27, PB98-963244	<a href="http://www.epa.gov/superfund/programs/lead/products.htm - guidance">http://www.epa.gov/superfund/programs/lead/products.htm - guidance</a>
2		U. S. EPA	1998	Proposed TSCA §403 Soil Lead Hazard and OSWER's Lead-in-Soils Policy	EPA 540-F-98-061. OSWER 9200.4-29, PB99-963211	<a href="http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf">http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf</a>
2		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4. EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qdocs/g4final">http://www.epa.gov/quality1/qdocs/g4final</a>
2		U. S. EPA Reg. 4	2000	Human Health Risk Assessment Bulletins - Supplement to RAGS		<a href="http://www.epa.gov/region04/waste/ots/healbul.htm">http://www.epa.gov/region04/waste/ots/healbul.htm</a>

## 2.5 Risk Assessments after the Feasibility Study

## ***2.5 Risk Assessments after the Feasibility Study***

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2	U. S. Army	2000	Interim Army Guidance for Conducting CERCLA Five-Year Reviews		
2	U. S. EPA	2001	Comprehensive Five-Year Review Guidance	OSWER Directive 9355.7-03B-P	<a href="http://www.epa.gov/superfund/resources/5year/index.htm">http://www.epa.gov/superfund/resources/5year/index.htm</a>
2	U. S. EPA	2002	Guidance for Monitoring at Hazardous Waste Sites: Framework for Monitoring Plan Development and	OSWER No. 9355.4-28	
3	U. S. EPA	1991	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Part B. Development of Risk-Based Preliminary Remediation Goals, Interim	EPA/540/R 92/003 OSWER Directive 9285.7-01B	<a href="http://www.epa.gov/superfund/programs/risk/ragsb/index.htm">http://www.epa.gov/superfund/programs/risk/ragsb/index.htm</a>
3	U. S. EPA	1993	Approaches for the Remediation of Federal Facility Sites Contaminated with Explosive or Radioactive Wastes (Handbook)	EPA625/R-93/013	
3	U. S. EPA	2000	Part II. Environmental Protection Agency: National Primary Drinking Water Regulations; Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring; Proposed Rule	Federal Register	<a href="http://www.epa.gov/safewater/ars/arsenic.pdf">http://www.epa.gov/safewater/ars/arsenic.pdf</a>
3	U. S. EPA U. S. DoD U. S. DOE	2000	Uniform Federal Policy for Implementing Environmental Quality Systems – Evaluating, Assessing, and Documenting Environmental Data Collection/Use and Technology	Intergovernmental Data Quality Task Force	
3	U. S. EPA	2001	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal.pdf">www.epa.gov/superfund/resources/reusefinal.pdf</a>
3	U. S. EPA Reg. 4	2001	EPA Region 4 Human Health Risk Assessment Bulletins– Supplement to RAGS	U.S. EPA Region 4	

## ***2.5 Risk Assessments after the Feasibility Study***

## 2.6 Risk Management

### Applicable AFCEE Notes

AFCEE Requirements for the Use of Scientific/Management Decision Points in Ecological Risk Assessments

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		U. S. EPA	1990	National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Final Rule	40 CFR 300.61-300.81 (Subpart F)	<a href="http://www.epa.gov/oilspill/ncpkeys.htm">http://www.epa.gov/oilspill/ncpkeys.htm</a>
1		U. S. EPA	1991	Role of Baseline Risk Assessment in Superfund Remedy Selection Decisions	OSWER Directive 9355.0-30	<a href="http://www.epa.gov/superfund/programs/risk/baseline.htm">http://www.epa.gov/superfund/programs/risk/baseline.htm</a>
1		U. S. EPA	1993	Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objective Process	Issued from Office of Research and Development	
1		U. S. EPA	1995	Land Use in CERCLA Remedy Selection Process, OSWER Directive No. 9355.7-04		<a href="http://www.epa.gov/superfund/action/guidance/remedy/landuse.htm">http://www.epa.gov/superfund/action/guidance/remedy/landuse.htm</a>
1		U. S. EPA	1997	Ecological Risk Management Principles for Superfund Sites	OSWER Dir.: 9285.7-28 P	
1		U. S. EPA Reg. 4	1998	Application of RAGS Part D at Federal Facilities in Region	Memorandum	
1		U. S. EPA	1998	Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.	EPA/540/F-98/030 OSWER9200.4-27, PB98-963244	<a href="http://www.epa.gov/superfund/programs/lead/products.htm">http://www.epa.gov/superfund/programs/lead/products.htm</a> - guidance
1		U. S. EPA	1998	EPA's Contaminated Sediment Management Strategy	EPA-823-R-98-001	<a href="http://www.epa.gov/waterscience/cs/strategy">http://www.epa.gov/waterscience/cs/strategy</a>
1		U. S. EPA	1998	Proposed TSCA §403 Soil Lead Hazard and OSWER's Lead-in-Soils Policy	EPA 540-F-98-061. OSWER 9200.4-29, PB99-963211	<a href="http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf">http://www.epa.gov/superfund/programs/lead/products/1298memo.pdf</a>
1		U. S. EPA	1999	Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites.	OSWER 9285.7-28P	<a href="http://www.epa.gov/superfund/programs/risk/tooleco.htm">http://www.epa.gov/superfund/programs/risk/tooleco.htm</a>
1		U. S. EPA	2000	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 3: Overview of Risk Management	Office of Water	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
1		U. S. Army	2000	Principles of Environmental Restoration	U.S. Army Environmental Center, Aberdeen Proving Ground, Edgewood Area	<a href="http://aec.army.mil/usaec/restoration/per-manual101.pdf">http://aec.army.mil/usaec/restoration/per-manual101.pdf</a>

## 2.6 Risk Management



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### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
1		DOD	2001	Policy on Land Use Controls Associated with Environmental Restoration Activities	Memorandum	
1		U. S. EPA	2002	Institutional Controls and Transfer of Real Property under CERCLA Section 120(h)(3)(A), (B) or (C)		
1		U. S. EPA	2002	Principles for Managing Contaminated Sediment Risk at Hazardous Waste Sites		<a href="http://www.epa.gov/superfund/resources/principles/9285.6-08.pdf">http://www.epa.gov/superfund/resources/principles/9285.6-08.pdf</a>
1		U. S. EPA Reg 10	2002	Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities Resource Conservation and Recovery Act (RCRA)		
1		U. S. EPA	2002	Role of Background in the CERCLA Cleanup Program	OSWER Dir.: 9285.6-07P	<a href="http://www.epa.gov/superfund/programs/risk/role.pdf">http://www.epa.gov/superfund/programs/risk/role.pdf</a>
2		U. S. EPA	1990	Hazard Ranking System	FR 55: 51625-51662	
2		U. S. EPA	1990	Managing Contaminated Sediments: EPA Decision-Making Processes	EPA 506/6-90/002	<a href="http://www.epa.gov/waterscience/library/sediment/managingcs.pdf">http://www.epa.gov/waterscience/library/sediment/managingcs.pdf</a>
2		U.S. EPA	1991	Conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfill Sites	EPA/540/P-91/001	
2		U.S. EPA	1991	Remediation of Contaminated Sediments	EPA/625/6-91/028	
2		U. S. EPA	1992	Guidance on Risk Characterization for Risk Managers and Risk Assessors	EPA Office of the Administrator	
2		U.S. EPA	1992	National Study of Chemical Residue in Fish, Volume 1	EPA 823-R-92_006a	<a href="http://www.epa.gov/waterscience/library/fish/residuevol1.pdf">http://www.epa.gov/waterscience/library/fish/residuevol1.pdf</a>
2		U. S. EPA	1992	National Study of Chemical Residue in Fish, Volume 2	EPA 823-R-92_006b	<a href="http://www.epa.gov/waterscience/library/fish/residuevol2.pdf">http://www.epa.gov/waterscience/library/fish/residuevol2.pdf</a>
2		U. S. EPA	1992	The Role of Natural Resource Trustees in the Superfund Process, Eco Update Intermittent Bulletin Vol, 1, no. 3	OERR, HSED Publ. 9345.0-05I	
2		U. S. EPA	1994	Assessment and Remediation of Contaminated Sediments (ARCS) Program - Final Summary Report.	EPA 905-S-94-001	<a href="http://www.epa.gov/glnpo/arcs/EPA-905-S94-001/EPA-905-S94-001.html">http://www.epa.gov/glnpo/arcs/EPA-905-S94-001/EPA-905-S94-001.html</a> - ToC8
2		U. S. EPA	1996	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 3: Overview of Risk Management	EPA/82B96006 Office of Water	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>

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### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. EPA	1997	Human Health Risk Assessment: Current Approaches & Future Directions	Risk Assessment Forum U.S.> Environmental Protection Agency Technical Panel	
2		DOD	1997	Relative Risk Site Evaluation Primer		<a href="http://www.dtic.mil/envirodod/Policies/Cleanup/re/risk_re/risk.html">http://www.dtic.mil/envirodod/Policies/Cleanup/re/risk_re/risk.html</a>
2		U. S. EPA	1998	Marine Toxicity Identification Evaluation (TIE), Phase I Guidance Document	EPA/600/R-096/054	
2		U. S. EPA	1998	Risk-Based Clean Closure		<a href="http://www.epa.gov/epaoswer/hazwaste/ca/resource/guidance/risk/cclosfnl.pdf">http://www.epa.gov/epaoswer/hazwaste/ca/resource/guidance/risk/cclosfnl.pdf</a>
2		U. S. EPA	1999	Fact Sheet Polychlorinated Dibenzo-p-dioxins and Related Compounds Update: Impact on Fish Advisories	EPA-823-F-99-015	
2		U.S. EPA	1999	Reuse of CERCLA Landfill and Containment Sites	EPA 540-F-99-015 OSWER 9375.3-	<a href="http://www.epa.gov/superfund/resources/presentation/finalpdf/reuse.pdf">http://www.epa.gov/superfund/resources/presentation/finalpdf/reuse.pdf</a>
2		U. S. ACE	1999	Risk Assessment Handbook - Volume I: Human Health Evaluation	Publication Number: EM 200-1-4	<a href="http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm">http://www.usace.army.mil/inet/usace-docs/eng-manuals/em200-1-4/toc.htm</a>
2		U. S. EPA	2000	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html">http://www.epa.gov/quality/qa_docs.html</a> - guidance
2		U. S. EPA	2000	Drinking Water Standards and Health Advisories Table Reg. 9	Compiled by Bruce MacIer Region 9, Drinking Water Office	
2		U. S. EPA	2000	Prediction of Sediment Toxicity Using Consensus-Based Freshwater Sediment Quality Guidelines	Final report of USGS to U. S. EPA	<a href="http://www.msc.nbs.gov/pubs/center/pdfDocs/91126.pdf">http://www.msc.nbs.gov/pubs/center/pdfDocs/91126.pdf</a>
2		USAF	2000	U.S. Air Force Installation Restoration Program Remedial Project Manager's Handbook		<a href="http://64.241.27.44/ILEVR/Greenbook/home.html">http://64.241.27.44/ILEVR/Greenbook/home.html</a>
2		U. S. EPA	2000	Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California	Federal Register: May 18, 2000 (Volume 65, Number 97) [Rules and Regulations] [Page 31681-31719]	
2		U. S. EPA	2001	Incidence and Severity of Sediment Contamination in Surface Waters of the United States, National Sediment Quality Survey- Draft Report	EPA-823-F-01-031	<a href="http://www.epa.gov/waterscience/cs/draft/survey.html">http://www.epa.gov/waterscience/cs/draft/survey.html</a>
2		U. S. EPA	2001	Planning for Ecological Risk Assessment: Developing Management Objectives	[Draft - Do Not Cite Or Quote] EPA/630/R-01/001A External Review Draft	

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## 2.6 Risk Management

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer.</i>	<i>Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
2		U. S. Navy	2001	U.S. Navy Human Health Risk Assessment Guidance		<a href="http://www-nehc.med.navy.mil/hhra/guidancedocuments/process/pdf/introduction.pdf">http://www-nehc.med.navy.mil/hhra/guidancedocuments/process/pdf/introduction.pdf</a>
2		U. S. EPA	2002	2002 Edition of the Drinking Water Standards and Health Advisories	EPA 822-R-02-038	
3		U. S. EPA	1992	Statistical Methods for Evaluating the Attainment of Cleanup Standards, Vol. 3: Reference – Based Standards for Soils and Solid Media	EPA/230/R-94/004 NTIS PB94-176-	
3		U. S. EPA	1994	Managing Ecological Risk at EPA: Issues and Recommendations for Progress	EPA/600/R-94/183	
3		U. S. EPA	1994	Role of the Ecological Risk Assessment in the Baseline Risk Assessment	OSWER Dir.: 9285.7-17	<a href="http://www.epa.gov/superfund/programs/risk/memo.pdf">http://www.epa.gov/superfund/programs/risk/memo.pdf</a>
3		U. S. EPA	1997	Evaluation of Superfund Ecotox Threshold Benchmark Values for Water and Sediment	EPA-SAB-EPEC-97-009 SAB letter to the EPA Administrator	
3		U. S. EPA	1997	The Role of CSGWPPs in EPA Remediation Programs	OSWER 9283.1-09	<a href="http://www.epa.gov/superfund/resources/csgwpp/role.pdf">http://www.epa.gov/superfund/resources/csgwpp/role.pdf</a>
3		U.S. EPA	1998	RCRA, Superfund & EPCRA Hotline Training Module - Introduction to: Applicable or Relevant and Appropriate Requirements	EPA540-R-98-020 OSWER9205.5-17	<a href="http://www.epa.gov/superfund/contacts/sfh hotline/over.pdf">http://www.epa.gov/superfund/contacts/sfh hotline/over.pdf</a>
3		U. S. DOD/EPA	2000	DoD and EPA Management Principles for Implementing Response Actions at Closed, Transferring, and Transferred (CTT) Ranges	Interim Final	
3		U. S. EPA	2000	Guidance for the Data Quality Objectives Process	EPA QA/G-4, EPA 600/R 96/055	<a href="http://www.epa.gov/quality1/qsd docs/g4final">http://www.epa.gov/quality1/qsd docs/g4final</a>
3		U. S. EPA	2000	Part II. Environmental Protection Agency: National Primary Drinking Water Regulations; Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring; Proposed Rule	Federal Register	<a href="http://www.epa.gov/safewater/ars/arsenic.pdf">http://www.epa.gov/safewater/ars/arsenic.pdf</a>
3		U. S. EPA Reg. 4	2001	EPA Region 4 Human Health Risk Assessment Bulletins-- Supplement to RAGS	U.S. EPA Region 4	
3		USAF & DLA	2001	Remedial Process Optimization Handbook		

## 2.6 Risk Management

## 2.7 Superseded by More Recent Guidance

### Applicable AFCEE Notes

There are no applicable notes.

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
	U. S. EPA	1986	Guidelines for Carcinogen Risk Assessment	EPA-630/R-00/004	
	U. S. EPA	1986	Superfund Public Health Evaluation Manual	PB87-183125	
	U. S. EPA	1987	Data Quality Objectives for Remedial Response Activities: Vol. 1 Development Process	EPA/540/G-87/003a	
	U.S. EPA	1988	Drinking Water Criteria for Polychlorinated Biphenyls	PB89-199256	<a href="http://wlapwww.gov.bc.ca/wat/wq/BCguidelines/pcbs/">http://wlapwww.gov.bc.ca/wat/wq/BCguidelines/pcbs/</a>
	U. S. EPA	1989	Exposure Factor Handbook	EPA/600/8 -89/043 OHEA	
	U.S. EPA	1989	Interim Methods for Development of Inhalation Reference Doses	EPA/600/8 -88/066F	
	U. S. EPA	1989	Risk Assessment Guidance for Superfund, Volume 2: Environmental Evaluation Manual, Interim Final	EPA/540/1 -89/001A	
	U.S. EPA	1990	Interim Methods for Development of Inhalation Reference Concentrations	EPA/600/8 -90/066A Review Draft (Do Not Cite or Quote)	
	U.S. EPA	1991	Methods for Aquatic Toxicity Identification Evaluations - Phase I: Toxicity Characterization Procedures	EPA/600/6 -91/003	
	U.S. EPA	1992	Evaluation of Terrestrial Indicators for Use in Ecological Assessments at Hazardous Wastes Sites	EPA/600/R-92/183	
	U. S. EPA	1992	Framework for Ecological Risk Assessment	RAF EPA/630/R- 92/001	
	U. S. EPA	1993	Data Quality Objectives Process for Superfund, Interim Final Guidance	EPA/540/R 93/071 OSWER NTIS PB94-963203	
	U.S. EPA	1993	Methods for Aquatic Toxicity Identification Evaluations ? Phase II: Toxicity Identification Procedures	EPA/600/3 -88/035	
	U.S. EPA	1993	Methods for Aquatic Toxicity Identification Evaluations ? Phase III: Toxicity Confirmation Procedures	EPA/600/3 -88/036	
	U. S. EPA	1993	RCRA Public Involvement Manual	EPA/530/R 93/006, OSWER	

## 2.7 Superseded by More Recent Guidance

## 2.7 Superseded by More Recent Guidance

### Applicable Guidance

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
	U. S. EPA	1994	Draft Revisions to the Guidelines for Carcinogenic Risk Assessment	EPA/600/BP-92?003	
	U. S. EPA	1994	Ecological Risk Assessment for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Internal Review Draft	ERT	
	U. S. EPA	1994	Estimating Exposure to Dioxin -Like Compounds, Volume I: Executive Summary, Volume II: Properties, Sources, Environmental Levels, and Background Exposures	EPA/600/6-88/005Ca ORD	
	U. S. EPA	1994	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 2: Risk Assessment and Fish Consumption Limits - Third Edition	Office of Science and Technology	
	U. S. EPA	1994	Guidance for the Data Quality Objectives Process, Final	EPA/600/R-96/055 ORD EPA/QA/G-4	
	U.S. EPA	1994	Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children	EPA 540-R-93/081 PB93-	<a href="http://www.epa.gov/superfund/programs/lead/products/toc.pdf">http://www.epa.gov/superfund/programs/lead/products/toc.pdf</a>
	U. S. EPA	1994	Health Assessment Document for 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and Related Compounds, Volume III of III	DRAFT EPA/600/BP-92/001cDO NOT QUOTE OR CITE August 1994 External Review Draft	
	U. S. EPA	1994	Revised Interim Soil Lead Guidance for CERCLA sites and RCRA Corrective Action Facilities	OSWER Dir.: 9355.4-12	
	U. S. EPA	1994	Technical Background Document for Draft Soil Screening Level Guidance	EPA-540/R-94/018 PB94-963503	
	U.S. EPA	1994	Technical Support Document: Parameters and Equations Used in the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children	EPA 540/R-94/040	<a href="http://www.epa.gov/superfund/programs/lead/products/tsd.pdf">http://www.epa.gov/superfund/programs/lead/products/tsd.pdf</a>
	U. S. EPA	1994	US EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review		
	U.S. EPA	1994	Validation Strategy for the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children		<a href="http://www.epa.gov/superfund/programs/lead/products/valstrat.pdf">http://www.epa.gov/superfund/programs/lead/products/valstrat.pdf</a>
	U. S. EPA	1995	Guidance for Risk Characterization, Science Policy Council		<a href="http://www.epa.gov/osp/spc/rcguide.htm">http://www.epa.gov/osp/spc/rcguide.htm</a>
	U. S. EPA	1995	Health Effects Assessment Summary Tables (HEAST)	EPA/540/R-95/036 OSWER TSC EPA Database modem access (513)	

## 2.7 Superseded by More Recent Guidance

## ***2.7 Superseded by More Recent Guidance***

### **Applicable Guidance**

<i>Relev. Rank</i>	<i>Note Refer. Author</i>	<i>Date</i>	<i>Title</i>	<i>Additional Citation Data</i>	<i>Web Link</i>
	U. S. EPA	1995	Scientific Advisory Board's Review of the draft Dioxin Exposure and Health Effects Reassessment Documents	EPA-SAB-EC-95-021 SAB letter to the EPA Administrator	
	U. S. EPA Reg. 4	1995	Supplemental Guidance to RAGS: EPA Region 4 Bulletins - Bulletin No. 1 Data Collection and Evaluation	WMD	
	U. S. EPA	1995	Supplemental Guidance to RAGS: EPA Region 4 Bulletins – Bulletin No. 1 Data Collection and Evaluation	WMD	
	U. S. EPA	1996	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Draft (ERAGS)	ERT	
	U. S. EPA	1996	Exposure Factors Handbook: Volume I of III General Factors, Preliminary Review Draft	EPA/600/P-95/002Ba ORD	
	U. S. EPA	1996	Exposure Factors Handbook: Volume II of III Food Ingestion Factors, Preliminary Review Draft	EPA/600/P-95/002Bb ORD	
	U. S. EPA	1996	Exposure Factors Handbook: Volume III of III Activities Factors, Preliminary Review Draft	EPA/600/P-95/002Bc ORD	
	U. S. EPA	1996	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 3: Overview of Risk Management	EPA/82B96006	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
	U. S. EPA	1996	Guidance for Data Quality Assessment: Practical Methods for Data Analysis	EPA/600/R 96/084 EPA/QA/G-9	
	U. S. EPA	1996	Proposed Guidelines for Carcinogen Risk Assessment	EPA/600/P 92/003C ORD	<a href="http://www.epa.gov/ORD/WebPubs/carcino">http://www.epa.gov/ORD/WebPubs/carcino</a>
	U. S. EPA	1996	Proposed Guidelines for Ecological Risk Assessment	FR 61: 4755147631	
	U. S. EPA	1996	US EPA Region 3 Risk -Based Concentration Table	FR 61: 47551-47631	
	U. S. EPA	1998	Draft Water Quality Criteria Methodology Revisions: Human Health; Notice	43756 Federal Register / Vol. 63, No. 157 / Friday, August 14, 1998 / Notices	
	U. S. EPA	1998	National Recommended Water Quality Criteria; Republication	Fed. Reg. December 10, 1998, Vol. 63, No. 237, pp. 68353-68364	
	U. S. EPA	1998	Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments).	OSWER 9285.7-01D, EPA 540/R-97/033, PB97-963305	<a href="http://www.epa.gov/superfund/programs/risk/ragsd/index.htm">http://www.epa.gov/superfund/programs/risk/ragsd/index.htm</a>
	U. S. EPA	1999	Comprehensive Five-Year Review Guidance. Draft.	EPA 540R/98/050. OSWER Directive 9355.7-03B-P. NTIS PB99-963214.	

## ***2.7 Superseded by More Recent Guidance***

## ***2.7 Superseded by More Recent Guidance***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer. Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
	U. S. EPA Reg. 9	1999	Drinking Water Standards and Health Advisories Table		
	U.S. EPA Reg. 3	1999	EPA Region 3 Risk-Based Concentration Table: Technical Background Information		<a href="http://www.epa.gov/reg3hwmd/risk/tech99.p">http://www.epa.gov/reg3hwmd/risk/tech99.p</a>
	U.S. EPA Reg. 3	1999	EPA Region 3 Soil-to-Groundwater Soil Screening Levels (SSLs)		<a href="http://www.epa.gov/reg3hwmd/risk/sslbg.pdf">http://www.epa.gov/reg3hwmd/risk/sslbg.pdf</a>
	U. S. EPA	1999	Guidelines for Carcinogen Risk Assessment	NECA-F0644 SAB Review Draft DO NOT CITE OR QUOTE, EPA 822-Z-99-001	
	U. S. EPA	1999	National Recommended Water Quality Criteria- Correction		
	U. S. EPA	1999	Strategy for Research on Environmental Risks to Children. Draft.		<a href="http://www.epa.gov/ncea/pdfs/Draft21.pdf">http://www.epa.gov/ncea/pdfs/Draft21.pdf</a>
	U. S. EPA	2000	EPA Region III Risk -Based Concentration Tables		<a href="http://www.epa.gov/reg3hwmd/risk/index.ht">http://www.epa.gov/reg3hwmd/risk/index.ht</a>
	U. S. Navy	2000	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U.S. Navy and Marine Corps Facilities Part 1: Overview of Metals Bioavailability, Final	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	
	U. S. Navy	2000	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U.S. Navy and Marine Corps Facilities Part 2: Technical Background Document for Assessing Metals Bioavailability,	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	
	DUSD (ES/CL)	2000	Interim Policy on Land Use Controls Associated with Environmental Restoration Activities		
	U. S. EPA	2000	User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings (Revised)		
	U. S. EPA	2001	Draft Supplemental Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway (Vapor Intrusion Guidance) - December 2001	RCRA	<a href="http://www.epa.gov/correctiveaction/eis/vapor/vapor.pdf">http://www.epa.gov/correctiveaction/eis/vapor/vapor.pdf</a>
	U. S. EPA	2001	National Primary Drinking Water Standards	EPA 816-F-01-007	<a href="http://www.epa.gov/safewater">http://www.epa.gov/safewater</a>
	U.S. EPA	2001	Reference Manual: Documentation of Updates for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK)		<a href="http://www.epa.gov/superfund/programs/lead/products/rmwini.pdf">http://www.epa.gov/superfund/programs/lead/products/rmwini.pdf</a>

## ***2.7 Superseded by More Recent Guidance***

## ***2.7 Superseded by More Recent Guidance***

### **Applicable Guidance**

<b><i>Relev. Rank</i></b>	<b><i>Note Refer. Author</i></b>	<b><i>Date</i></b>	<b><i>Title</i></b>	<b><i>Additional Citation Data</i></b>	<b><i>Web Link</i></b>
	U.S. EPA	2001	Review of Adult Lead Models - Evaluation of Models for Assessing Human Health Risks Associated with Lead Exposures at Non-Residential Areas of Superfund and Other Hazardous Waste Sites	EPA 9285.7-46	<a href="http://www.epa.gov/superfund/programs/lead/products/adultreview.pdf">http://www.epa.gov/superfund/programs/lead/products/adultreview.pdf</a>
	U. S. EPA	2001	Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (Peer Review Draft)	OSWER 9355.4-24	<a href="http://www.epa.gov/superfund/resources/soil/ssgmarch01.pdf">http://www.epa.gov/superfund/resources/soil/ssgmarch01.pdf</a>
	U.S. EPA	2001	User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Windows« Version	EPA 9285.7-42 EPA 540-K-01-005	<a href="http://www.epa.gov/superfund/programs/lead/products/ugwin.pdf">http://www.epa.gov/superfund/programs/lead/products/ugwin.pdf</a>

## ***2.7 Superseded by More Recent Guidance***



### **3.1.1 AFCEE Requirements for Application of the Data Quality Objectives Process for Human Health and Ecological Risk Assessments**

*Initial version March 2002; current version August 2003*

#### **Introduction**

The Data Quality Objectives (DQO) process is a series of planning steps used to define the criteria that a data-collection design should satisfy (U.S. EPA, 2000a; 2000b). The DQO process ensures that the collection of environmental data is tied to specific problems that need to be solved and decisions that need to be made. DQOs are developed based on specific, well-formulated questions that need to be answered to enable sufficiently informed and technically defensible remedial decisions. The developed DQOs then serve as the basis for designing a data-collection strategy that will produce the type, quantity, and quality of data needed to adequately answer these questions in an efficient and cost-effective manner.

The successful implementation of the DQO process for both human health and ecological risk assessments requires the participation of risk managers, risk assessors, and other appropriate professionals and stakeholders. Risk managers generally include the remedial project manager (RPM) or base environmental coordinator (BEC), as well as the state and U.S. EPA RPMs participating in the Environmental Restoration Program (ERP). The risk managers are the ultimate decision makers. During the DQO process, the risk managers are responsible for characterizing the decisions that must be made and supported by the risk assessment. The risk assessors are responsible for presenting a comprehensive data-collection strategy in a work plan (WP) and sampling and analysis plan (SAP) designed to obtain the data needed to support the decision-making process.

#### **AFCEE Requirements**

DQOs will be developed in accordance with U.S. EPA's DQO process for hazardous waste sites during the planning of any site or background investigation to obtain data for a human health or ecological risk assessment (U.S. EPA, 2000b). The DQOs will (1) clearly express the purpose and objectives of the investigation, (2) identify the schedule, resources, milestones, and regulatory requirements, (3) define the most appropriate type and quantity of data to collect, (4) describe the most appropriate conditions—how, when, and where—for data collection, and (5) specify or describe tolerable limits on decision errors and uncertainties.

The investigation will not begin until the risk managers agree on the DQOs and the data-collection strategy documented in a WP and SAP is finalized with the signature approval of the risk managers. The AFCEE must be notified promptly whenever the risk managers cannot reach agreement on the DQOs or the sampling strategy for an investigation.

## **Recommended Practices and Guidance**

The risk assessors contracted with the AFCEE should ensure that the DQOs are technically defensible, consistent with an up-to-date conceptual site model (CSM), and clearly linked to unanswered questions to be addressed using the data obtained from the investigation. The risk assessors should also work with the risk managers to develop a sampling and analysis strategy to meet the DQOs developed for the investigation.

The full DQO process consists of seven steps (U.S. EPA, 2000a; 2000b):

1. State the problem
2. Identify the decisions to be made
3. Identify inputs to the decision
4. Define the study boundaries
5. Develop a decision rule
6. Specify limits on decision errors
7. Optimize the design for obtaining data

DQOs are qualitative and quantitative statements derived from the first six steps of this process. The DQO process should be dynamic and flexible during the development of the DQOs, and the outputs from one step should lead to a reconsideration of other steps whenever appropriate. The detail of the DQOs that are developed and documented in a WP and SAP will depend on the size and complexity of the investigation.

All seven steps of the DQO process should be developed as appropriate for any data-collection effort conducted to support a human health or ecological risk assessment. Some of the statistical elements of steps 5, 6, and 7 may not be applicable if a statistical hypothesis cannot be formulated and linked to a clear decision. The degree to which the decision will depend on a statistical analysis rather than a qualitative evaluation will be determined by the nature of the risk assessment (screening or baseline), the DQOs developed (quantitative and qualitative statements), and the data (quantitative and qualitative information) that will be available through the planned and the previous investigations to meet the DQOs. If statistical approaches are not used to develop DQO steps 5, 6, or 7, explanations of these decisions and alternative qualitative approaches should be documented in the WP and SAP.

Step 1 in the DQO process includes the development or refinement of the CSM (U.S. EPA, 2000b). An accurate CSM is critical because it will serve as the foundation for all subsequent inputs and decisions during the DQO process. Note that this step corresponds to “problem formulation” in screening and baseline ecological risk assessments (U.S. EPA, 1997).

If both human health and ecological risk assessments are planned for a site, the DQOs and sampling and analysis strategy should be developed in a manner that avoids the duplication of efforts. When appropriate, human health and ecological risk assessors should coordinate their activities and communicate with each other throughout the DQO

process. The early development of CSMs and DQOs by a multi-disciplinary team that includes human health and ecological risk assessors will substantially increase the likelihood that the data needed for both assessments will be obtained through the investigation.

Generally, the DQOs, data-collection design, and quality assurance/quality control procedures will be integrated in the quality assurance project plan to present and document a coherent plan for collecting the data. After data collection is completed, the data will be evaluated during the data quality assurance process to determine whether the DQOs have been met (U.S. EPA, 2000a; 2000b; 2000c).

## References

- U.S. EPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final*. U.S. Environmental Protection Agency: EPA/630/R-95-002F.
- U.S. EPA. 2000a. *Guidance for the Data Quality Objectives Process (QA/G-4), Final*. U.S. Environmental Protection Agency: EPA/600/R-96-055.
- U.S. EPA. 2000b. *Data Quality Objectives Process for Hazardous Waste Site Investigations (QA/G-4HW), Final*. U.S. Environmental Protection Agency: EPA/600/R-00-007.
- U.S. EPA. 2000c. *Guidance for Data Quality Assessment: Practical Methods for Data Analysis (QA/G-9QA96)*. U.S. Environmental Protection Agency: EPA/600/R-96-084.

### **3.1.2 AFCEE Requirements for the Use of Scientific/Management Decision Points in Ecological Risk Assessments**

*Initial version March 2002; current version August 2003*

#### **Introduction**

Scientific/management decision points (SMDPs) are documented communication points between risk assessors and risk managers during the conduct of an ecological risk assessment (ERA) (U.S. EPA, 1997). Risk managers generally include the installation's remedial project manager (RPM) or base environmental coordinator (BEC) and the state and U.S. EPA RPMs participating in the Environmental Restoration Program (ERP). Other stakeholders, including federal and state natural resource trustees, may also have valuable input into the decision-making process. However, the risk managers are the ultimate decision makers; they must reach agreement on the issues being addressed at each SMDP. The risk assessors contracted with the AFCEE are responsible for presenting comprehensive information on the issues so that the risk managers can reach technically defensible agreements. The agreements enable efficient and cost-effective planning and progress of subsequent elements of the ERA.

#### **AFCEE Requirements**

SMDPs will document the planning of either a screening or baseline ERA, the conduct of a screening ERA, the development of the conceptual site model (CSM) for a baseline ERA, and the development of a study design for the baseline ERA (U.S. DoD, 2000; U.S. EPA, 1997; 1998). In addition, SMDPs will occur as needed during the site investigation. Each SMDP will involve the risk managers, risk assessors, and other appropriate professionals and stakeholders; these individuals will evaluate and approve the work completed or plan the activities and direction of subsequent work. The ERA will not progress to the next step until the risk managers agree on the critical issues of the SMDP and these agreements are clearly documented. Whenever the risk managers cannot reach agreement on the critical issues that are the subject of the SMDP, the AFCEE will be notified promptly and work on the ERA will not continue.

**Problem formulation and planning** aspects of both screening and baseline ERAs will include an SMDP that documents the need for the ERA, its management objectives, ecological attributes potentially at risk, and agreements on the information required for making technically defensible remedial decisions (U.S. EPA, 1998). The ERA process will not begin until the risk managers agree on and document the need for and the objectives of the ERA, the ecological attributes at risk, and the information required to make remedial decisions.

**Screening ERAs** will include an SMDP, when the risk managers decide on and document one of the following:

- There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk

- A baseline ERA is needed because the information is not adequate to decide whether or not ecological risks are negligible
- A baseline ERA is needed because the information indicates a potential for adverse ecological effects

**CSM** development for a baseline ERA will include an SMDP, when the risk assessors and risk managers discuss the CSM prepared for the site by the risk assessors contracted with the AFCEE. The risk managers must agree on all of the critical elements of the CSM: contaminants of concern, assessment endpoints, exposure pathways, and risk questions. The agreement must also be fully documented before proceeding with study design development for the baseline ERA.

**Study design development** will begin only after the information required for completing the baseline ERA and making technically defensible remedial decisions is comprehensively defined and documented during problem formulation and planning. Recommended measurement endpoints, data quality objectives (DQOs), site investigation methods, and data analysis techniques will be presented to and discussed with the risk managers (U.S. EPA, 1997). These recommendations will be fully based on and consistent with the agreed-upon CSM. These decisions will be fully documented in the finalized work plan (WP) and sampling and analysis plan (SAP). The decisions must have the signature approval of the risk managers before the site investigation begins.

**Site investigations** yielding compelling reasons to revisit the agreements of prior SMDPs will prompt an additional SMDP during the site investigations. Any changes that the risk managers agree on at this point will be documented in an addendum to the WP or SAP.

### **Recommended Practices and Guidance**

A fundamental principle of planning either a screening or baseline risk assessment is that the risk assessors should begin planning the assessment only after they fully understand the potential value of conducting the assessment for the risk managers (U.S. EPA, 1998). Once the risk managers decide that an ERA (screening or baseline) is needed, the risk assessors contracted with the AFCEE should work with the risk managers to facilitate the development of clearly articulated management goals of the ERA. The risk assessors and risk managers should also discuss the range of management options to be considered. The scope, complexity, focus, and timing of the ERA should be clearly based on the objectives of the ERA, the complexity of the site, and the resources available. The risk assessors should proceed only after the risk managers agree on the need for and objectives of the ERA and after the risk assessors determine the relevance of the available data and the effort needed to accomplish the objectives.

The risk assessors contracted with the AFCEE should ensure that the decisions and agreements of the risk managers at each SMDP are technically sound. Each SMDP that occurs after a screening ecological risk assessment or during a baseline ERA should be documented in sufficient detail to provide a technically solid foundation for the subsequent steps of the ERA process. In particular, the decision to proceed with a baseline ERA based on the results of a screening assessment, and the agreements pertaining to baseline problem formulation, planning, and the CSM should be

documented by the risk managers as soon as possible after they are made. Documentation may be in the form of a letter from the installation RPM or BEC to the other risk managers detailing the decisions and agreements made at each of these SMDPs. Later in the process, the WP and SAP should include the documentation of these SMDPs. The WP and SAP will also document or cite the documentation for all subsequent decisions and agreements on the study design, including the results and conclusions of any field verification study of the sampling plan performed prior to finalization of the WP and SAP (U.S. EPA, 1997).

The risk assessors contracted with the AFCEE should ensure that the risk managers understand that agreements documented at prior SMDPs will not be revisited during the site investigation. Exceptions should occur only if all of the risk managers believe that there is a compelling new reason to do so (i.e., changing field conditions or unexpected nature and extent of contamination). If there is a compelling reason, then the risk assessors should present an explanation of the unexpected conditions, their implications, and recommended modifications of the WP or SAP; they should also provide satisfactory responses to the questions, comments, concerns, and expressed requirements of the risk managers. The risk assessors should ensure that the assessment endpoints and risk questions will still be addressed if changes are made to the WP or SAP during the site investigation.

Risk management should also include SMDPs that require the risk assessors and risk managers to discuss the results of the baseline ERA as needed. The risk assessors contracted with the AFCEE should ensure that the risk managers understand the results, strengths, uncertainties, and ecological significance of the baseline ERA. The risk assessors should also help to ensure that the decisions documented in the record of decision or other decision documents are technically defensible and reflect an accurate summary of the ERA.

## **References**

- U.S. DoD. 2000. *Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment*. SFIM-AEC-ER-CR-200015. Aberdeen Proving Ground, MD.
- U.S. EPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final*. U.S. Environmental Protection Agency: EPA/630/R-95-002F.
- U.S. EPA. 1998. *Guidelines for Ecological Risk Assessment, Final*. U.S. Environmental Protection Agency: EPA/630/R-95/002F.

### **3.1.3 AFCEE Requirements for Evaluation of Vapor Intrusion into Indoor Air**

*August 2003*

#### **Introduction**

The guidance released by the U.S. Environmental Protection Agency (EPA) (2002) provides a consistent method to both the responsible parties of contaminated sites and regulatory agencies to evaluate the vapor intrusion pathway. The method facilitates demonstration of due diligence when assessing the vapor intrusion pathway for completeness and the associated risks to indoor receptors. The approach presented in the EPA guidance is a tiered series of evaluations; each is used to determine whether further evaluation or immediate action is warranted or whether the pathway can be removed from further consideration. Should the vapor intrusion pathway be found to be complete, the estimated or measured vapor concentrations are used to estimate risks to the residents or occupants of the affected buildings.

A complicating factor in evaluating the risk from vapor intrusion of site-related chemicals into indoor air is the potential presence in the building air of some of the same chemicals from background sources (e.g., ambient air contaminants or sources in the buildings such as household solvents/cleaners and fuels). This situation can generate misleading results because it is difficult—sometimes impossible—to eliminate or adequately account for contributions from background sources (U.S. EPA, 2002). Therefore, indoor air sampling is conducted only if it is necessary to confirm modeled estimates of contaminant concentrations or when there is a potential for direct release of site-related vapors into indoor air (such as from basement sumps containing contaminated groundwater).

#### **AFCEE Requirements**

The vapor intrusion into indoor air pathway must be considered when evaluating the potential risks posed by site contaminants. A phased approach will be used to evaluate (1) the potential for site-related vapors to intrude into nearby buildings and (2) the resulting risk if the pathway is complete. Each phase—or step within a phase—of the evaluation will be governed by a work plan that is based on an up-to-date conceptual site model (CSM) and data quality objectives (DQOs) specific to the evaluation step being planned.

If at any phase—or step within a phase—a determination is made that the subsurface-to-indoor air pathway is incomplete, the evaluation leading to that determination will be documented. Documentation will include details of the investigation of potential contaminant-transport-augmentation factors, such as seasonal conditions and underground utility corridors.

If the subsurface-to-indoor air pathway is potentially complete, the DQO process will be followed rigorously to plan the risk assessment effort(s) and to ensure that the required data are collected to make technically sound risk-based decisions. The effort(s) will be comprehensively documented, and the risk assessment(s) will include a risk characterization that considers cumulative risk to residents and occupants via all exposure

pathways and includes a comprehensive uncertainty analysis (U.S. EPA, 2000; Hers *et al.*, 2003). If indoor air sampling is required, the work plan for these efforts will be developed based on existing guidance (MA DEP, 2002; U.S. EPA, 2002) to ensure that the results are technically defensible. If a baseline risk assessment has already been submitted to the regulatory agencies before the indoor air risk assessment is completed, the documentation of the indoor air evaluation will be prepared for submittal to the regulatory agencies as a stand alone risk assessment document.

If, during any phase of the evaluation, buildings are identified that potentially warrant immediate action, the AFCEE Project Manager and the installation Remedial Project Manager will be notified immediately. These notifications and any actions taken will be documented in letters to both managers.

### **Recommended Practices and Guidance**

A phased approach should be used to evaluate the potential for subsurface vapors to intrude into indoor air and pose an inhalation risk. The phased approach is necessary because there are several points in the process where substantive decisions must be made concerning whether additional evaluation is needed. Three major phases are recommended: (1) the pathway evaluation phase, (2) the media-to-media transfer evaluation phase, and (3) the confirmation phase. During all phases of investigation the individuals conducting the work should be mindful of conditions that would warrant immediate action (e.g., resident reports of headaches/dizziness, contaminant odors, potential explosive hazards) and immediately contact the appropriate parties to ensure that necessary protective action is taken.

The pathway evaluation phase should be limited to determining (1) whether the pathway for the migration of site-related subsurface contaminants into the indoor air of nearby buildings is potentially complete and (2) whether current conditions warrant immediate action. This first phase can be completed when general knowledge of the site is sufficient to develop a CSM and to know or reasonably suspect that site-related contaminants of potential indoor air concern are present in the subsurface (U.S. EPA, 2002). During this evaluation phase, diligence is needed to ensure comprehensive investigation of factors that could enhance the transport of contaminated media toward indoor receptors (e.g., utility conduits and seasonal water table fluctuations). The report on this phase should clearly demonstrate either that the pathway is not complete or that it is potentially complete.

The initial effort in the media-to-media transfer evaluation phase should be to evaluate the potential for unacceptable indoor air concentrations of chemicals of potential (COPCs) by comparing measured or reasonably estimated media concentrations to screening concentrations available from selected guidance documents (such as U.S. EPA, 2002). If the measured or reasonably estimated media concentrations do not exceed the screening concentrations, this information should be included in the risk assessment for the site. If a baseline risk assessment has already been submitted to the regulatory agencies, the documentation of the indoor air evaluation should be prepared for submittal to the regulatory agencies as a stand alone document.

If the site media concentrations of contaminants of potential indoor air concern are greater than the screening concentrations, an additional media-to-media transfer



evaluation is conducted. To the extent possible, this effort should incorporate site-specific information into the model used to estimate indoor air concentrations of contaminants (Johnson and Ettinger, 1991; U.S. EPA, 2000). Such site-specific information includes—but is not limited to—spatial characteristics of the contaminated medium and building foundation, soil characteristics, and building structural and air handling characteristics (Hers *et al.*, 2003). This step should produce estimates of sub-foundation soil gas and indoor air concentrations of COPCs, as well as an indication of whether intruded vapors of COPCs pose an unacceptable risk. The risk determination is made by comparing the calculated indoor air concentrations to published risk-based concentrations (e.g.: U.S. EPA, 2002; U.S. EPA Region IX, 2002) or is based on calculated risk estimates. In either case, the risk determination is presented as a risk characterization that includes a comprehensive uncertainty analysis (Hers *et al.*, 2003; U.S. EPA, 2000).

The confirmation phase is initiated in cases where the results of the media-to-media transfer evaluation indicate that indoor air concentrations of COPCs may pose an unacceptable risk or when the results are equivocal. In these cases, the concentrations of COPCs in sub-foundation soil gas, or as a last option in indoor air, need to be evaluated. This DQO-guided evaluation should focus on confirming the concentrations of COPCs calculated in the media-to-media evaluation phase. The results of this evaluation are presented as a risk characterization that includes a comprehensive uncertainty analysis (Hers *et al.*, 2003; U.S. EPA, 2000).

Because of the complications associated with sampling indoor air and distinguishing the contribution of background concentrations to the total indoor air concentration of COPCs, sampling of indoor air should be conducted only if remediation decisions cannot be made without such an evaluation. Sampling of indoor air will likely be required when preferential pathways exist for vapor intrusion into building, such as sumps or wet basements.

## References

- Hers, I., Zapf-Gilje, R., Johnson, P.C., and Li, L. 2003. "Evaluation of the Johnson and Ettinger Model for Prediction of Indoor Air Quality," *Ground Water Monitoring and Remediation*. 23(2): 119-133.
- Johnson, P.C. and Ettinger, R. 1991. "Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors into Buildings," *Environmental Science and Technology*. 25(8): 1445-1452.
- MA DEP. 2002. *Indoor Air Sampling and Evaluation Guide*. Massachusetts Department of Environmental Protection: WSC Policy #02-430.
- U.S. EPA. 2000. *Science Policy Council Handbook: Risk Characterization*. U.S. Environmental Protection Agency: EPA 100-B-00-002F.
- U.S. EPA. 2002. *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils*. U.S. Environmental Protection Agency: EPA/540/1-89/002.
- U.S. EPA Region IX. 2002. *Region 9 Preliminary Remediation Goals (PRGs)*. U.S. Environmental Protection Agency, Region IX.

### **3.2.1 AFCEE Requirements for Development and Application of Conceptual Site Models**

*Initial version March 2002; current version August 2003*

#### **Introduction**

A conceptual site model (CSM) (sometimes called a conceptual model) is a written and/or pictorial representation of an environmental system. CSMs describe the biological, physical, and chemical processes that determine the transport of contaminants from sources through environmental media to environmental receptors that could potentially be affected by exposure to the contaminants. CSMs are used to integrate technical information, identify data needs, establish reference areas for collecting information on the background concentrations of chemicals, and develop working hypotheses or questions about how exposures might affect receptors. These functions of CSMs make them critical elements of all risk assessment work plans, reports, and briefings. For the purpose of this note, a site is defined as the entity on which remedial decisions will be made.

#### **AFCEE Requirements**

Once a preliminary assessment/site inspection, a RCRA facility assessment, or a National Priority List evaluation has been conducted for a site, there should be sufficient information to develop an initial CSM. Site-specific CSMs must be provided in the work plans for each subsequent investigative effort and they must be used to technically justify the efforts delineated in the work plans. Site-specific CSMs must be revised to integrate the technical information generated by these investigations and the revised CSMs must be used to interpret the risk assessments conducted for each site. Site-specific CSMs are required for the following activities:

- Integration and presentation of site information at all Scientific/Management Decision Points
- Development and justification of investigation work plans
- Integration of risk assessment information in remedial investigation reports
  - Interpretation of the risk assessments
  - Evaluation of the uncertainty of the risk assessments
- Evaluation of remedial alternatives

#### **Recommended Practices and Guidance**

An outline of the overall process for developing a CSM is provided in Exhibit 6 of the Guidance for Data Usability in Risk Assessment (U.S. EPA, 1992). Greater detail on the information that is included in human health and ecological CSMs can be found in a variety of guidance documents and open literature publications (e.g., ASTM, 1995; Suter, 1999; U.S. EPA, 1989; 1996). Once the necessary information is available, the means of presenting the CSM must be addressed. The type of presentation used is governed by the complexity of the site and the audience to whom the CSM will be presented. The audience may not be limited to environmental professionals and may include the general public.

There is no single best way to present the CSM, and the method may vary with the specific purpose of the document or the briefing in which it is imbedded. The most useful way to present the CSM is with a combination of text, figures, flow charts, and tables (ASTM, 1995). The CSM for each site includes maps that accurately identify the location of the source and depict the boundaries of the base, as well as other sites and sources, residential areas, wetlands, and other areas where potential receptors may be found.

A CSM evolves as the Environmental Restoration Program (ERP) efforts for a site progress. In the ERP process, a CSM is used as a communication tool to integrate site information, clarify assumptions, and pose questions to be answered by the risk assessments for the site. Developing the CSM compels the risk assessor to work with the risk managers to justify their assumptions and develop questions that need to be answered concerning source areas, exposure pathways, and receptors. The CSM is then used to justify and focus additional investigations in a work plan. It also provides the framework for the risk assessment and its uncertainty analysis.

CSMs are used to demonstrate that a proposed source characterization effort will provide information that (1) is both sufficient and relevant for the site risk assessments and (2) meets the data quality objectives. Following the source characterization effort, the CSM is updated to incorporate the information developed by the investigation. When source characterization information is integrated into the CSM, an evaluation is provided of whether the source of contamination has been sufficiently characterized to support the site risk assessments.

The CSM includes an evaluation of all potential pathways. For each pathway, a technical case is developed to designate the pathway as complete, incomplete, negligible, or insufficiently characterized. For those pathways that are complete, information is provided that supports its description as a major or a minor contributor to the current or the potential future exposure of each receptor. In considering ecological receptors, the food web that may result in exposure of higher trophic level receptors to site contaminants is delineated in sufficient detail to make the case for pathways being complete, incomplete, negligible, or insufficiently characterized.

All potential receptors are included in the CSM. The information on the exposure pathways is used as the basis for determining whether each receptor is or is not exposed. Cases supporting the exposure or non-exposure are presented for both current and future human health and ecological receptors, as appropriate for the site.

Ecological risk assessment CSMs differ from human-health risk assessment CSMs predominantly in the description of the receptors. A variety of ecological receptors can be delineated in a generalized (human-health and ecological) CSM. In an ecological risk assessment CSM, the exposure pathways must be directly linked to the assessment endpoints—the ecological attributes that are to be protected (U.S. EPA, 1997). The CSM serves as the foundation for the selection of measurement endpoints and for the sampling and analysis plan developed for the baseline ecological risk assessment.

## References

ASTM. 1995. *Standard Guide for Developing Conceptual Site Models for Contaminated Sites*. American Society for Testing and Materials: E 1689–95.

Suter, G. W. 1999. “Developing Conceptual Models for Complex Ecological Risk Assessments,” *Human and Ecological Risk Assessment*. (5)2: 375–396.

U.S. EPA. 1989. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final (RAGS, Part A)*. U.S. Environmental Protection Agency: EPA/540/1-89/002.

U.S. EPA. 1992. *Guidance for Data Usability in Risk Assessment (Part A)*. U.S. Environmental Protection Agency: 9285.7-09A/FS.

U.S. EPA. 1996. *Soil Screening Guidance: User’s Guide*. U.S. Environmental Protection Agency: EPA/540/R-96-018.

U.S. EPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final*. U.S. Environmental Protection Agency: EPA 540/R-97-006.

### **3.2.2 AFCEE Requirements for Development and Use of Lines of Evidence in Ecological Risk Assessments**

*Initial version March 2002; current version August 2003*

#### **Introduction**

Lines of evidence in ecological risk assessments (ERAs) are defined as “[i]nformation derived from different sources or by different techniques that can be used to describe and interpret risk estimates. Unlike the term ‘weight of evidence’, it does not necessarily imply assignment of quantitative weightings to information” (U.S. EPA, 1998). Lines of evidence include the measurement endpoints, which are calculated ecological hazard quotients and indices, as well as other quantitative measures used to evaluate the potential risk of harm to assessment endpoints. In addition, lines of evidence include the qualitative and the professional judgment elements of an ERA. For the baseline ERA, multiple measurement endpoints are often associated with each assessment endpoint; these measurement endpoint lines of evidence are the basis for structuring the analysis section of this assessment. Therefore, the lines of evidence that will be developed for a baseline ERA are delineated only after the assessment endpoints are selected.

Delineating the lines of evidence, particularly the quantitative measurement endpoints, establishes the study design and the data quality objectives (DQOs) for the baseline ERA. As such, the lines of evidence that will be developed for each assessment endpoint are comprehensively described in site-specific work plans (WPs) and sampling and analysis plans (SAPs) (U.S. EPA, 1997).

Preparation of the risk characterization of the ERA includes evaluation and interpretation of all lines of evidence both quantitative and qualitative. The risk characterization, along with the associated uncertainties, is developed such that the thresholds for effects on assessment endpoints and the likelihood of risk of harm to assessment endpoints are understood by the risk managers so that they can make informed and sound decisions.

#### **AFCEE Requirements**

The results of screening ecological risk calculations (U.S. EPA, 1997) are likely to be the only quantitative line of evidence to support the decisions that are made at the screening stage. However, additional lines of evidence will be developed using existing and readily available information to more fully inform the decision makers as they determine whether (1) the ecological risk posed by a site is acceptable, and therefore remediation is not required based on ecological risk, or (2) a site may pose potential adverse ecological effects, and therefore a more thorough assessment or, in some cases, immediate remedial action is warranted. In cases where the potential for ecological impacts exists, the available lines of evidence will be used to eliminate negligible-risk combinations of contaminants and exposure pathways from further consideration (U.S. EPA, 1997).

If the outcome of the screening ERA results in a decision that a more thorough assessment is warranted, the lines of evidence that will be used to evaluate the potential risk to site-specific assessment endpoints will be delineated in the WP and the SAP for

the site. Development of the WP and SAP will incorporate the DQO process to ensure that the type, quantity, and quality of data collected for each line of evidence during the ecological investigation are adequate to support the intended use of the information.

In the risk characterization section of the ERA, data from the lines of evidence will be integrated into a statement about risk to the assessment endpoints established during problem formulation. The statement will accomplish the following:

- Interpret the quantitative risk estimate for each assessment endpoint to include existing impacts, risks, and thresholds of effects on the assessment endpoints
- Evaluate the likelihood of the potential adverse effects actually being realized by the assessment endpoints

Although not specifically lines of evidence, the risk characterization section will include information on the following to facilitate the making of fully informed decisions:

- The location and areal extent of contamination above a threshold for adverse effects
- The degree to which the contaminant concentration exceeds the threshold for adverse effects
- The duration that the contaminant concentrations are expected to exceed the threshold for adverse effects, both with and without removal of the contaminant source

### **Recommended Practices and Guidance**

The development, presentation, and interpretation of the lines of evidence should be done such that a framework is developed for expressing the confidence in the estimate of risk to the assessment endpoints. The lines of evidence are not intended to provide the “proof” demanded in experimental work. However, the risk assessor needs to provide a comprehensive evaluation of all of the lines of evidence developed in the ERA. Presenting only the numeric outcomes of the measurement endpoints will not provide adequate information for the decision-making process.

Confidence in the evaluated risk of harm to assessment endpoints will be increased substantially if several lines of evidence—derived from different sources and techniques—are used in the evaluation. Such lines of evidence include hazard quotients and indices, additional quotient estimates (for example, calculated using background concentrations of chemicals of potential ecological concern), modeling results, bioassays, field information (including the status of vegetation from contaminated and reference areas, abundance and diversity of macroinvertebrates, and species activity observations), extent and mobility of the contamination, tissue data from public health evaluations, and chemical-specific applicable or relevant and appropriate requirements.

When lines of evidence are used to facilitate interpretation of the risk assessment outcome, three factors must be considered when evaluating the information.

- The quality of the data for each line of evidence needs to be delineated. If the information is qualitative, the identity and credentials of the professional interpreting the information should be provided

- The uncertainty associated with each line of evidence should be described
- The directness with which each line of evidence relates to the questions or hypotheses defined during problem formulation should be delineated

After the quality of the collected data, its associated uncertainty, and its relationship to the risk hypotheses have been delineated, a line of evidence is described and interpreted. If lines of evidence do not point toward the same conclusion, the reasons for any inconsistencies should be investigated and discussed in the risk characterization section. If possible, any inconsistencies should be explained to provide an overall conclusion of the potential risk to assessment endpoints, thus providing clear useful information to the decision makers.

## **References**

U.S. EPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final*. U.S. Environmental Protection Agency: EPA/630/R-95-002F.

U.S. EPA. 1998. *Guidelines for Ecological Risk Assessment, Final*. U.S. Environmental Protection Agency: EPA/540/R-97-006.

### **3.2.3 AFCEE Requirements for Development and Application of Uncertainty Analyses in Risk Assessment**

*Initial version March 2002; current version August 2003*

#### **Introduction**

The risk characterization narrative is the most important part of the risk assessment because the risk managers rely on the narrative to make decisions. The uncertainty analysis is a critical element of the risk characterization; without the uncertainty analysis, the risk characterization would be little more than a collection of data, calculations, and estimates. The uncertainty analysis portion of the risk characterization—consisting of analysis, discussion, and conclusions—provides a balanced representation of the uncertainties associated with the earlier portions of the risk assessment and explains their relevance to the human health or environmental effects of concern. The discussion of uncertainty requires analysis and comment on such issues as (1) the quality and quantity of available data, (2) gaps in the database for specific chemicals, (3) the quality of the measurement data, (4) the use of default assumptions, and (5) the scientific judgments or science policy positions that were used to bridge information gaps. This discussion should lead to a statement of confidence in the risk assessment and the associated uncertainties.

#### **AFCEE Requirements**

In both the human health and ecological risk assessments, the detail and sophistication required in the uncertainty analyses depend on whether the uncertainty evaluated is associated with a screening or baseline risk assessment. Although the uncertainty associated with a screening risk assessment will be substantially greater than that of a baseline assessment, the sources and degree of uncertainty associated with screening risk estimates are to be an integral part of the risk characterization sections of the screening assessments.

For baseline risk assessments, the uncertainty associated with all general assumptions will be evaluated, and their likely effect on the calculated risk estimate will be presented and explained (see exhibit 6-21, U.S. EPA, 1989, for example). Furthermore, for all baseline risk assessments, the uncertainty associated with the values selected for all parameters will be presented in individual tables for each exposure scenario evaluated. The table for each exposure scenario will include (1) identification of the parameter, (2) the range of values (observed or reasonable, as appropriate), (3) the midpoint value, (4) the value(s) used in the risk assessment, (5) the rationale for selecting the value(s) used, (6) the uncertainty associated with the value(s), and (7) the likely impact on the risk estimate. The sources of all literature values presented in the table will be provided. The information in the uncertainty table will include the degree to which selected parameter values likely vary from conservative yet reasonable values for the specific conditions of the site being evaluated. The tables will also address the impact of the selected value(s) on the risk assessment—whether and to what degree the value selected would tend to overestimate or underestimate the risk.



Based on the information described above, the noteworthy uncertainties—those that could have greatest impact on the estimated risk—will be identified and interpreted to provide a clear understanding about the consequential aspects of the assessment, including the likelihood of the estimated risk actually being realized by the receptor or assessment endpoint. This information will be developed and presented prominently with the risk estimate in the risk characterization portion of the risk assessment (U.S. EPA, 1989; 1995; 1998; 2000).

### **Recommended Practices and Guidance**

The Environmental Restoration Program generally uses qualitative rather than quantitative methods to evaluate the uncertainty associated with (1) the general assumptions that are made, (2) the values selected for individual parameters of the risk assessment, and (3) the risk estimates themselves. Qualitative methods include a technical discussion that evaluates whether the assessments are representative of actual site conditions. The application of quantitative methods—such as Monte Carlo techniques—to analyze uncertainty is certainly not discouraged. However, the purpose of the uncertainty analysis is to give the risk manager insight into the risk characterization. Therefore, it is important to interpret the results of quantitative uncertainty assessments of selected elements of the risk assessment for their impact on the overall risk estimate relative to other elements whose uncertainty is qualitatively evaluated.

The uncertainty of the individual elements of the hazard identification, toxicity assessment, and exposure assessment could be presented in the risk characterization section of the human health risk assessment and the uncertainty associated with the individual elements of problem formulation, site investigation and analysis of exposure and effects, and verification and acceptance of sampling design could be presented in the risk characterization section of the ecological risk assessment. However, this approach is not recommended because it can introduce into important risk characterization narratives of the human health and ecological risk assessments voluminous information that has minimal impact on the estimated risk or contributes little to the understanding of the uncertainty associated with the risk estimates. Therefore, the recommended approach is to comprehensively address the uncertainties associated with the individual elements of the human health and ecological risk assessment in their respective sections or in an uncertainty section that precedes the risk characterization section. The uncertainty analysis for each section of the risk assessment should identify those elements that—because of their inherent contribution to the calculated risk or because of their associated uncertainty—may have a substantial impact on the estimated risk or on the understanding of the uncertainty associated with the risk estimate.

The uncertainty analysis, a critical element of the risk characterization, must be developed to provide a clear understanding to the risk manager concerning the consequential aspects of the risk assessment. Therefore, based on the uncertainty analyses of the individual risk assessment sections, the noteworthy uncertainties—those that could have greatest impact on the estimated risk—will be further interpreted in the risk characterization section (U.S. EPA, 1989; 1995; 1998; 2000). While the conventional practice is to make conservative assumptions in the absence of data, such assumptions

must be reasonable and the assessment results must be interpreted with caution. Information should be presented in the final assessment indicating that using reasonably conservative assumptions at multiple steps of the risk assessment may produce risk estimates that are overly conservative and thus unreasonable.

## References

- U.S. EPA. 1989. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final (RAGS, Part A)*. U.S. Environmental Protection Agency: EPA/540/1-89/002.
- U.S. EPA. 1995. *Policy for Risk Characterization at the U.S. Environmental Protection Agency*. Issued by the Administrator of the U.S. Environmental Protection Agency (March).
- U.S. EPA. 1998. *Guidelines for Ecological Risk Assessment, Final*. U.S. Environmental Protection Agency: EPA/630/R-95-002F.
- U.S. EPA. 2000. "Risk Characterization," *Science Policy Council Handbook*. U.S. Environmental Protection Agency: EPA 100-B-00-002F.

### **3.2.4 AFCEE Requirements for Selecting Chemicals of Potential Concern in Human Health and Ecological Risk Assessments**

*August 2003*

#### **Introduction**

A site contaminant is a chemical present at elevated concentrations in a medium because of release attributable to site activities. A chemical of potential concern (COPC) is a contaminant selected for further evaluation in a human health or ecological risk assessment because it may threaten human health or the environment. A COPC selected for further evaluation in an ecological risk assessment may also be called a chemical of potential ecological concern. The credibility of a risk assessment depends, in part, on selecting and determining the concentrations (and sometimes the chemical forms) of the COPCs evaluated in the risk assessment.

#### **AFCEE Requirements**

The selection of COPCs will be based on selection criteria delineated in the work plan (WP) that governs the risk assessment. The selection criteria will be supported by data quality objectives (DQOs) and sufficiently detailed in the WP to ensure that all selected COPCs are (1) likely attributable to activities at the site and (2) present at sufficient concentrations or have other characteristics that warrant evaluation in a risk assessment (U.S. EPA, 1989; 1992a; 2002).

Selection criteria will ensure that all selected COPCs are likely attributable to site activities, including one or more of the following:

- Positively detected in at least one sample from the site and associated with the site based on historical information
- Tentatively identified and either associated with the site based on historical information or confirmed by special analytical methods
- Transformation products of chemicals likely to be present as a result of site activities

Selection criteria will also ensure that all selected COPCs are present at sufficient concentrations or exhibit other characteristics that warrant evaluation as a COPC, including one or more of the following:

- Present at concentrations greater than those found in associated blanks
- Present at concentrations sufficiently greater than naturally occurring background concentrations
- Present at a concentration greater than human health or ecological risk-based screening concentrations
- Likely to migrate from one medium to another to threaten human health or the environment
- Likely to bioaccumulate or otherwise persist in the environment

Typically, the COPCs selected for a human health risk assessment will differ from those selected for the ecological risk assessment for a site. These differences will usually warrant separate but coordinated efforts to select COPCs for human health and ecological risk assessments (U.S. EPA, 1992b; 1997). The criteria and DQOs used to select COPCs will be developed independently for human and ecological receptors.

Additional criteria for selecting COPCs or reducing the list of COPCs may be developed based on state and local regulatory requirements, professional judgment, and stakeholder involvement. Additional criteria will be based on DQOs and sufficiently detailed in the WP to ensure that all chemicals attributable to site activities and potentially posing unacceptable risks to human health or the environment will be selected as COPCs to be included in the appropriate human health or ecological risk assessment.

The COPC selection process will be approved by the risk managers during review of the WP and sampling and analysis plan (SAP) for human health risk assessments and during problem formation and planning for ecological risk assessments. The information and rationale used to select the COPCs in a human health or ecological risk assessment will be summarized in the report(s) that present the risk assessments and their results. This summary will include a table modeled after Standard Table 2 (*Occurrence, Distribution and Selection of Chemicals of Potential Concern*) in Appendix A of RAGS Part D (U.S. EPA, 2001).

### **Recommended Practices and Guidance**

Additional criteria for selecting COPCs or reducing the list of COPCs may be based, for example, on grouping chemicals by class or mechanism of toxicity or evaluating detection frequencies in either a human health or ecological risk assessment. Addition or elimination of chemicals from the list of COPCs could also be based on evaluating the chemicals as essential nutrients in a human health risk assessment or the likely significance of specific exposure routes for selected chemicals in an ecological risk assessment (U.S. EPA, 1989; 1997). A WP that includes such optional selection or elimination criteria should also clearly show that the time and effort required to develop, implement, and defend these criteria will likely facilitate, rather than delay, the completion of the risk assessment.

Whenever additional site characterization information is developed, the chemical information should be evaluated to determine whether chemicals should be added to or removed from the list of COPCs based on the criteria developed in the approved WP. For example, the concentration of the chemical may be higher than originally reported, degradation products of the chemical may be found at potentially toxic concentrations at the site, the method detection limit (MDL) or sample quantitation limits (SQLs) or sample reporting limits (SRLs) may be greater than risk-based screening values, or the chemical belongs to a class for

which other members of the class were selected as COPCs. A report that presents the risk assessment and its results should also clearly identify such COPCs and explain why they were ultimately selected for further evaluation in the risk assessment.

## References

- U.S. EPA. 1989. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A, Baseline Risk Assessment (Interim Final)*. U.S. Environmental Protection Agency: EPA/540/1-89/002.
- U.S. EPA. 1992a. *Guidelines for Exposure Assessment*. U.S. Environmental Protection Agency: Federal Register 57: 22887-22938.
- U.S. EPA. 1992b. *Guidance for Data Usability in Risk Assessment (Part A), Final*. U.S. Environmental Protection Agency: 9285.7-09A.
- U.S. EPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final*. U.S. Environmental Protection Agency: EPA/540/R-97/006.
- U.S. EPA. 2001. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments)*. U.S. Environmental Protection Agency: Pub. 9285.7-47.
- U.S. EPA. 2002. *Draft Guidance for Evaluating the Vapor Intrusion to Indoor air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*.

### **3.2.5 AFCEE Requirements for Characterization and Use of Background Concentrations of Chemicals in Human Health and Ecological Risk Assessments**

*August 2003*

#### **Introduction**

Background concentrations of chemicals are the concentrations that would be expected at a site not contaminated by past or current operations and activities. Chemicals present at concentrations “sufficiently” greater than background concentrations are considered site-related contaminants (U.S. EPA, 1992a; 2002a). The comparison of site to background concentrations of chemicals, together with other lines of evidence, forms the basis for selecting the chemicals of potential concern (COPCs) to be evaluated further in human health or ecological risk assessments.

There are two main categories of background: naturally occurring and anthropogenic (U.S. EPA, 1989; 1992a; 1995; 2002a). Naturally occurring background consists of the concentrations of chemicals in the environment that do not result from human activities. Anthropogenic background consists of the concentrations of chemicals in the environment from human activities unrelated to site activities. The goal of the Environmental Restoration Program is to address risks from contamination attributable to site activities, not to alter the natural environment or to remediate anthropogenic contamination. Accordingly, cleanup goals for a site are not set below naturally occurring or anthropogenic background concentrations. Understanding the contribution of background concentrations to site risks is important in the remedial decision making process wherever the background concentrations of chemicals contribute substantially to the total risks resulting from COPCs in media contaminated through site activities.

#### **AFCEE Requirements**

Background concentrations of chemicals should be determined during the site characterization that will result in the selection of the COPCs to be evaluated in a human health or ecological risk assessment. The development of information on the background concentrations of chemicals will be supported by data quality objectives (DQOs) defined during the scoping and planning phases of an investigation (U.S. EPA, 1989; 1992a). Documentation that the background samples are comparable to site samples and representative of the background conditions for the site will be provided in the report presenting the risk assessment (U.S. EPA, 1989; 1992a; 1995; 2002a). The rationale for selecting the background area(s), background sampling locations, and the number of background samples must be consistent with the DQOs and clearly documented in the work plan (WP) or sampling and analysis plan (SAP).

The rigor and sophistication of the any statistical approach proposed to characterize the background concentrations of chemicals or to compare site

concentrations to background concentrations must be defined through the DQO process. Approaches for identifying and evaluating outlier values in the data sets and spatial and temporal patterns of chemical concentrations at the background and site areas will be presented in the WP or SAP (U.S. EPA, 2002a). Any statistical approach proposed must be justified in the WP or SAP in terms of its appropriateness, advantages, and limitations (U.S. EPA, 1989; 1992a; 1992b; 1995).

Estimates of the risks associated with the background concentrations of COPCs will be calculated and compared to the total risks calculated for the COPCs (U.S. EPA, 2002b). Uncertainties associated with the background concentrations of chemicals and the risks evaluated based on these concentrations will be discussed comprehensively in the uncertainty analysis (U.S. EPA, 1992a; 1995).

### **Recommended Practices and Guidance**

Before planning a background study, an effort should be made to determine whether background data that meet the pertinent DQOs are available from previous investigations. The quality of these data should be delineated in the document presenting the risk assessment if the data are used in the risk assessment. Literature values and background data developed for other sites should not generally be used in place of site-specific background data or to avoid collecting site-specific background data (U.S. EPA, 1992a).

Rigorous statistical analyses are not needed if the concentrations of contaminants in the site samples are clearly greater than their concentrations in the background samples. Also, the number of background samples needed may be small if the difference between site concentrations and background concentrations is expected to be obvious. Further, the number needed may be small if the chemical will most probably be detected only infrequently in the background samples (U.S. EPA, 1989; 1992a; 1995).

However, a statistical approach may be necessary to determine the number of samples needed if the difference between site and background concentrations of chemicals will probably not be obvious (U.S. EPA, 1992a; 2002a). If a statistical approach is necessary, an expert environmental statistician should be consulted before deciding on the number of background samples and the background sampling locations.

Conditions at some bases do not allow specific background areas to be clearly distinguished from contaminated areas on the base. An alternative method has been successfully applied to define background soil concentrations of inorganic contaminants under these circumstances (Cook, 1998).

## References

- Cook, P.D. 1998. "Estimating Background Concentration of Inorganic Analytes from On-Site Soil Sample Data," *Superfund Risk Assessment in Soil Contamination*, Vol. 3. Edited by K.B. Hoddinott: ASTM STP 1338.
- U.S. EPA. 1989. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final*. U.S. Environmental Protection Agency: EPA/540/1-89/002.
- U.S. EPA. 1992a. *Guidance for Data Usability in Risk Assessment (Part A)*. U.S. Environmental Protection Agency: OERR 9285.7-09a.
- U.S. EPA. 1992b. *Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities: Addendum to Interim Final Guidance*. U.S. Environmental Protection Agency: EPA/530/R-93/003.
- U.S. EPA. 1995. *Engineering Forum Issue: Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites*. U.S. Environmental Protection Agency: EPA/540/S-96/500.
- U.S. EPA. 2002a. *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites*. U.S. Environmental Protection Agency: EPA 540-R-01-003.
- U.S. EPA. 2002b. *Policy Considerations for the Application of Background Data in Risk Assessment and Remedy Selection: Role of Background in the CERCLA Cleanup Program, Appendix B*. U.S. Environmental Protection Agency: OSWER 9285.6-07P.



### **3.2.6 AFCEE Requirements for Risk Characterizations in Human Health Risk Assessments**

*August 2003*

#### **Introduction**

Risk characterization is the final component of a human health risk assessment. It integrates information from the preceding hazard identification, toxicity assessment, and exposure assessment components of the risk assessment, then generates an overall conclusion about risk and the related uncertainties that is complete, informative, and useful for the risk managers. The risk characterization conveys the risk assessors' professional judgments about the nature and existence of—or lack of—human health risks (U.S. EPA, 1995). Both the human health and ecological risk assessment require characterizations. The risk characterizations for human health risk assessments are developed and presented independently from the ecological risk assessments that are performed for a site.

Although it is the final step in risk assessment, risk characterization is the starting point for risk management considerations and the foundation for remedial decision-making. Because every risk assessment involves many assumptions, and therefore has many uncertainties, the challenge in characterizing risk is to convey the subset of findings, strengths, and limitations of the risk assessment that are key for the risk managers.

Effective risk management is impeded without effective communication of information about the receptors potentially at risk, how these receptors might be affected, what the severity and reversibility of adverse effects might be, how confident the risk assessors are in their predictions, and other qualitative information that is critical for decision-making. The objective is to relay to the risk manager(s)—in frank terms—the scope, strengths, and limitations of the risk assessment.

#### **AFCEE Requirements**

The risk characterization will restate the scope of the assessment, express results clearly, articulate major assumptions and uncertainties, identify reasonable alternative interpretations, and separate scientific conclusions from regulatory agency policy considerations and requirements.

The risk characterization section will bring the toxicity/potency data and the exposure data together into quantitative expressions of estimated risk for all receptors considered in the risk assessment. Minimally, risk characterization of a human health baseline risk assessment will include the following:

1. Tables presenting reasonable maximum and central tendency estimates of exposure point concentrations for each chemical of potential concern (COPC) in each medium
2. Tables presenting the parameter values used to estimate both maximum and central tendency exposures parameter values for each exposure pathway

3. Tables presenting the cancer slope factors and reference doses, as well as the sources of these values, used to estimate risk and the hazard index for each COPC and exposure route
4. Tables presenting reasonable maximum and central tendency estimates of cumulative cancer risk and hazard indices arranged by receptors and exposure scenarios (current and future)
5. A table summarizing reasonable maximum and central tendency estimated pathway risks and hazard indices arranged by receptors and media clearly indicating the estimated risk from background concentrations and site concentrations of each relevant COPC
6. Tables identifying and explaining the noteworthy uncertainties associated with the quantified risks and hazards arranged by receptors and exposure scenarios (current and future)
7. Comprehensive statements of the quantified estimates of cancer risks and hazard indices that clearly address the likelihood that the risk may actually be realized by the receptors

The requirements of item number 7 include unequivocal statements of the key strengths and weaknesses of the assessment, a brief bottom line statement about the risks (including the confidence in the estimate[s] of risk and hazard indexes), and information on what is known about the nature, likelihood, and magnitude of any potential adverse effect (U.S. EPA, 2000). This information will be provided prominently, along with all statements that present the quantitative risk estimates.

### **Recommended Practices and Guidance**

From the beginning of and throughout the risk assessment process, dialogue among the risk assessors and the risk assessment users will ensure that the risk assessors understand the needs of the decision makers. This type of collaboration will enable decision makers to produce a risk assessment that will completely and efficiently address their needs with results that can be communicated effectively to stakeholders who might be affected by the risk management decisions. While conducting a risk assessment, assessors should focus on the key points that need to be presented in the final risk characterization step.

The risk characterization of the baseline risk assessment should highlight the greatest potential sources of risk at a site so that they may be addressed effectively in the remediation process. One requirement of the risk characterization is that conclusions about the magnitude and kind of risk at a site be developed. Another requirement is that conclusions be developed on the likelihood that the estimated risk will actually be realized by the current or future receptors. However, the risk assessment should not include an evaluation of the significance of the risk in a program context or whether and how the risk should be addressed; these are risk management issues (U.S. EPA, 1989).

## **References**

U.S. EPA. 1989. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final (RAGS, Part A)*. U.S. Environmental Protection Agency: EPA/540/1-89/002.

U.S. EPA. 1995. *Policy for Risk Characterization at the U.S. Environmental Protection Agency*. Issued by the Administrator of the U.S. Environmental Protection Agency (March).

U.S. EPA. 2000. "Risk Characterization," *Science Policy Council Handbook*. U.S. Environmental Protection Agency: EPA 100-B-00-002F.

## 4. Documents Evaluated for Risk Assessment Relevance

<u>Date</u>	<u>Author</u>	<u>Title</u>	<u>Additional Citation Data</u>	<u>Web Link</u>
	U. S. EPA	An SAB Report: A Framework for Assessing and Reporting on Ecological Condition	EPA-SAB-EPEC-02-xxx	<a href="http://www.epa.gov/sab/pdf/ecoframework.pdf">http://www.epa.gov/sab/pdf/ecoframework.pdf</a>
1985	U.S. EPA	Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites	EPA/600/8 -85/002	<a href="http://www.epa.gov/clariton/clhtml/pubtitle">http://www.epa.gov/clariton/clhtml/pubtitle</a>
1986	U. S. EPA	Guidelines for Carcinogen Risk Assessment	EPA-630/R-00/004	
1986	U. S. EPA	Guidelines for Mutagenicity Risk Assessment	EPA-630/R-98/003	
1986	U. S. EPA	Guidelines for the Health Risk Assessment of Chemical Mixtures	EPA-630/R-98/002	
1986	U. S. EPA	Superfund Public Health Evaluation Manual	PB87-183125	
1987	U. S. EPA	Data Quality Objectives for Remedial Response Activities: Vol. 1 Development Process	EPA/540/G-87/003a	
1987	U. S. EPA	Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements	OSWER Directive 9234.0-05	
1988	U. S. EPA	Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion	EPA 520/1 -88-020	
1988	U. S. EPA	Superfund Exposure Assessment Manual	EPA/540/1 -88/001 OSWER Directive 9285.5-1 NTIS PB89-135859	
1988	U.S. EPA	Technical Support Document on Risk Assessment of Chemical Mixtures	EPA/600/8 -90/064	
1988	U.S. EPA	Drinking Water Criteria for Polychlorinated Biphenyls (PCBs)	PB89-199256	<a href="http://wlapwww.gov.bc.ca/wat/wq/BCguide/">http://wlapwww.gov.bc.ca/wat/wq/BCguide/</a>
1988	U. S. EPA	Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA	OSWER Publ. 9355.3-01	<a href="http://www.epa.gov/superfund/action/guidan">http://www.epa.gov/superfund/action/guidan</a>
1989	U. S. EPA	Exposure Factor Handbook	EPA/600/8 -89/043 OHEA	
1989	U. S. EPA	Risk Assessment Guidance for Superfund, Volume 2: Environmental Evaluation Manual, Interim Final	EPA/540/1 -89/001A	
1989	U. S. EPA	Statistical Analysis of the Ground Water Monitoring Data at RCRA Facilities, Interim Final Guidance	EPA/530/SW -89/026OSW,W MD NTIS PB89-151-047	
1989	U.S. EPA	Interim Methods for Development of Inhalation Reference Doses	EPA/600/8 -88/066F	
1989	U.S. EPA	RCRA Facility Investigation (RFI) Guidance, Vol. III of IV: Air and Surface Water Releases	EPA 530/SW -89-031	
1989	U.S. EPA	RCRA Facility Investigation (RFI) Guidance, Vol. IV of IV: Case Study Examples	EPA 530/SW -89-031	
1989	USAF	The Installation Restoration Program Toxicology Guide, Volumes 1 -4	Harry G. Armstrong Aerospace Medical Research Laboratory	

1989	U.S. EPA	Soil Sampling Quality Assurance User's Guide - Second Edition	EPA/600/8 -89/045	<a href="http://www.epa.gov/tio/download%2Fchar%2F">http://www.epa.gov/tio/download%2Fchar%</a>
1989	U.S. EPA	RCRA Facility Investigation (RFI) Guidance, Vol. I of IV: Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations	EPA 530/SW -89-031	<a href="http://www.hanford.gov/dqo/project/level5/r">http://www.hanford.gov/dqo/project/level5/r</a>
1989	U.S. EPA	RCRA Facility Investigation (RFI) Guidance, Vol. II of IV: Soil, Ground Water and Subsurface Gas Releases	EPA 530/SW -89-031	<a href="http://www.hanford.gov/dqo/project/level5/r">http://www.hanford.gov/dqo/project/level5/r</a>
1989	U. S. EPA	Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A Baseline Risk Assessment, Interim Final (RAGS, Part A)	EPA/540/1 -89/002 OSWER Directive 9285.7-01A	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1990	U. S. EPA	Hazard Ranking System	FR 55: 51625-51662	
1990	U.S. EPA	Interim Methods for Development of Inhalation Reference Concentrations	EPA/600/8 -90/066A Review Draft (Do Not Cite or Quote)	
1990	USAF	The Installation Restoration Program Toxicology Guide, Volume 5	Harry G. Armstrong Aerospace Medical Research Laboratory	
1990	U. S. EPA	National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Final Rule	40 CFR 300.61-300.81 (Subpart F)	<a href="http://www.epa.gov/oilspill/ncpkeys.htm">http://www.epa.gov/oilspill/ncpkeys.htm</a>
1990	U. S. EPA	Managing Contaminated Sediments: EPA Decision-Making Processes	EPA 506/6 -90/002	<a href="http://www.epa.gov/waterscience/library/sed">http://www.epa.gov/waterscience/library/sed</a>
1991	U. S. EPA	Guidelines for Development Toxicity Risk Assessment	Federal Register: 56(234):63798-63826	
1991	U. S. EPA	The Role of Biological Technical Assistance Groups (BTAGs) in Ecological Assessment, Eco Update Intermittent Bulletin Vol. 1, no. 1	OERR, HSED Publ. 9345.0-051	
1991	U.S. EPA	Conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfill Sites	EPA/540/P -91/001	
1991	U.S. EPA	Methods for Aquatic Toxicity Identification Evaluations - Phase I: Toxicity Characterization Procedures	EPA/600/6 -91/003	
1991	U.S. EPA	Remediation of Contaminated Sediments	EPA/625/6 -91/028	
1991	U. S. EPA Reg. 3	Exposure Point Concentrations in Groundwater	EPA/903/8 -91/002	<a href="http://www.epa.gov/reg3hwmd/risk/guide5.p">http://www.epa.gov/reg3hwmd/risk/guide5.p</a>
1991	U. S. Army	Health Risk Assessment Guidance for the Installation Restoration Program and Formerly Used Defense Sites	Pamphlet 40-578	<a href="http://www.army.mil/usapa/epubs/pdf/p40_5">http://www.army.mil/usapa/epubs/pdf/p40_5</a>
1991	U. S. EPA Reg. 3	Risk Assessment: Technical Guidance Manual: EPA Region III Guidance on Handling Chemical Concentration Data Near the Detection Limit in Risk Assessments		<a href="http://www.epa.gov/reg3hwmd/risk/guide3.h">http://www.epa.gov/reg3hwmd/risk/guide3.h</a>
1991	U. S. EPA	Ecological Assessment of Superfund Sites: An Overview, Eco Update Intermittent Bulletin Vol. 1, no. 2	OERR, HSED Publ. 9345.0-051	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1991	U. S. EPA	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Part B. Development of Risk -Based Preliminary Remediation Goals, Interim	EPA/540/R 92/003 OSWER Directive 9285.7-01B	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1991	U. S. EPA	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Part C, Risk Evaluation of Remedial Alternatives,	EPA/540/R-92/004 OSWER Directive 9285.7-01C	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>

1991	U. S. EPA	Risk Assessment Guidance for Superfund Vol.1: Human Health Evaluation Manual, Supplemental Guidance: “ Standard Default Exposure Factors.” Interim Final	OSWER Directive 9285.6-03	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1991	U. S. EPA	Role of Baseline Risk Assessment in Superfund Remedy Selection	OSWER Directive 9355.0-30	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1992	U. S. EPA	Briefing the BTAG: Initial Description of Setting, History and Ecology of a Site, Eco Update Intermittent Bulletin Vol. 1, no. 5	OERR, HSED Publ. 9345.0-051	
1992	U. S. EPA	Framework for Ecological Risk Assessment	RAF EPA/630/R- 92/001	
1992	U. S. EPA	Guidance for Performing Site Inspections Under CERCLA, Interim Draft		
1992	U. S. EPA	Guidance on Risk Characterization for Risk Managers and Risk Assessors	EPA Office of the Administrator	
1992	U. S. EPA	Statistical Methods for Evaluating the Attainment of Cleanup Standards, Vol. 3: Reference – Based Standards for Soils and Solid Media	EPA/230/R-94/004 NTIS PB94-176-	
1992	U. S. EPA	Statistical Training Course for Ground-Water Monitoring Data Analysis	EPA/530/R-93-003	
1992	U. S. EPA	Supplemental Guidance to RAGS: Calculating the Concentration Term	OSWER Directive 9285.7-081	
1992	U. S. EPA	The Role of Natural Resource Trustees in the Superfund Process, Eco Update Intermittent Bulletin Vol 1, no. 3	OERR, HSED Publ. 9345.0-051	
1992	U.S. EPA	Evaluation of Terrestrial Indicators for Use in Ecological Assessments at Hazardous Wastes Sites	EPA/600/R-92/183	
1992	U. S. EPA	Dermal Exposure Assessment: Principles and Applications; Final	EPA/600/8 -91/011bOHEA	<a href="http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm">http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm</a>
1992	U. S. EPA	Guidance for Data Useability in Risk Assessment (Part B)	OSWER 9285.7-09B NTIS PB92-963362	<a href="http://epa.gov/superfund/programs/risk/datau">http://epa.gov/superfund/programs/risk/datau</a>
1992	U. S. EPA	Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities: Addendum to Interim Final	EPA/530/R-93/003OSWWM	<a href="http://www.epa.gov/epaoswer/hazwaste/ca/re">http://www.epa.gov/epaoswer/hazwaste/ca/re</a>
1992	U. S. EPA	Guidelines for Exposure Assessment	FR 57: 22887-22938	<a href="http://www.epa.gov/ncea/pdfs/guidline.pdf">http://www.epa.gov/ncea/pdfs/guidline.pdf</a>
1992	U. S. EPA	Guidance for Data Useability in Risk Assessment (Part A)	Publ. 9285.7-09A/FS NTIS PB92-963356	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1992	U. S. EPA	Developing a Work Scope for Ecological Assessments, Eco Update Intermittent Bulletin Vol. 1, no. 4	OERR, HSED Publ.	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1992	U.S. EPA	National Study of Chemical Residue in Fish, Volume 1	EPA 823-R-92_006a	<a href="http://www.epa.gov/waterscience/library/fish">http://www.epa.gov/waterscience/library/fish</a>
1992	U. S. EPA	National Study of Chemical Residue in Fish, Volume 2	EPA 823-R-92_006b	<a href="http://www.epa.gov/waterscience/library/fish">http://www.epa.gov/waterscience/library/fish</a>
1993	U. S. EPA	Approaches for the Remediation of Federal Facility Sites Contaminated with Explosive or Radioactive Wastes (Handbook)	EPA625/R-93/013	
1993	U. S. EPA	Data Quality Objectives Process for Superfund, Interim Final Guidance	EPA/540/R 93/071 OSWER NTIS PB94-963203	
1993	U. S. EPA	External Exposure to Radionuclides in Air, Water, and Soil	Fed. Guidance Report No. 12 EPA-402-R-93-081	
1993	U. S. EPA	Guidance for Planning for Data Collection in Support of Environmental Decision Making Using the Data Quality Objective Process	Issued from Office of Research and Development	

1993	U. S. EPA	Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons	EPA/600/R-93/089 ORD	
1993	U. S. EPA	RCRA Public Involvement Manual	EPA/530/R 93/006, OSWER	
1993	U. S. EPA	Sediment Quality Criteria for the Protection of Benthic Organisms: Acenaphthene		
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1993	U. S. EPA	Sediment Quality Criteria for the Protection of Benthic Organisms: Endrin		
1993	U. S. EPA	Sediment Quality Criteria for the Protection of Benthic Organisms: Fluoranthene		
1993	U. S. EPA	Sediment Quality Criteria for the Protection of Benthic Organisms: Phenanthrene		
1993	U. S. EPA	Superfund Program: Checklist For Ecological Assessment/Sampling -	Environmental Response Branch, Emergency Response Division, Office of Emergency and Remedial Response Office of Solid Waste and Emergency Response	
1993	U.S. EPA	Methods for Aquatic Toxicity Identification Evaluations ? Phase II: Toxicity Identification Procedures	EPA/600/3 -88/035	
1993	U.S. EPA	Methods for Aquatic Toxicity Identification Evaluations ? Phase II: Toxicity Identification Procedures for Samples Exhibiting Acute and	EPA/600/R-92/080	
1993	U.S. EPA	Methods for Aquatic Toxicity Identification Evaluations ? Phase III: Toxicity Confirmation Procedures	EPA/600/3 -88/036	
1993	U.S. EPA	Methods for Aquatic Toxicity Identification Evaluations ? Phase III: Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity	EPA/600/R-92/081	
1993	U. S. EPA	Wildlife Exposure Factors Handbook Volume I	EPA/600/R-93/187a ORD	<a href="http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActTy">http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActTy</a>
1993	U. S. EPA	Wildlife Exposure Factors Handbook Volume II:	EPA/600/R-93/187b ORD	<a href="http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActTy">http://cfpub.epa.gov/ncea/cfm/wefh.cfm?ActTy</a>
1993	U. S. EPA	Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening, US EPA Region III	EPA/903/R 93/001	<a href="http://www.epa.gov/reg3hwmd/risk/guide2.h">http://www.epa.gov/reg3hwmd/risk/guide2.h</a>
1993	U. S. EPA	Selecting Remediation Techniques for Contaminated Sediment	EPA-823-B93-001	<a href="http://www.epa.gov/waterscience/library/sed">http://www.epa.gov/waterscience/library/sed</a>
1994	ASTM	Standard Guide for Handling Uncertainties in Risk Assessments	Committee E-47 E47.13 Subcommittee on Assessment of Risk to Human Health and the Environment from Hazardous Waste Sites	
1994	U. S. Army	Field Manual on Environmental Chemistry and Fate of Chemical Warfare Agents	Southwest Research Institute	
1994	U. S. Army	Toxicity Summary for 2-Amino-4,6-Dinitrotoluene	U.S. Army Environmental Center	

1994	U. S. EPA	Catalogue of Standard Toxicity Tests for Ecological Risk Assessment, Eco Update Intermittent Bulletin	EPA/540/F 94/013 OERR,HSED Publ. 9345.0-051 NTIS PB94-963304
1994	U. S. EPA	Data Quality Objectives Decision Error Feasibility Trials (DEFT)	EPA Computer Program
1994	U. S. EPA	Draft Revisions to the Guidelines for Carcinogenic Risk Assessment	EPA/600/BP -92/003
1994	U. S. EPA	Ecological Risk Assessment for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Internal Review Draft	ERT
1994	U. S. EPA	Ecological Risk Assessment Issue Papers	EPA/630/R-94/009
1994	U. S. EPA	Estimating Exposure to Dioxin -Like Compounds, Volume I: Executive Summary, Volume II: Properties, Sources, Environmental Levels, and Background Exposures	EPA/600/6 -88/005Ca ORD
1994	U. S. EPA	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 2: Risk Assessment and Fish Consumption Limits - Third Edition	Office of Science and Technology
1994	U. S. EPA	Guidance for the Data Quality Objectives Process, Final	EPA/600/R-96/055 ORD EPA/QA/G-4
1994	U. S. EPA	Guidance on Accelerating CERCLA Environmental Restoration at Federal Facilities	
1994	U. S. EPA	Health Assessment Document for 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and Related Compounds, Volume III of III	DRAFT EPA/600/BP-92/001cDO NOT QUOTE OR CITE August 1994 External Review Draft
1994	U. S. EPA	Highlights of the 9th Annual RRAC/6th Annual SEEW, Eco Update Intermittent Bulletin Vol. 4, no.2	EPA/540/F 94/048 OERR, HSED Publ. 9345.0-051 NTIS PB94-963313
1994	U. S. EPA	Managing Ecological Risk at EPA: Issues and Recommendations for Progress	EPA/600/R-94/183
1994	U. S. EPA	Methods for Assessing the Toxicity of Sediment-Associated Contaminants with Estuarine and Marine Amphipods	EPA/600/R-94/025
1994	U. S. EPA	Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry	EPA/600/8 -88/066F Environmental Criteria and Assessment Office, Office of Health and Environmental
1994	U. S. EPA	Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Fresh Water Invertebrates.	EPA/600/R-94/024
1994	U. S. EPA	Revised Interim Soil Lead Guidance for CERCLA sites and RCRA Corrective Action Facilities	OSWER Dir.: 9355.4-12
1994	U. S. EPA	Selecting and Using Reference Information in Superfund Ecological Risk Assessments, Eco Update Intermittent Bulletin Vol. 2, no. 4	EPA/540/F-94/050 OERR, HSED Publ. 9345.0-051 NTIS PB94-963319
1994	U. S. EPA	Technical Background Document for Draft Soil Screening Level Guidance	EPA-540/R-94/018 PB94 -963503
1994	U. S. EPA	US EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Reviews	



1994	U. S. EPA	US EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review			
1994	U. S. EPA	Assessment and Remediation of Contaminated Sediments (ARCS) Program - Final Summary Report.	EPA 905-S-94-001		<a href="http://www.epa.gov/glnpo/arcs/EPA-905-">http://www.epa.gov/glnpo/arcs/EPA-905-</a>
1994	U. S. EPA Reg. 3	Risk Assessment: Technical Guidance Manual Use of Monte Carlo Simulation in Risk Assessments			<a href="http://www.epa.gov/reg3hwmd/risk/guide1.h">http://www.epa.gov/reg3hwmd/risk/guide1.h</a>
1994	U.S. EPA Reg. 9	Region 8 Superfund Technical Guidance Evaluating and Identifying Contaminants of Concern for Human Health			<a href="http://www.epa.gov/Region8/superfund/risks">http://www.epa.gov/Region8/superfund/risks</a>
1994	U.S. EPA	Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children	EPA 540-R-93/081	PB93 -	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
1994	U.S. EPA	Technical Support Document: Parameters and Equations Used in the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in	EPA 540/R-94/040		<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
1994	U.S. EPA	Validation Strategy for the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children			<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
1994	U. S. EPA	Field Studies for Ecological Risk Assessment, Eco Update Intermittent Bulletin Vol. 2, no. 3	EPA/540/F 94/014 OERR, HSED		<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1994	U. S. EPA	Using Toxicity Tests in Ecological Risk Assessment, Eco Update Intermittent Bulletin Vol. 2, no. 1	EPA/540/F 95/012 OERR, HSED		<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1994	U. S. EPA	Role of the Ecological Risk Assessment in the Baseline Risk Assessment	OSWER Dir.: 9285.7-17		<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1995	U. S. Army	Toxicity Summary for Nitrobenzene	U.S. Army Environmental Center		
1995	U. S. Army	Toxicity Summary for 1,3,5 Trinitrobenzene	U.S. Army Environmental Center		
1995	U. S. Army	Toxicity Summary for 1,3,5,7-Tetrazocine (HMX)	U.S. Army Environmental Center		
1995	U. S. Army	Toxicity Summary for 1,3-Dinitrobenzene	U.S. Army Environmental Center		
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1995	U. S. Army	Toxicity Summary for 2-Amino-4-Nitrotoluene	U.S. Army Environmental Center		
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1995	U. S. EPA	Elements to Consider when Drafting EPA Risk Characterizations	EPA Science Policy Council paper		
1995	U. S. EPA	Final Water Quality Guidance for the Great Lakes			
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			EPA Database modem access (513)		
1995	U. S. EPA	Proposed Guidelines for Neurotoxicity Risk Assessment; Notice	FR Vol. 60, No. 192		

1995	U. S. EPA	Science Advisory Board (SAB) Review of the Agency's Approach for Developing Sediment Criteria for Five Metals (cadmium, copper, lead, nickel, and zinc)	EPA-SAB-EPEC-95-020 letter to the Administrator	SAB	
1995	U. S. EPA	Scientific Advisory Board's Review of the draft Dioxin Exposure and Health Effects Reassessment Documents	EPA-SAB-EC-95-021 to the EPA Administrator	SAB letter	
1995	U. S. EPA	Supplemental Guidance to RAGS: EPA Region 4 Bulletins – Bulletin No. 1 Data Collection and Evaluation	WMD		
1995	U. S. EPA Reg. 4	Supplemental Guidance to RAGS: EPA Region 4 Bulletins - Bulletin No. 1 Data Collection and Evaluation	WMD		
1995	U. S. EPA Reg. 8	Use of Monte Carlo Simulation in Risk Assessment			
1995	ASTM	Standard Guide for Developing Conceptual Site Models for Contaminated Sites	Designation: E 1689 – 95		<a href="http://www.astm.org/cgi-">http://www.astm.org/cgi-</a>
1995	U. S. EPA	EPA Risk Characterization Program			<a href="http://www.epa.gov/osp/spc/rccover.htm">http://www.epa.gov/osp/spc/rccover.htm</a>
1995	U. S. EPA	Guidance for Risk Characterization, Science Policy Council			<a href="http://www.epa.gov/osp/spc/rcguide.htm">http://www.epa.gov/osp/spc/rcguide.htm</a>
1995	U. S. EPA Reg. 3	Risk Assessment: Technical Guidance Manual - Assessing Dermal Contact with Soil; Existing Guidance			<a href="http://www.epa.gov/reg3hwmd/risk/solabsg2">http://www.epa.gov/reg3hwmd/risk/solabsg2</a>
1995	U. S. EPA	Land Use in CERCLA Remedy Selection Process, OSWER Directive No. 9355.7-04			<a href="http://www.epa.gov/superfund/action/guidan">http://www.epa.gov/superfund/action/guidan</a>
1995	U. S. EPA	Policy for Risk Characterization at the U.S. Environmental Protection Agency			<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1995	U. S. EPA	Establishing Background Levels, EPA/540/F-94/03 0	NTIS PB94-9633 13 Number is EPA 540F94030		<a href="http://www.epa.gov/superfund/sites/npl/hrsr">http://www.epa.gov/superfund/sites/npl/hrsr</a>
1995	U. S. EPA	Engineering Forum Issue: Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites	EPA/540/5 -96/500 OSWER		<a href="http://www.epa.gov/swertio1/tsp/download/">http://www.epa.gov/swertio1/tsp/download/</a>
1995	U. S. EPA	QA/QC Guidance for Sampling and Analysis of Sediments, Water, and Tissues for Dredged Material Evaluation: Chemical Evaluations	EPA 823-B-95-001		<a href="http://www.epa.gov/waterscience/library/sed">http://www.epa.gov/waterscience/library/sed</a>
1995	U. S. EPA	Establishing Background Levels	EPA/540/F-94/030 NTIS PB94-9633 13		<a href="http://www.ertresponse.com/Training/train_p">http://www.ertresponse.com/Training/train_p</a>
1996	U. S. ACE	Risk Assessment Handbook, Volume II: Environmental Evaluation	Publication Number: EM 200-1-4		
1996	U. S. EPA	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Draft	ERT		
1996	U. S. EPA	Ecological Significance and Selection of Candidate Assessment Endpoints, Eco Update Intermittent Bulletin Vol. 3, no. 1	EPA/540/F 95/037 OERR, HSED Publ. 9345.0-11FSI NTIS PB95-963323		
1996	U. S. EPA	Ecotox Thresholds, Eco Update Intermittent Bulletin Vol. 3, no. 2	EPA/540/F-95/038 OERR, HSED Publ. 9345.0-12FSI NTIS PB95-963324		
1996	U. S. EPA	Exposure Factors Handbook: Volume I of III General Factors, Preliminary Review Draft	EPA/600/P -95/002Ba ORD		

1996	U. S. EPA	Exposure Factors Handbook: Volume II of III Food Ingestion Factors, Preliminary Review Draft	EPA/600/P -95/002Bb ORD	
1996	U. S. EPA	Exposure Factors Handbook: Volume III of III Activities Factors, Preliminary Review Draft	EPA/600/P -95/002Bc ORD	
1996	U. S. EPA	Guidance for Data Quality Assessment: Practical Methods for Data	EPA/600/R 96/084 EPA/QA/G-9	
1996	U. S. EPA	Proposed Guidelines for Ecological Risk Assessment	FR 61: 4755147631	
1996	U. S. EPA	Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil		
1996	U. S. EPA	Reproductive Toxicity Risk Assessment Guidelines	Federal Register: 61(212):56274-56322	
1996	U. S. EPA	US EPA Region 3 Risk -Based Concentration Table	FR 61: 47551-47631	
1996	U. S. EPA	Immunoassay Guidelines for Planning Environmental Projects Reg. 1		
1996	U. S. EPA	Proposed Guidelines for Carcinogen Risk Assessment	EPA/600/P 92/003C ORD	<a href="http://www.epa.gov/ORD/WebPubs/carcino">http://www.epa.gov/ORD/WebPubs/carcino</a>
1996	U. S. EPA	PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures	EPA/600/P -96F	<a href="http://www.epa.gov/ORD/WebPubs/pcb/">http://www.epa.gov/ORD/WebPubs/pcb/</a>
1996	U. S. EPA	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 3: Overview of Risk Management	EPA/82B96006	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
1996	U. S. EPA	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 3: Overview of Risk Management	EPA/82B96006 Office of Water	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
1996	U.S. EPA	Bioavailability of Arsenic and Lead in Environmental Substrates	EPA 910/R-96-002	<a href="http://www.epa.gov/r10earth/offices/oea/risk/">http://www.epa.gov/r10earth/offices/oea/risk/</a>
1996	U. S. EPA	US EPA Region 9 Preliminary Remediation Goals Reg. 9		<a href="http://www.epa.gov/region09/waste/sfund/pr">http://www.epa.gov/region09/waste/sfund/pr</a>
1996	U. S. EPA	Groundwater Use and Value Determination Guidance Reg. 1		<a href="http://www.epa.gov/region1/superfund/resou">http://www.epa.gov/region1/superfund/resou</a>
1996	U. S. EPA	Soil Screening Guidance: User's Guide	EPA/540/R 96/018 OSWER Publ. 9355.4-23 NTIS PB94-963505	<a href="http://www.epa.gov/superfund/resources/soil/">http://www.epa.gov/superfund/resources/soil/</a>
1996	U. S. EPA	Soil Screening Guidance: Fact Sheet	EPA/540/F-95/041	<a href="http://www.epa.gov/superfund/resources/soil">http://www.epa.gov/superfund/resources/soil</a>
1996	U. S. EPA	Soil Screening Guidance: Technical Background Document	EPA/540/R 95/128 OSWER Publ. 9355.4-17A NTIS PB94-963502	<a href="http://www.epa.gov/superfund/resources/soil">http://www.epa.gov/superfund/resources/soil</a>
1997	U. S. EPA	Ecological Risk Management Principles for Superfund Sites	OSWER Dir.: 9285.7-28 P	
1997	U. S. EPA	Evaluation of Superfund Ecotox Threshold Benchmark Values for Water and Sediment	EPA-SAB-EPEC-97-009 SAB letter to the EPA Administrator	
1997	U. S. EPA	Fact Sheet: EPA Special Report on Endocrine Disruptors		

1997	U. S. EPA	Human Health Risk Assessment: Current Approaches & Future	Risk Assessment Forum U.S. Environmental Protection Agency Technical Panel	
1997	U. S. EPA	Mercury Report to Congress Vols. 1 - 8	EPA-452/R-97-003	
1997	U. S. EPA	The Incidence and Severity of Sediment Contamination in Surface Waters of the United States (Volumes 1-3)	EPA 8230R-97-006 EPA 8230R-97-006 EPA 8230R-97-	
1997	U. S. EPA	To Filter, or Not to Filter; That is the Question	EPA-SAB-EEC-97-011 SAB letter to the EPA Administrator	
1997	U. S. EPA Reg. 10	EPA Region 10 Supplemental Ecological Risk Assessment Guidance for Superfund	EPA 910-R-97-005	
1997	DOD	Relative Risk Site Evaluation Primer		<a href="http://www.dtic.mil/envirodod/Policies/Clea">http://www.dtic.mil/envirodod/Policies/Clea</a>
1997	U. S. EPA	Policy for Use of Probabilistic Analysis in Risk Assessment at the U.S. Environmental Protection Agency.		<a href="http://www.epa.gov/ncea/mcpolicy.htm">http://www.epa.gov/ncea/mcpolicy.htm</a>
1997	U. S. EPA	The Lognormal Distribution in Environmental Applications. OSWER	EPA/600/R-97/006	<a href="http://www.epa.gov/nerlesd1/tsc/issue.htm">http://www.epa.gov/nerlesd1/tsc/issue.htm</a>
1997	U. S. EPA	Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination	OSWER 9200.4-18	<a href="http://www.epa.gov/oerrpage/superfund/reso">http://www.epa.gov/oerrpage/superfund/reso</a>
1997	U. S. EPA	Special Report on Environmental Endocrine Disruption: An Effects Assessment and Analysis	EPA/630/R-96/012	<a href="http://www.epa.gov/ORD/">http://www.epa.gov/ORD/</a>
1997	U. S. EPA	Chapter 8. Dose-Response Modeling for 2,3,7,8-TCDD. Draft.	EPA/600/P-92/001C8	<a href="http://www.epa.gov/ORD/WebPub/dioxin">http://www.epa.gov/ORD/WebPub/dioxin</a>
1997	U. S. EPA	Priorities for Ecological Protection: An Initial List and Discussion Document for EPA.	EPA/600/S-97/002	<a href="http://www.epa.gov/ORD/WebPubs/prioritie">http://www.epa.gov/ORD/WebPubs/prioritie</a>
1997	U. S. EPA	Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Methyl Tertiary-Butyl Ether (MtBE).	EPA Fact Sheet. EPA-822-F-97-009	<a href="http://www.epa.gov/ost/drinking/mtbefact.pdf">http://www.epa.gov/ost/drinking/mtbefact.pdf</a>
1997	U. S. EPA	Health Effects Assessment Summary Tables (HEAST)		<a href="http://www.epa.gov/radiation/heast/">http://www.epa.gov/radiation/heast/</a>
1997	U. S. EPA	CERCLA Coordination with Natural Resources Trustees	OSWER 9200.4-22A	<a href="http://www.epa.gov/superfund/programs/nrd/">http://www.epa.gov/superfund/programs/nrd/</a>
1997	U. S. EPA	The Role of CSGWPPs in EPA Remediation Programs	OSWER 9283.1-09	<a href="http://www.epa.gov/superfund/resources/csg">http://www.epa.gov/superfund/resources/csg</a>
1997	U. S. EPA	Exposure Factors Handbook, Volume 1 – 3 General Factors	EPA/600/P-95/002Fa. NTIS PB98-124255	<a href="http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm">http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm</a>
1997	U. S. EPA	Guiding Principles for Monte Carlo Analysis	EPA/630/R-97/001	<a href="http://www.epa.gov/ncea/monnteabs.htm">http://www.epa.gov/ncea/monnteabs.htm</a>
1997	U. S. EPA	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, US EPA Interim Final (ERAGS)	OSWER 9285.7-25, EPA/540/R-	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1998	U. S. ACE	Development of a Multimedia Exposure Assessment Model for Evaluating Ecological Risk of Exposure to Military-Related Compounds (MRCs) at Military Sites	Tech. Rpt. IRRP-98-9	
1998	U. S. EPA	Draft Water Quality Criteria Methodology Revisions: Human Health;	43756 Federal Register / Vol. 63, No. 157 / Friday, August 14, 1998 / Notices	
1998	U. S. EPA	Guidance for Data Quality Assessment Practical Methods for Data	EPA/600/R-96/084 EPA QA/G-9	

1998	U. S. EPA	Marine Toxicity Identification Evaluation (TIE), Phase I Guidance	EPA/600/R-096/054	
1998	U. S. EPA	National Recommended Water Quality Criteria; Republication	Fed. Reg. December 10, 1998, Vol. 63, No. 237, pp. 68353-68364	
1998	U. S. EPA	Toxicological Review of Beryllium and Compounds		
1998	U. S. EPA Reg. 4	Application of RAGS Part D at Federal Facilities in Region 4.	Memorandum	
1998	U. S. EPA Reg. 4	Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Alternatives, and Inclusion of Stakeholders	Memorandum	
1998	U. S. Navy	Procedural Guidance for Statistically Analyzing Environmental Background Data		
1998	U.S. Army	US Army Environmental Restoration Programs Guidance Manual		
1998	USAF	Methods to Quantify Uncertainty in Human Health Risk Assessment	USAF Armstrong Laboratory	
1998	USAF	Military-Specific Exposure Factors Study	Human Effectiveness Directorate, Wright Patterson Air Force Base	
1998	U. S. EPA	Guidelines for Ecological Risk Assessment. Final.	EPA/630/R-95-002F	<a href="http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?id=28383">http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?id=28383</a>
1998	U. S. EPA	Risk-Based Clean Closure		<a href="http://www.epa.gov/epaoswer/hazwaste/ca/re">http://www.epa.gov/epaoswer/hazwaste/ca/re</a>
1998	U. S. EPA	Summary of the U.S. EPA Workshop on the Relationship Between Exposure Duration and Toxicity.		<a href="http://www.epa.gov/ncea/pdfs/tbexptox.pdf">http://www.epa.gov/ncea/pdfs/tbexptox.pdf</a>
1998	U.S. EPA	Viewpoints on Bioavailability for Wildlife		<a href="http://www.epa.gov/Region8/superfund/risks">http://www.epa.gov/Region8/superfund/risks</a>
1998	U.S. EPA	RCRA, Superfund & EPCRA Hotline Training Module - Introduction to: Applicable or Relevant and Appropriate Requirements	EPA540-R-98-020 OSWER9205.5-17	<a href="http://www.epa.gov/superfund/contacts/sfhot">http://www.epa.gov/superfund/contacts/sfhot</a>
1998	U. S. EPA	Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.	EPA/540/F-98/030 OSWER9200.4- 27, PB98-963244	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
1998	U. S. EPA	Proposed TSCA §403 Soil Lead Hazard and OSWER's Lead-in-Soils	EPA 540-F-98-061. OSWER9200.4- 29, PB99-963211	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
1998	U.S. EPA	IEUBK Model Mass Fraction of Soil in Indoor Dust (MSD) Variable	EPA 540-F-00-008	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
1998	U. S. EPA	Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments).	OSWER 9285.7-01D, EPA 540/R- 97/033, PB97-963305	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1998	U. S. EPA	Use of Soil Cleanup Criteria in 40 CFR Part 192 as Remediation Goals for CERCLA Sites.	OSWER 9200.4-25	<a href="http://www.epa.gov/superfund/resources/soil">http://www.epa.gov/superfund/resources/soil</a>
1998	U. S. EPA	EPA's Contaminated Sediment Management Strategy	EPA-823-R-98-001	<a href="http://www.epa.gov/waterscience/cs/strategy">http://www.epa.gov/waterscience/cs/strategy</a>
1998	U. S. ACE	Technical Project Planning (TPP) Process	USACE EM200-1-2	<a href="http://www.usace.army.mil/inet/usace-">http://www.usace.army.mil/inet/usace-</a>
1998	U.S. EPA	Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities: Volumes 1 - 3	EPA530-D-98-001	<a href="http://www.epa.gov/epaoswer/hazwaste/com">http://www.epa.gov/epaoswer/hazwaste/com</a>
1999	U. S. Army	Derivation of Health-Based Environmental Screening Levels for Chemical Warfare Agents - A Technical Evaluation	USACHPPM	

1999	U. S. Army	Recommendation for Army Working with the USEPA Region 4 - Policy for Ecological Risk Assessments (ERAs) at Military Bases	USACHPPM	
1999	U. S. DOD/EPA	Lead-Based Paint Guidelines for Disposal of Department of Defense Residential Real Property - A Field Guide	Interim Final	
1999	U. S. EPA	Cancer Risk Coefficients for Environmental Exposure to Radionuclides	EPA 402-R-99-001 Air and Radiation	
1999	U. S. EPA	Comprehensive Five-Year Review Guidance. Draft.	EPA 540R/98/050. OSWER Directive 9355.7-03B-P. NTIS PB99-963214.	
1999	U. S. EPA	Estimating Risk from Contaminants Contained in Agricultural Fertilizers - Draft Report	RTI Project No. 92U-7200-017	
1999	U. S. EPA	Fact Sheet Polychlorinated Biphenyls (PCBs) Update: Impact on Fish Advisories	Office of Water 4305 EPA-823-F-99-	
1999	U. S. EPA	Fact Sheet Polychlorinated Dibenzo-p-dioxins and Related Compounds Update: Impact on Fish Advisories	EPA-823-F-99-015	
1999	U. S. EPA	Fact Sheet Toxaphene Update: Impact on Fish Advisories	Office of Water 4305 EPA-823-F-99-	
1999	U. S. EPA	Frequently Asked Questions (FAQs) on the Adult Lead Model	Technical Review Workgroup for Lead	
1999	U. S. EPA	Guidance on Environmental Data Verification and Validation	EPA-QA/G8 Peer Review Draft	
1999	U. S. EPA	Guidelines for Carcinogen Risk Assessment	NECA-F0644 SAB Review Draft DO NOT CITE OR QUOTE,	
1999	U. S. EPA	National Recommended Water Quality Criteria- Correction	EPA 822-Z-99-001	
1999	U. S. EPA	US EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review		
1999	U. S. EPA Reg. 9	Drinking Water Standards and Health Advisories Table		
1999	U. S. Navy	Handbook for Statistical Analysis of Environmental Background Data	SWDIV and EFA West of Navel Engineering Command	
1999	U.S.EPA	Interim Guidance for Perchlorate	Memorandum	
1999	U. S. Navy	Navy Policy for Conducting Ecological Risk Assessments		<a href="http://web.ead.anl.gov/ecorisk/policy/pdf/pol">http://web.ead.anl.gov/ecorisk/policy/pdf/pol</a>
1999	U. S. EPA	Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities - Volumes 1, 2, & 3.	EPA 530-D-99-001 (A,B,&C)	<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/pro">http://www.epa.gov/Arkansas/6pd/rcra_c/pro</a>
1999	U. S. EPA	Revised Risk Assessment for the Air Characteristic Study Volume I Overview	EPA 530-R-99-019a	<a href="http://www.epa.gov/epaoswer/hazwaste/id/r9">http://www.epa.gov/epaoswer/hazwaste/id/r9</a>
1999	U. S. EPA	Revised Risk Assessment for the Air Characteristic Study Volume II Technical Background document	EPA 530-R-99-019b	<a href="http://www.epa.gov/epaoswer/hazwaste/id/r9">http://www.epa.gov/epaoswer/hazwaste/id/r9</a>
1999	U.S. EPA	Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants; States' Compliance--Revision of Polychlorinated Biphenyls (PCBs) Criteria	Federal Register, Volume 64, Number 216, page 61181	<a href="http://www.epa.gov/fedrgstr/EPA-">http://www.epa.gov/fedrgstr/EPA-</a>

1999	U. S. EPA	Toxicological Review Cadmium and Compounds. Draft. CAS No. 7440-		<a href="http://www.epa.gov/ncea/pdfs/cad/cad1.pdf">http://www.epa.gov/ncea/pdfs/cad/cad1.pdf</a>
1999	U. S. EPA	Strategy for Research on Environmental Risks to Children. Draft.		<a href="http://www.epa.gov/ncea/pdfs/Draft21.pdf">http://www.epa.gov/ncea/pdfs/Draft21.pdf</a>
1999	U. S. EPA	Guidance for Conducting Health Risk Assessment of Chemical Mixtures. Draft.	NCEA-C-0148	<a href="http://www.epa.gov/ncea/pdfs/mixture.pdf">http://www.epa.gov/ncea/pdfs/mixture.pdf</a>
1999	U.S. EPA	Asian and Pacific Islander Seafood Consumption Study	EPA 910/R-99-003	<a href="http://www.epa.gov/r10earth/offices/oea/risk/">http://www.epa.gov/r10earth/offices/oea/risk/</a>
1999	U.S. EPA Reg. 3	EPA Region 3 Soil-to-Groundwater Soil Screening Levels (SSLs)		<a href="http://www.epa.gov/reg3hwmd/risk/sslbg.pdf">http://www.epa.gov/reg3hwmd/risk/sslbg.pdf</a>
1999	U.S. EPA Reg. 3	EPA Region 3 Risk-Based Concentration Table: Technical Background Information		<a href="http://www.epa.gov/reg3hwmd/risk/tech99.p">http://www.epa.gov/reg3hwmd/risk/tech99.p</a>
1999	U. S. EPA Reg. 1	EPA Region 1 Risk Updates, Number 5.		<a href="http://www.epa.gov/region1/superfund/resou">http://www.epa.gov/region1/superfund/resou</a>
1999	U.S. EPA Reg. 8	Background Concentrations - Use in EPA Risk Assessments		<a href="http://www.epa.gov/Region8/superfund/risks">http://www.epa.gov/Region8/superfund/risks</a>
1999	U. S. EPA	Part II. Environmental Protection Agency: National Primary Drinking Water Regulations; Radon-222; Proposed Rule.	Federal Register	<a href="http://www.epa.gov/safewater/radon/proposa">http://www.epa.gov/safewater/radon/proposa</a>
1999	U.S. EPA Reg. 5	Use of the TRW Interim Adult Lead Methodology in Risk Assessment	Memo from EPA Reg.5 to TRW	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
1999	U.S. EPA	IEUBK Model Bioavailability Variable		<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
1999	U.S. EPA	IEUBK Model Soil/Dust Ingestion Rates	EPA 540-F-00-007	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
1999	U. S. EPA	A Community Guide to Superfund Risk Assessment.	EPA 540-K-99-003. OSWER 9285.7-	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1999	U. S. EPA	Risk Assessment Guidance for Superfund, Volume 3 – Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A). Draft	OSWER EPA 000-0-99-000	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1999	U. S. EPA	Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual Supplement to Part A: Community Involvement in Superfund Risk Assessments.	EPA 540/R-98/042 HWC. OSWER 9285.7-01E-P. PB99-963303	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1999	U. S. EPA	Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites.	OSWER 9285.7-28P	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
1999	U.S. EPA	Improving Site Assessment: Abbreviated Preliminary Assessments	EPA 540-F-98-037	<a href="http://www.epa.gov/superfund/programs/site">http://www.epa.gov/superfund/programs/site</a>
1999	U.S. EPA	Improving Site Assessment: Combined PA/SI Assessments	EPA 540-F-98-038 OSWER 9375.2-10FS	<a href="http://www.epa.gov/superfund/programs/site">http://www.epa.gov/superfund/programs/site</a>
1999	U.S. EPA	Improving Site Assessment: Pre-CERCLIS Screening Assessments	EPA 540-F-98-039 OSWER 9375.2-11FS	<a href="http://www.epa.gov/superfund/programs/site">http://www.epa.gov/superfund/programs/site</a>
1999	U.S. EPA	Reuse of CERCLA Landfill and Containment Sites	EPA 540-F-99-015 OSWER 9375.3-	<a href="http://www.epa.gov/superfund/reso urces/pres">http://www.epa.gov/superfund/reso urces/pres</a>
1999	U. S. EPA	Radiation Risk Assessment at CERCLA Sites: Q&A.	OSWER 9200.4-31P	<a href="http://www.epa.gov/superfund/resources/radi">http://www.epa.gov/superfund/resources/radi</a>
1999	U. S. ACE	Risk Assessment Handbook - Volume I: Human Health Evaluation	Publication Number: EM 200-1-4	<a href="http://www.usace.army.mil/inet/usace-">http://www.usace.army.mil/inet/usace-</a>
2000	DUSD (ES/CL)	Interim Policy on Land Use Controls Associated with Environmental Restoration Activities		
2000	U. S. Army	Interim Army Guidance for Conducting CERCLA Five-Year Reviews		

2000	U. S. Army	Standard Practice for Wildlife Toxicity Reference Values	US Army CHPPM Technical Guide No. 254
2000	U. S. DOD/EPA	DoD and EPA Management Principles for Implementing Response Actions at Closed, Transferring, and Transferred (CTT) Ranges	Interim Final
2000	U. S. EPA	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo- p-Dioxin (TCDD) and Related Compounds, Part I: Estimating Exposure to Dioxin-Like Compounds, Volume 2: Sources of Dioxin -Like Compounds in the United States	EPA/600/P -00/001Bb DO NOT CITE OR QUOTE Draft Final Report
2000	U. S. EPA	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo- p-Dioxin (TCDD) and Related Compounds, Part I: Estimating Exposure to Dioxin-Like Compounds, Volume 3: Properties, Environmental Levels, and Background Exposures	EPA/600/P -00/001Bc DO NOT CITE OR QUOTE Draft Final Report
2000	U. S. EPA	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo- p-Dioxin (TCDD) and Related Compounds, Part I: Estimating Exposure to Dioxin-Like Compounds, Volume 4: Site-Specific Assessment	EPA/600/P -00/001Bd DO NOT CITE OR QUOTE Draft Final Report
2000	U. S. EPA	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo- p-Dioxin (TCDD) and Related Compounds, Part II: Health Assessment for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds - Chapters 1 through 7	EPA/600/P -00/001Be DO NOT CITE OR QUOTE Draft Final Report
2000	U. S. EPA	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo- p-Dioxin (TCDD) and Related Compounds, Part III: Integrated Summary and Risk Characterization for 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds	EPA/600/P -00/001Bg DO NOT CITE OR QUOTE Preliminary Draft
2000	U. S. EPA	Report on the Peer Review of the Dioxin Reassessment Documents: Toxicity Equivalency Factors for Dioxin and Related Compounds (Chapter 9) and Integrated Risk Characterization Document	
2000	U. S. EPA	Revisions to the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000); Notice	Fed. Reg. Vol. 65, No. 214, Nov. 3
2000	U. S. EPA	Supplementary Guidance for Conducting Health Risk Assessment of Chemical Mixtures	EPA/630/R-00?002 Product of the Risk Assessment Forum
2000	U. S. EPA	User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings (Revised)	
2000	U. S. EPA	Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California	Federal Register: May 18, 2000 (Volume 65, Number 97)] [Rules and Regulations] [Page 31681-31719]
2000	U. S. EPA Reg. 6	Region 6 Human Health Medium-Specific Screening Levels	
2000	U. S. EPA Reg. 9	Drinking Water Standards and Health Advisories Table	Compiled by Bruce Macler Region 9, Drinking Water Office



2000	U. S. EPA U. S. DoD U. S. DOE	Uniform Federal Policy for Implementing Environmental Quality Systems – Evaluating, Assessing, and Documenting Environmental Data Collection/Use and Technology Programs	Intergovernmental Data Quality Task Force	
2000	U. S. Navy	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U. S. Navy and Marine Corps Facilities Part 1: Overview of Metals Bioavailability, User's Guide	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	
2000	U. S. Navy	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U. S. Navy and Marine Corps Facilities Part 2: Technical Background Document for Assessing Metals Bioavailability, User's Guide	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	
2000	U. S. Navy	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U.S. Navy and Marine Corps Facilities Part 1: Overview of Metals Bioavailability, Final	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	
2000	U. S. Navy	Guide for Incorporating Bioavailability Adjustments into Human Health and Ecological Risk Assessments at U.S. Navy and Marine Corps Facilities Part 2: Technical Background Document for Assessing Metals Bioavailability, Final	Naval Facilities Engineering Service Center and the Engineering Field Activity West (NAVFAC)	
2000	USAF	U.S. Air Force Installation Restoration Program Remedial Project Manager's Handbook		<a href="http://64.241.27.44/ILEVR/Greenbook/home.">http://64.241.27.44/ILEVR/Greenbook/home.</a>
2000	U. S. Army	Principles of Environmental Restoration	U.S. Army Environmental Center, Aberdeen Proving Ground, Edgewood Area	<a href="http://aec.army.mil/usaec/restoration/per-">http://aec.army.mil/usaec/restoration/per-</a>
2000	U. S. EPA	Child-Specific Exposure Factors Handbook. Draft.	NCEA-W-0853	<a href="http://cfpub.epa.gov/ncea/cfm/efcsefh2.cfm">http://cfpub.epa.gov/ncea/cfm/efcsefh2.cfm</a> -
2000	U. S. Navy	Navy Interim Final Policy on the Use of Background Chemical Levels		<a href="http://web.ead.anl.gov/ecorisk/policy/pdf/bk">http://web.ead.anl.gov/ecorisk/policy/pdf/bk</a>
2000	U. S. EPA	Options for Development of Parametric Probability Distributions for Exposure Factors	EPA/600/R-00/058.	<a href="http://www.epa.gov/ncea/paramprob4ef.htm">http://www.epa.gov/ncea/paramprob4ef.htm</a>
2000	U. S. EPA	Benchmark Dose Technical Guidance Document.	EPA/630/R-00/001	<a href="http://www.epa.gov/ncea/pdfs/bmds/BMD_E">http://www.epa.gov/ncea/pdfs/bmds/BMD_E</a>
2000	U. S. EPA	Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Part II: Health Assessment for 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and Related Compounds (Draft Final)	EPA/600/P -00/001Ae	<a href="http://www.epa.gov/ncea/pdfs/dioxin/">http://www.epa.gov/ncea/pdfs/dioxin/</a>
2000	U. S. EPA	Draft Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds		<a href="http://www.epa.gov/ncea/pdfs/dioxin/dioxrea">http://www.epa.gov/ncea/pdfs/dioxin/dioxrea</a>
2000	U. S. EPA	Workshop Report on Characterizing Ecological Risk at the Watershed	EPA/600/R-99/111	<a href="http://www.epa.gov/ncea/pdfs/ecorisk/ecoris">http://www.epa.gov/ncea/pdfs/ecorisk/ecoris</a>
2000	U. S. EPA	Science Policy Council Handbook: Risk Characterization	EPA 100-B-00-002	<a href="http://www.epa.gov/osp/spc/rchandbk.pdf">http://www.epa.gov/osp/spc/rchandbk.pdf</a>
2000	U. S. EPA	Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs	EPA-823-R-00-001 & EPA-823-R-00-002	<a href="http://www.epa.gov/ost/cs/biotesting/bioacc">http://www.epa.gov/ost/cs/biotesting/bioacc</a>
2000	U. S. EPA	Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs.	EPA 823/R-00/001	<a href="http://www.epa.gov/ost/cs/biotesting/bioacc">http://www.epa.gov/ost/cs/biotesting/bioacc</a>

2000	U. S. EPA	Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates - Second	EPA 600/R- 99/064	<a href="http://www.epa.gov/ost/cs/freshfact/html">http://www.epa.gov/ost/cs/freshfact/html</a>
2000	U. S. EPA	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 1: Fish Sampling and Analysis - Third Edition	EPA 823_B_00-007	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
2000	U. S. EPA	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 2: Risk Assessment and Fish Consumption Limits - Third Edition	Office of Water	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
2000	U. S. EPA	Guidance for Assessing Chemical Contaminant Data for Use In Fish Advisories - Volume 3: Overview of Risk Management	Office of Water	<a href="http://www.epa.gov/ost/fish/guidance.html">http://www.epa.gov/ost/fish/guidance.html</a>
2000	U. S. EPA	Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000).	EPA-822-B-00-004	<a href="http://www.epa.gov/ost/humanhealth/method">http://www.epa.gov/ost/humanhealth/method</a>
2000	U. S. EPA	Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW, Final.	EPA 600/R-00/007	<a href="http://www.epa.gov/quality/qa_docs.html">http://www.epa.gov/quality/qa_docs.html</a> -
2000	U. S. EPA	Guidance for Data Quality Assessment: Practical Methods for Data	EPA/600/R 96/084 EPA/QA/G-9	<a href="http://www.epa.gov/quality/qa_docs.html">http://www.epa.gov/quality/qa_docs.html</a> -
2000	U.S. EPA	EPA Quality Manual for Environmental Programs		<a href="http://www.epa.gov/quality/qs-docs/5360.pdf">http://www.epa.gov/quality/qs-docs/5360.pdf</a>
2000	U. S. EPA	Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). Revision	EPA 402-R-97-016	<a href="http://www.epa.gov/radiation/marssim">http://www.epa.gov/radiation/marssim</a>
2000	U. S. EPA	EPA Region III Risk -Based Concentration Tables		<a href="http://www.epa.gov/reg3hwmd/risk/index.ht">http://www.epa.gov/reg3hwmd/risk/index.ht</a>
2000	U. S. EPA Reg. 4	Human Health Risk Assessment Bulletins - Supplement to RAGS		<a href="http://www.epa.gov/region04/waste/ots/heal">http://www.epa.gov/region04/waste/ots/heal</a>
2000	U. S. EPA	Part II. Environmental Protection Agency: National Primary Drinking Water Regulations; Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring; Proposed Rule	Federal Register	<a href="http://www.epa.gov/safewater/ars/arsenic.pdf">http://www.epa.gov/safewater/ars/arsenic.pdf</a>
2000	U. S. EPA	Part II. Environmental Protection Agency: National Primary Drinking Water Regulations; Radionuclides; Final Rule.		<a href="http://www.epa.gov/safewater/rads/radfr.pdf">http://www.epa.gov/safewater/rads/radfr.pdf</a>
2000	U. S. EPA	Lead at Outdoor Firing Ranges	EPA-540-F-00-009	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
2000	U. S. EPA	TRW Recommendations for Sampling and Analysis of Soil at Lead (Pb)	EPA 540-F-00-010 OSWER 9285.7-	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
2000	U. S. EPA	Ecological Soil Screening Level (Eco-SSL) Guidance. Draft.		<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
2000	U. S. EPA	Peer Review Workshop Report on Ecological Soil Screening Level (ECO-SSL) Guidance Document.	Contract No. 68-C-99-238	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
2000	U. S. EPA	Remediation Goals for Radioactively Contaminated CERCLA Sites Using the Benchmark Dose Cleanup Criterion in 10 CFR Part 40 – Appendix A, I, Criterion 6(6).	OSWER 9200.4-35P	<a href="http://www.epa.gov/superfund/resources/radi">http://www.epa.gov/superfund/resources/radi</a>
2000	U. S. EPA	Soil Screening Guidance for Radionuclides: Technical Background Document	EPA/540-R-00-006	<a href="http://www.epa.gov/superfund/resources/radi">http://www.epa.gov/superfund/resources/radi</a>
2000	U. S. EPA	Soil Screening Guidance for Radionuclides: User's Guide	EPA/540-R-00-007, PB2000 963307	<a href="http://www.epa.gov/superfund/resources/radi">http://www.epa.gov/superfund/resources/radi</a>
2000	U.S. EPA	AQUATOX Release 1: A SimA SIMULATION MODEL FOR AQUATIC ECOSYSTEMS (Fact Sheet)	EPA#: 823-F-00-015	<a href="http://www.epa.gov/waterscience/models/aqu">http://www.epa.gov/waterscience/models/aqu</a>

2000	U. S. EPA	Prediction of Sediment Toxicity Using Consensus-Based Freshwater Sediment Quality Guidelines	Final report of USGS to U. S. EPA	<a href="http://www.msc.nbs.gov/pubs/center/pdfDoc">http://www.msc.nbs.gov/pubs/center/pdfDoc</a>
2000	U. S. EPA	Guidance for the Data Quality Objectives Process	EPA QA/G-4. EPA 600/R 96/055	<a href="http://www.epa.gov/quality/1/qsdocs/g4final">http://www.epa.gov/quality/1/qsdocs/g4final</a> .
2000	U. S. DoD	Tri-Service Remedial Project Manager's Handbook for Ecological Risk Assessment	SFIM-AEC-ER-200015	<a href="https://www.denix.osd.mil/denix/Public/Libr">https://www.denix.osd.mil/denix/Public/Libr</a>
2001	DOD	Policy on Land Use Controls Associated with Environmental Restoration Activities	Memorandum	
2001	U. S. EPA	2001 National Listing of Fish and Wildlife Advisories	EPA-823-F-02-010 Office of Water	
2001	U. S. EPA	Framework for Cumulative Risk Assessment	NECA-F-1098	
2001	U. S. EPA	Guidance for Characterizing Background Chemicals in Soil at Superfund Sites	External Review Draft Office of Emergency and Remedial Response	
2001	U. S. EPA	Planning for Ecological Risk Assessment: Developing Management Objectives	[Draft - Do Not Cite Or Quote] EPA/630/R-01/001A External Review Draft	
2001	U. S. EPA	Policy for Addressing Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites	DRAFT - 16 July 2001 Review Copy	
2001	U. S. EPA	Sources, Emission and Exposure for Trichloroethylene (TCE) and Related Chemicals	National Center for Environmental Assessment	
2001	U. S. EPA Reg. 4	EPA Region 4 Human Health Risk Assessment Bulletins- Supplement to RAGS	U.S. EPA Region 4	
2001	USAF & DLA	Remedial Process Optimization Handbook		
2001	USEPA	Fact Sheet Mercury Update: Impact on Fish Advisories	Office of Water 4305 EPA-823-F-01-	
2001	U. S. Navy	Navy Guidance for Conducting Ecological Risk Assessments		<a href="http://web.ead.anl.gov/ecorisk/process/pdf/in">http://web.ead.anl.gov/ecorisk/process/pdf/in</a>
2001	U. S. EPA	Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action (Final)	Solid Waste and Emergency Response (5303W) EPA/530/R-01/015	<a href="http://www.epa.gov/correctiveaction">http://www.epa.gov/correctiveaction</a>
2001	U. S. EPA	Draft Supplemental Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway (Vapor Intrusion Guidance) - December 2001	RCRA	<a href="http://www.epa.gov/correctiveaction/eis/vap">http://www.epa.gov/correctiveaction/eis/vap</a>
2001	U. S. EPA Reg 4	Environmental Investigations Standard Operating Procedures and Quality Assurance Manual		<a href="http://www.epa.gov/region4/sesd/eisopqam/e">http://www.epa.gov/region4/sesd/eisopqam/e</a>
2001	U. S. EPA Reg. 4	Ecological Risk Assessment Bulletins - Supplement to RAGS: (1) Ecological Introduction, (2) Ecological Screening Values, (3) Endpoint Selection, (4) Natural Resources Trustees		<a href="http://www.epa.gov/Region4/waste/ots/ecol">http://www.epa.gov/Region4/waste/ots/ecol</a>
2001	U. S. EPA	National Primary Drinking Water Standards	EPA 816-F-01-007	<a href="http://www.epa.gov/safewater">http://www.epa.gov/safewater</a>
2001	U.S. EPA	Review of Adult Lead Models - Evaluation of Models for Assessing Human Health Risks Associated with Lead Exposures at Non-Residential Areas of Superfund and Other Hazardous Waste Sites	EPA 9285.7-46	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
2001	U.S. EPA	Reference Manual: Documentation of Updates for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK)		<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>

2001	U. S. EPA	Lead; Identification of Dangerous Levels of Lead; Final Rule	Fed. Reg. Vol. 66, No. 4	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
2001	U.S. EPA	User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Windows« Version	EPA 9285.7-42 EPA 540-K-01-005	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
2001	U. S. EPA	The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments, ECO Update Intermittent Bulletin	EPA 540/F-01/014	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
2001	U. S. EPA	Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments) Final	Pub. 9285.7-47	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
2001	U. S. EPA	Risk Assessment Guidance for Superfund, Volume 1 – Human Health Evaluation Manual Part E, Interim Supplemental Guidance for Dermal Risk Assessment, Review Draft for Public Comment	OSWER Directive 9285.7-02EP	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
2001	U. S. EPA	Risk Assessment Guidance for Superfund, Volume 3 - Part A: Process for Conducting Probabilistic Risk Assessments (RAGS 3A).	EPA 540-R-2-002 OSWER 9285.7-45	<a href="http://www.epa.gov/superfund/RAGS3A/ind">http://www.epa.gov/superfund/RAGS3A/ind</a>
2001	U. S. EPA	Comprehensive Five-Year Review Guidance	OSWER Directive 9355.7-03B-P	<a href="http://www.epa.gov/superfund/resources/5yr">http://www.epa.gov/superfund/resources/5yr</a>
2001	U. S. EPA	Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (Peer Review Draft)	OSWER 9355.4-24	<a href="http://www.epa.gov/superfund/resources/soil">http://www.epa.gov/superfund/resources/soil</a>
2001	U. S. EPA	Water Quality Criterion for the Protection of Human Health:	EPA-823-R-01-001	<a href="http://www.epa.gov/waterscience/criteria/met">http://www.epa.gov/waterscience/criteria/met</a>
2001	U. S. EPA	Incidence and Severity of Sediment Contamination in Surface Waters of the United States, National Sediment Quality Survey- Draft Report	EPA-823-F-01-031	<a href="http://www.epa.gov/waterscience/cs/draft/sur">http://www.epa.gov/waterscience/cs/draft/sur</a>
2001	U. S. EPA	Method for Assessing the Chronic Toxicity of Marine and Estuarine Sediment-associated Contaminants with the Amphipod <i>Leptocheirus plumulosus</i> , First Edition	EPA 600/R-01/020	<a href="http://www.epa.gov/waterscience/cs/guidanc">http://www.epa.gov/waterscience/cs/guidanc</a>
2001	U. S. Navy	Navy Policy for Conducting Human Health Risk Assessments Under the Environmental Restoration Program	Memorandum 5090 Ser N453E/1U595168	<a href="http://www-">http://www-</a>
2001	U. S. Navy	U.S. Navy Human Health Risk Assessment Guidance		<a href="http://www-">http://www-</a>
2001	U. S. EPA	Clarifying DQO Terminology Usage to Support Modernization of Site Cleanup Practice	Prepared by Deana Crumbling, USEPA Technology Innovation Office	<a href="http://www.epa.gov/superfund/resources/reusefinal">www.epa.gov/superfund/resources/reusefinal</a>
2001	U. S. EPA	Reuse Assessment: A Tool To Implement The Superfund Land Use Directive Alternative Title: Reuse Assessment Guide	OSWER 9355.7-06.P	<a href="http://www.epa.gov/superfund/resources/reusefinal">www.epa.gov/superfund/resources/reusefinal</a>
2002	U. S. ACE	Guide for Characterizing Sites Contaminated with Energetic Materials	EDRC/CRREL TR02-1US ACE Engineer Research and Development Center	
2002	U. S. ACE	White Paper: Using RESRAD in a CERCLA Radiological Risk		
2002	U. S. Army	Bioconcentration, Bioaccumulation and Biomagnification of Nitroaromatic and Nitramine Explosives and their Breakdown Products	U. S. Army CHPPM Toxicology Study No.87-MA-6943-01	
2002	U. S. Army	Selection of Assessment and Measurement Endpoints for Ecological Risk Assessments	SFIM-AEC-ER-TR-2002018	

2002	U. S. Army	Technical Document for Ecological Risk Assessment: Planning for Data Collection	SFIM-AEC-ER-TR-2002017	
2002	U. S. EPA	2002 Edition of the Drinking Water Standards and Health Advisories	EPA 822-R-02-038	
2002	U. S. EPA	Estimated Per Capita Fish Consumption in the United States	EPA-821-C-02-003	
2002	U. S. EPA	Guidance for Monitoring at Hazardous Waste Sites: Framework for Monitoring Plan Development and Implementation	OSWER No. 9355.4-28	
2002	U. S. EPA	Handbook on the Management of Ordnance and Explosives at Closed, Transferring, and Transferred Ranges and Other Sites	Interim Final Draft	
2002	U. S. EPA	Institutional Controls and Transfer of Real Property under CERCLA Section 120(h)(3)(A), (B) or (C)		
2002	U. S. EPA	Perchlorate Environmental Contamination: Review and Risk	External Review Draft - Do Not Cite or Quote NCEA-103	
2002	U. S. EPA	Perchlorate Update		
2002	U. S. EPA	Radionuclide Preliminary Remediation Goals (PRGs) for Superfund	OSWER Dir.: 9285.6-08	
2002	U. S. EPA	Update: National Listing of Fish and Wildlife Advisories	EPA-823-F-02-007 Office of Water	
2002	U. S. EPA	Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities Resource Conservation and Recovery Act (RCRA)		
2002	U. S. Navy	Critical Issues for Contaminated Sediment Management	MESO-02-TM-01	
2002	U. S. EPA	Distribution of OSWER of Radionuclide Preliminary Remediation Goals (PRGs) for Superfund Electronic Calculator	OSWER Dir. #: 9355.01 -83A	<a href="http://epa.gov/superfund/resources/radiation/">http://epa.gov/superfund/resources/radiation/</a>
2002	U.S. EPA Reg. 6	EPA Region 6 Human Health Medium-Specific Screening Levels		<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/pd_">http://www.epa.gov/Arkansas/6pd/rcra_c/pd_</a>
2002	U.S. EPA Reg. 6	RCRA Delisting Technical Support Document	EPA906-D-98-001	<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/pd_">http://www.epa.gov/Arkansas/6pd/rcra_c/pd_</a>
2002	U.S. EPA Reg. 6	Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities - Peer Review Draft		<a href="http://www.epa.gov/Arkansas/6pd/rcra_c/pro">http://www.epa.gov/Arkansas/6pd/rcra_c/pro</a>
2002	U. S. EPA	Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)		<a href="http://www.epa.gov/correctiveaction/eis/vap">http://www.epa.gov/correctiveaction/eis/vap</a>
2002	U.S. EPA	National Ambient Air Quality Standards (NAAQS)		<a href="http://www.epa.gov/reg3airtd/airquality/NA">http://www.epa.gov/reg3airtd/airquality/NA</a>
2002	U.S. EPA Reg. 3	EPA Regions 3 Risk-based Concentration Table		<a href="http://www.epa.gov/reg3hwmd/risk/rbc1002">http://www.epa.gov/reg3hwmd/risk/rbc1002</a>
2002	U.S. EPA Reg. 3	Derivation of Vinyl Chloride RBCs - Memorandum		<a href="http://www.epa.gov/reg3hwmd/risk/vcrbc.P">http://www.epa.gov/reg3hwmd/risk/vcrbc.P</a>
2002	U. S. EPA Reg 9	Region 9 Preliminary Remediation Goals (PRGs) Table 2002 Update		<a href="http://www.epa.gov/region09/waste/sfund/pr">http://www.epa.gov/region09/waste/sfund/pr</a>
2002	U. S. EPA Reg. 4	Ecological Assessment Standard Operating Procedures and Quality Assurance Manual	U. S. EPA Region 4 SEED-EAB	<a href="http://www.epa.gov/region4/sesd/eabsop/eab">http://www.epa.gov/region4/sesd/eabsop/eab</a>
2002	U.S. EPA	Overview of the IEUBK Model for Lead in Children	EPA 540-R-99-015	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>

2002	U.S. EPA	Blood Lead Concentrations of U.S. Adult Females: Summary Statistics from Phase 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III)	EPA 9285.7-52	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
2002	U.S. EPA	Reference Manual: Documentation of Updates for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK)	EPA 9285.7-44	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
2002	U.S. EPA	System Requirements and Design for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Window« Version	EPA 9285.7-43	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
2002	U.S. EPA	User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Windows« Version	EPA 9285.7-42 EPA 540-K-01-005	<a href="http://www.epa.gov/superfund/programs/lead">http://www.epa.gov/superfund/programs/lead</a>
2002	U.S. EPA	Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites	EPA 540-R-01-003	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
2002	U.S. EPA	Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites		<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
2002	U. S. EPA	Role of Background in the CERCLA Cleanup Program	OSWER Dir.: 9285.6-07P	<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
2002	U. S. EPA	Principles for Managing Contaminated Sediment Risk at Hazardous Waste Sites		<a href="http://www.epa.gov/superfund/resources/prin">http://www.epa.gov/superfund/resources/prin</a>
2002	U.S. EPA	Common Radionuclide Found at Superfund Sites	EPA 540?R-00-004	<a href="http://www.epa.gov/superfund/resources/radi">http://www.epa.gov/superfund/resources/radi</a>
2002	U. S. EPA	Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual	EPA-823-B-01-002	<a href="http://www.epa.gov/waterscience/cs/collecti">http://www.epa.gov/waterscience/cs/collecti</a>
2002	U.S. EPA	National Recommended Water Quality Criteria: 2002	EPA-822-R-02-047	<a href="http://www.epa.gov/waterscience/pc/revcom">http://www.epa.gov/waterscience/pc/revcom</a>
2002	U.S. EPA	Generic Assessment Endpoints for Ecological Risk Assessment	EPA/630/P -02/004A	<a href="http://cfpub.epa.gov/ncea/raf/recordisplay.cfm">http://cfpub.epa.gov/ncea/raf/recordisplay.cfm</a>
2002	U.S. EPA	Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites		<a href="http://www.epa.gov/superfund/programs/risk">http://www.epa.gov/superfund/programs/risk</a>
2003	U.S. EPA	Status of EPA's Interim Assessment Guidance for Perchlorate	Memorandum	
2003	U.S. EPA	Draft Final Guidelines for Carcinogen Risk Assessment	EPA/630/P -03/001A	<a href="http://www.epa.gov/ncea/raf/cancer2003.htm">www.epa.gov/ncea/raf/cancer2003.htm</a>