



U.S. Navy Human Health Risk Assessment Guidance

Chapter 7 – Tier IA and Tier IB Risk-Based Screening

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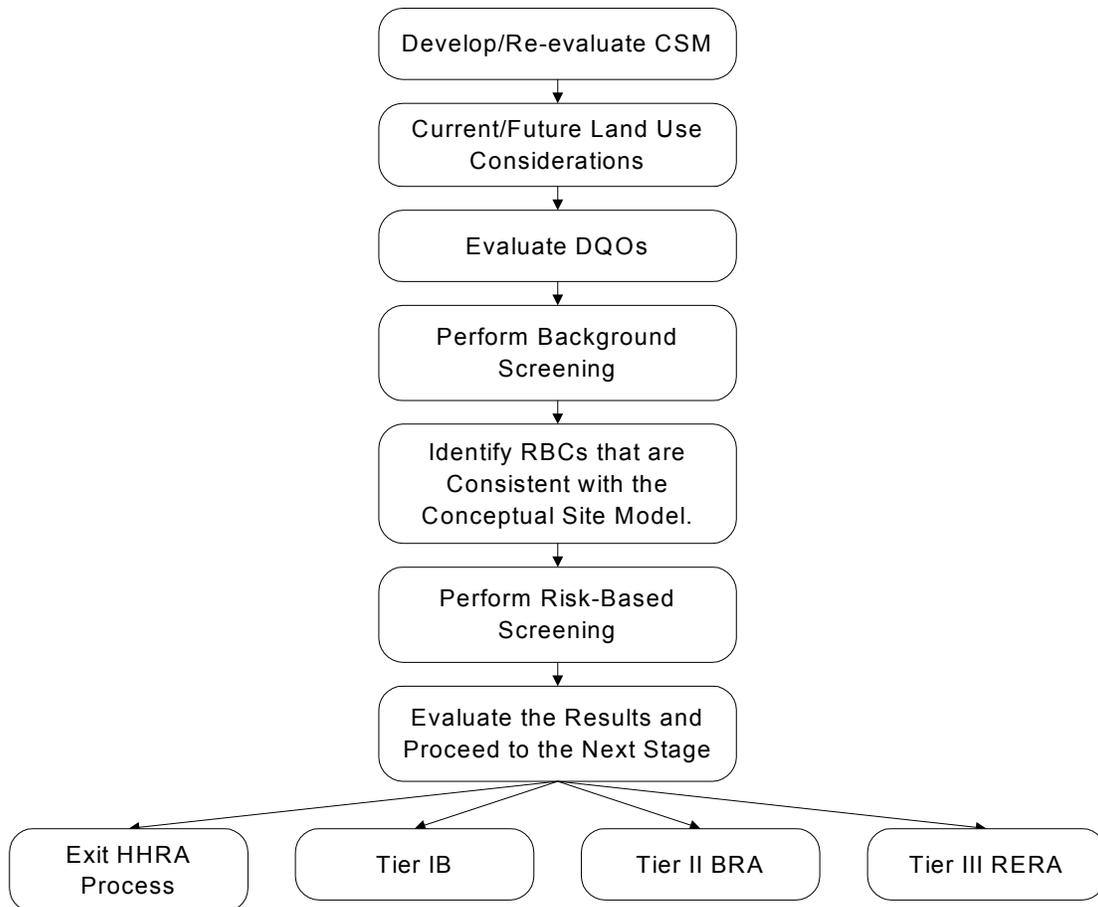
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7.0 Introduction

This chapter details the process for risk-based screening. Risk-based screening compares site chemical concentrations to conservative risk-based concentrations (RBCs) in order to determine if the site may exit the human health risk assessment (HHRA) process. [Figure 7.1](#) presents an overview of the risk-based screening process. The following sections present the purpose, objectives, methodology, and key assumptions that should be considered when performing risk-based screening.

Figure 7.1 – Overview of the Risk-Based Screening Process



7.1 Purpose and Objectives

The purpose of risk-based screening is to cost-effectively determine, early in the process, whether or not a site poses acceptable risks using conservative default exposure assumptions. Risk-based screening is an efficient way to evaluate sites for several reasons.

- ♦ Risk-based screening is a standard part of the risk assessment process. The United States Environmental Protection Agency (USEPA) has increasingly emphasized this approach, because it saves time and money while protecting human health: "Human health risk assessment includes effort-intensive steps which require many detailed calculations by experts. A few chemicals and a few routes of exposure dominate most baseline risk assessments. Effort expended on minor contaminants and exposure routes, i.e., those which do not influence overall risk, is essentially



wasted. This guidance is intended to identify and focus on dominant contaminants of concern and exposure routes at the earliest feasible point in the baseline risk assessment. Use of these methods will decrease effort and time spent assessing risk, without loss of protectiveness (USEPA, 1993).” In addition, the outcomes of risk-based screening are consistent with what would occur if a complete human health risk assessment was performed (USEPA, 1993).

- ◆ The process is relatively quick and easy to perform.
- ◆ Regulatory agencies recognize the utility of risk-based screening and accept decisions that are made based on the results.

Risk-based screening is a useful step in the site evaluation process because a site will either be eliminated from further consideration or a subset of chemicals at the site will be identified as being of concern and will become the focus of subsequent site investigation and evaluation.

7.2 Tier IA and IB Exit Criteria

7.2.1 EXIT CRITERIA

Exit criteria are used to evaluate the risk-based screening results to determine if a site can exit the HHRA process. Exit criteria are quantitative expressions of acceptable risks that may be used in conjunction with institutional controls and land use to determine if a site can exit the HHRA process or if it warrants further evaluation. The three ways to exit the human health risk assessment process from the risk-based screening step are as follows.

- 1.) **Incomplete Exposure Pathways** – If chemicals present on site are not accessible to humans (e.g., non-volatile chemicals under a building foundation, no human populations present, etc.) then there is no possibility for human exposure, no risk, and the site may exit the HHRA process.
- 2.) **Background** – If there are no chemical concentrations present on site that are greater than background concentrations then the site may exit the HHRA process. *Note: This applies to all chemicals that are present in background samples. If a chemical was not detected in background samples, then it should not be screened out and should be evaluated further, using risk-based approaches.*
- 3.) **Risk-Based Screening** – If there are no chemicals present on site that are greater than risk-based screening criteria (i.e., concentrations of chemicals in different media that are derived using conservative target risk goals and standard exposure scenarios) then the site may exit the HHRA process. *Note: This comparison should also include chemicals detected at concentrations that are not representative of background concentrations. Essential nutrients (i.e., calcium, magnesium, potassium, iron and sodium) should be eliminated from consideration in the risk assessment because they are not associated with toxicity in humans under normal circumstances. Also, chemicals that are detected infrequently and at low concentrations (e.g., less than 5% frequency of detection and at concentrations slightly above the detection limit) should be eliminated from further consideration in the risk assessment process (USEPA, 1989).*

Note: If an “Interim Removal Action” is performed (i.e., if all, or some, of the contamination is removed) then the site should be re-evaluated using the exit criteria identified above to determine whether or not it may exit the HHRA process.

After completing Tier IA, a site will either go to Tier IB, Tier II, Tier III, or exit the HHRA process (i.e., no further action or proposed plan with institutional controls). Sites that are evaluated in Tier IB will either go to Tier II, Tier III, or exit the HHRA process. [Figure 7.2](#) presents exit criteria for risk-based screening in the context of the overall site remediation process. Regardless of the initial exit criteria that are selected,



it is important for Remedial Project Managers (RPMs) to continually re-evaluate their site with regards to the exit criteria to determine if it may exit the HHRA process.

Note: If a site exits the human health risk assessment process, Maximum Contaminant Levels [MCLs] or non-zero Maximum Contaminant Level Goals [MCLGs] and ecological risks should still be considered. In addition, the exit criteria presented in this section should not be viewed as discrete values. RPMs should evaluate each site on a case-by-case basis to determine if the risks are considered acceptable or unacceptable (USEPA, 1991c). In some situations, risks that are acceptable at one site may not be considered acceptable at another site. This may be due to a variety of site-specific factors, such as the uncertainty associated with characterizing exposure or the uncertainties associated with the toxicity values of chemicals responsible for the majority of the risk.

7.2.2 BACKGROUND INFORMATION ON EXIT CRITERIA

Exit criteria are developed based on regulatory benchmarks and cancer and noncancer health risks. They may also take into account land use or institutional controls. The regulatory benchmarks and land use are discussed below. For more information on cancer and noncancer risks see Chapter 8 – Tier II Baseline Risk Assessment.

Regulatory Benchmarks

RBCs are calculated based on default exposure scenarios and assumptions using a carcinogenic risk goal of one chance in one million (1E-06) and noncarcinogenic hazard quotient of one (USEPA, 1991c). In other words, RBCs are set at concentrations that are below levels of regulatory concern. In instances where there are both cancer- and noncancer-based RBCs, the lower of the two values (usually the cancer-based value) is selected as the RBC for the chemical.

Note: Some USEPA Regions use different target risk goals to develop RBCs depending on the type of evaluation being performed. For example, USEPA Region III recommends that a target risk goal of 1/10th of the RBC be used when screening chemical concentration versus noncancer RBCs. Therefore, it is important to check USEPA Regional Guidance, if available, to determine the target risk goals that should be used in risk-based screening.

Impact of Land Use Controls and Institutional Controls on Exit Criteria

In some cases the Tier IA or IB screening evaluation results depend on land use controls (LUCs), such as institutional controls or future land use decisions. It is important to understand the benefits of LUCs, as well as the restrictions that accompany them. Implementing LUCs for a site can be beneficial because it allows the risk assessment to reflect actual future land use which can lower the cost of the remediation if a land use other than residential is specified. This is due to the fact that exit criteria for land uses other than residential (e.g., industrial) are typically less stringent. Although LUCs may present a viable option as part of a remedy, it is important to consider the long-term, life-cycle, costs of LUCs (e.g., long-term monitoring). The implementation of LUCs is a risk management decision and long-term costs of LUCs should be weighed against the additional costs of cleanup to unrestricted use.



Figure 7.2 – Navy Tiered CERCLA Process





7.3 Overview of Tier I--Risk Based Screening

Risk-based screening compares site chemical concentrations to RBCs. RBCs are concentrations of chemicals in soil, air, and water that are considered protective of human health. They are determined by performing a reverse risk assessment: standard risk assessment equations are rearranged to solve for media concentrations rather than risk. For Tier IA, default residential and industrial exposure scenarios are combined with USEPA toxicity values and target risk goals (e.g., a cancer risk of 1E-06 and a hazard quotient of 1) to determine acceptable concentrations of chemicals in each media. For Tier IB, site-specific exposure scenarios are combined with USEPA toxicity values and target risk goals to determine acceptable concentrations of chemicals in each media.

The Tier I Risk-Based Screening process consists of the following steps:

- 1.) develop a conceptual site model (CSM);
- 2.) evaluate data quality objectives (DQOs);
- 3.) compare site concentrations to background and eliminate chemicals that are not elevated above background;
- 4.) identify RBCs appropriate for Tier IA or Tier IB;
- 5.) identify appropriate Tier IA or IB site chemical concentrations for each medium;
- 6.) perform risk-based screening by comparing chemical concentrations to RBCs for each medium; and
- 7.) evaluate the results of the screening using the exit criteria to determine if the site can exit the cleanup process or warrants further study.

Each of these topics is discussed in detail in the following sections.

7.4 Develop/Re-Evaluate the Conceptual Site Model

A key step in the risk-based screening process is the development of a CSM that identifies the likely contaminant source areas, exposure pathways, and potential receptors. The exposed populations and exposure pathways identified in the CSM can then be compared to the assumptions (e.g., exposed population) used to calculate the RBCs. If there are significant complete exposure pathways that are not included in the RBCs, then it may be necessary to perform a Tier IB or a Tier II evaluation in order to evaluate the additional pathways. Also, it is important to evaluate each potential exposure pathway to determine if a complete exposure pathway exists. In some instances the exposure pathways may not be complete (e.g., ingestion of groundwater from a non-potable aquifer is not a complete exposure pathway) and should not be included in the CSM. [Table 7.1](#) presents the exposure scenarios and exposure pathways that are used by the USEPA to develop RBCs. The current and future potentially exposed populations primarily depend on land use. Therefore, it is important that the CSM take into account likely future land use. This topic is presented in the following section.



Table 7.1 – Exposure Scenarios Used by the USEPA to Develop Risk-Based Concentrations

Medium Exposure Route	Residential Land Use				Industrial Land Use			
	USEPA Reg. IX (USEPA, 2000c)	USEPA Reg. III (USEPA, 2000a)	USEPA Reg. VI (USEPA, 2000b)	USEPA SSLs (USEPA, 1994b)	USEPA Reg. IX (USEPA, 2000c)	USEPA Reg. III (USEPA, 2000a)	USEPA Reg. VI (USEPA, 2000b)	USEPA SSLs (USEPA, 1994b)
Target Cancer Risk Level	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06
Target Hazard Quotient	1	1	1	1	1	1	1	1
Groundwater								
Ingestion	X	X	X	X				
Inhalation of volatiles	X	X	X	X				
Surface Water								
Ingestion	X		X					
Inhalation of volatiles	X		X					
Ingestion of fish		X						
Soil								
Ingestion	X	X	X	X	X	X	X	X
Inhalation of particulates	X		X		X			Chromium (VI) only
Inhalation of volatiles	X		X	X	X			X
Exposure to groundwater contaminated by soil leachate				X				
Dermal absorption	X		X		X			Pentachloro-phenol only

7.5 Current/Future Land Use Considerations

7.5.1 THE IMPORTANCE OF LAND USE CONSIDERATIONS

Land use is a critical component of the risk assessment process because it dictates which RBCs (i.e., residential, industrial, or other) are appropriate for use in the risk-based screening process. Land use concerns are addressed in both the risk assessment and the risk management efforts. Risk assessment addresses land use in terms of actual and assumed exposure scenarios, which determine exposed populations and affect exposure mechanisms, durations, and frequencies. The role of risk management



in land use involves making decisions based on the use of the property, both current and plausible future use, and how any potential risk might be mitigated. Under these circumstances, land use information is shared between the risk assessment and risk management processes. In the event a site is proposed for use or re-use with restrictions, the issue of LUCs must be addressed.

7.5.2 LAND USE CONTROLS

The Chief of Naval Operations issued interim final guidance on LUCs (USNAVY, 1999). LUCs are divided into two types: engineering controls (ECs) and institutional controls (ICs). ECs refer to engineered remedies that contain or reduce contamination and/or limit access to the contaminated property (including both land and water). ECs may include fences, signs, landfill caps, provision of potable water supplies, and guards (to prevent access). Institutional controls are legal devices that ensure ECs are properly managed and ensure land use restrictions are enforced. ICs include easements, restrictive covenants, zoning, permits, and educational programs (informing those potentially exposed of the risk and appropriate actions to mitigate that risk). Note that specific state and regional regulatory agencies may have established separate requirements for LUC implementation. Although LUCs may present a viable option as part of a remedy, it is important to consider the long term, life cycle, costs of LUCs (e.g., long-term monitoring). The long-term costs of LUCs should be weighed against the additional costs of cleanup to unrestricted use.

7.5.3 BACKGROUND INFORMATION ON DETERMINING FUTURE LAND USE

Land use assumptions for conducting HHRAs should be based on a factual understanding of site-specific conditions and reasonably anticipated use. The land use evaluated in the risk assessment should not be based on a residential exposure scenario (i.e., the default worst-case) unless residential land use is plausible for the site. The USEPA has made the following recommendations in regard to land use considerations:

- ◆ future land use assumptions allow the baseline risk assessment and the feasibility study to focus on the development of practical and cost-effective remedial alternatives, leading to site activities that are consistent with the reasonably anticipated future land use;
- ◆ a range of land uses, and therefore exposure assumptions, may be considered, depending on the amount and certainty of information supporting a land use evaluation;
- ◆ discussions with local land use planning authorities, appropriate officials, and the public, as appropriate, should be conducted as early as possible in the scoping phase of the project; and
- ◆ sites that are located on federal facilities may have different land use considerations than private property because the future land use assumptions (e.g., industrial, recreational, etc.) at sites that are undergoing base closure may be different than at sites where a federal agency will be maintaining control of the facility (USEPA, 1995).

Various sources of information, including activity master plans and local zoning plans, can be utilized in making educated decisions about potential land use for a given site. Land use assumptions should take into consideration the interests of all affected stakeholders, including the local residents and municipal government. Land use issues should be carefully documented and resolved maintaining regular communication between the risk manager and the risk assessor.



7.6 Evaluate Data Quality Objectives

The analytical data for a site should be evaluated prior to risk-based screening to ensure that the site-specific DQOs have been achieved. DQOs ensure that the information needed to perform a credible risk-based screening evaluation is collected. The key data quality objectives for risk-based screening are as follows.

- ◆ **Data Quality** – The analytical data should be of suitable quality for HHRA purposes. That is, data should be collected in a manner that provides a basis for making remedial decisions at a site.
- ◆ **Site Characterization** – There should be enough samples to adequately characterize the site. In addition to sample density and sample coverage considerations, it is important that all media of concern are sampled at likely exposure points in order to provide a consistent basis for comparing site data and the RBCs.
- ◆ **Analytical Detection Limits** – It is important that the analytical methods selected for a site are sensitive enough to support the needs of the risk assessment (i.e., the detection limits for chemicals of potential concern should be less than their RBCs). The value of risk-based screening is diminished if the detection limits are greater than the RBCs.

7.7 Background Screening

7.7.1 PURPOSE OF BACKGROUND SCREENING

On 18 September 2000 the Office of the Chief of Naval Operations (CNO) issued the Interim Final Navy Policy on the Use of Background Chemical Levels in Risk Assessment (USNAVY, 2000). The purpose of this policy is to provide clarification of the Navy's policy on the consideration of background chemical levels in the list of chemicals of potential concern (COPCs) in the Environmental Restoration Program. The Policy describes how to consider background chemicals levels in the program by:

- 1.) identifying those chemicals that are in the environment due to releases from the site;
- 2.) eliminating from consideration in the risk assessment process both naturally occurring and anthropogenic chemicals that are present at levels below background;
- 3.) ensuring documentation and discussion of potential risk from chemicals that have been eliminated during the background evaluation process; and
- 4.) developing remediation action levels that are not below background.

Screening out chemicals based on site-specific background or reference-area concentrations is an important step in the identification of COPCs. The purpose of background screening is to focus the risk assessment on COPCs that are related to site activities and to eliminate chemicals that are present at background concentrations. Background is defined in the Interim Final Navy Policy on Background Chemical Levels as either naturally occurring (non-anthropogenic) or anthropogenic (ambient), which are unrelated to Navy activities or operations (USNAVY, 2000). The purpose of a site risk assessment is to estimate the incremental risks associated with contamination present at the site due to Navy activities, not background contamination.

7.7.2 DETERMINING BACKGROUND CONCENTRATIONS

Background concentrations of chemicals can be determined from existing site or base-wide information, published regional or national background concentrations, or by developing a sampling program to establish background concentrations. The following Navy guidance documents present approaches for



identifying background concentrations of chemicals and determining whether or not site concentrations are significantly different.

- ◆ Naval Facilities Engineering Command. September 1998. Procedural Guidance for Statistically Analyzing Environmental Background Data. SWDIV and EFA WEST.
- ◆ Naval Facilities Engineering Command. July 1999. Handbook For Statistical Analysis of Environmental Background Data. SWDIV and EFA West.

7.8 Identifying Appropriate Risk-Based Concentrations

7.8.1 TIER IA RISK-BASED CONCENTRATIONS

It is important to select the most appropriate RBCs for use in evaluating sites based on probable future land use. For example, if the site is currently used for industrial purposes (and expected future use is industrial), or if master plans indicate that future land use at a site is industrial, then industrial RBCs should be selected for comparison to site concentrations. Different USEPA regions, states, and other organizations, have developed RBCs that could be used for Tier IA. Examples of Tier IA RBC sources include the following.

- ◆ USEPA Region III Risk-Based Concentration Table (USEPA, 1993).
<http://www.epa.gov/reg3hwmd/risk/riskmenu.htm>.
- ◆ USEPA Region VI Human Health Medium-Specific Screening Levels (USEPA, 2000b).
http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm.
- ◆ USEPA Region IX Preliminary Remediation Goals (USEPA, 2000c).
<http://www.epa.gov/region09/waste/sfund/prg/index.html>.

Note: Some USEPA Regions use different target risk goals to develop RBCs depending on the type of evaluation being performed. For example, USEPA Region III recommends that a target risk goal of 1/10th of the RBC be used when screening chemical concentration versus noncancer RBCs. Therefore, it is important to check USEPA Regional Guidance, if available, to determine the target risk goals that should be used in risk-based screening.

7.8.2 TIER IB RISK-BASED CONCENTRATIONS

Tier IB RBCs should be developed based on plausible site-specific exposure scenarios. Land use will determine the site-specific RBC exposure scenarios, including what populations are being exposed and how often they are being exposed. In some cases, site-specific RBCs may be calculated based on current land use involving very specific exposure scenarios such as property that is used for commercial purposes. In other cases site-specific RBCs may be developed based on future land use considerations. Additionally site-specific or scenario-specific RBCs may be developed for a certain geographical region (e.g., Alaska) where the activity patterns of the exposed population are likely to be significantly different from the generic default RBC exposure scenarios. These examples highlight the importance of considering land use and developing realistic and defensible conceptual site models when calculating site-specific RBCs.



7.8.3 IDENTIFYING TIER IA AND TIER IB RISK-BASED CONCENTRATIONS FOR LEAD

The traditional risk assessment approach for evaluating noncancer effects from exposure to chemicals involves comparison of chemical intakes to a reference dose (RfD). This approach is inappropriate for lead because a no-observed-adverse-effects-level (NOAEL) for lead has not been identified (i.e., there is no RfD for lead) by the USEPA. Blood lead concentrations are accepted as the preferred measure of cumulative lead exposures. Blood lead concentrations provide an index for evaluating the likelihood of adverse effects from lead exposure. A blood lead level of 10 µg/dL has been identified by the Centers for Disease Control as a benchmark for evaluating exposure to lead, and the USEPA defines a greater-than-5-percent probability of exceeding the 10 µg/dL criterion value as posing an unacceptable threat to human health (USEPA, 1994a).

Tier IA and Tier IB RBCs for lead should be based on the latest information available from the USEPA's Technical Review Workgroup (TRW) for lead. For residential exposures to lead in soil, the USEPA recommends a screening level of 400 mg/kg (USEPA, 1998). For other exposure scenarios, RBCs should be developed based on the Integrated Exposure Uptake Biokinetic (IEUBK) Model and the Adult Pb Model, as appropriate. See <http://www.epa.gov/oerrpage/superfund/programs/lead/trw.htm> for more information on evaluating lead exposures.

7.9 Performing Risk-Based Screening

7.9.1 RISK-BASED SCREENING PROCESS

Risk-based screening incorporates all of the information that is known about a site at an early juncture in the decision-making process. RBC values are identified based on information about current and future land use. Site chemical concentrations are then compared to RBC values to determine if the site warrants further evaluation. [Figure 7.3](#) illustrates the risk-based screening process.

Note: Chemicals that are not detected in any samples, or are detected at a low frequency (e.g., less than 5% frequency of detection and at low concentrations) for a medium are typically eliminated from further consideration in the risk assessment process. Also, essential nutrients (i.e., calcium, magnesium, potassium, iron and sodium) should be eliminated from consideration in the risk assessment because they are not associated with toxicity in humans under normal circumstances (USEPA, 1991a).

7.9.2 TIER IA SCREENING PROCESS

The maximum detected chemical concentration for each medium is compared to the appropriate residential or industrial RBC.



Figure 7.3 – Example of Risk-Based Screening

Step 1 – Identify RBCs

Chemical	Example Industrial Soil RBC (mg/kg)
Inorganics	
Arsenic (inorganic)	3.8
Zinc and Compounds	613,200
Pesticides/PCBs	
Aroclor 1254	2.9
Endosulfan I	12,264.0
Semi-Volatile Organic Compounds	
Benzo(a)pyrene	0.8
Hexachlorobutadiene	73.4

Step 2 – Determine Site Chemical Concentrations

Chemical	Number of Samples Analyzed	Frequency of Detection (%)	Maximum Detected Concentration (mg/kg)
Inorganics			
Arsenic (inorganic)	10	90%	72
Zinc and Compounds	5	100%	1470
Pesticides/PCBs			
Aroclor 1254	50	22%	145
Endosulfan I	50	50%	900
Semi-Volatile Organic Compounds			
Benzo(a)pyrene	11	64%	101
Hexachlorobutadiene	12	58%	5

Step 3 – Compare Site Chemical Concentrations to RBCs

Chemical	Maximum Detected Concentration (mg/kg)	Example Industrial Soil RBC (mg/kg)	Exceed RBC?
Inorganics			
Arsenic (inorganic)	72	3.8	Yes
Zinc and Compounds	1470	613,200	No
Pesticides/PCBs			
Aroclor 1254	145	2.9	Yes
Endosulfan I	900	12,264	No
Semi-Volatile Organic Compounds			
Benzo(a)pyrene	101	0.8	Yes
Hexachlorobutadiene	5	73.4	No

Note: The Tier IB risk-based screening approach compares representative upper-bound chemical concentrations to site-specific RBCs.



7.9.3 TIER IB SCREENING PROCESS

In contrast to Tier IA, the representative upper bound exposure point concentration (EPC) for each chemical is compared to the appropriate site-specific RBC. The following sources provide detailed information on developing RBCs.

- ◆ USEPA Region III Risk-Based Concentration Table (USEPA, 1993).
<http://www.epa.gov/reg3hwmd/risk/riskmenu.htm>.
- ◆ USEPA Region VI Human Health Medium-Specific Screening Levels (USEPA, 2000b).
http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm.
- ◆ USEPA Region IX Preliminary Remediation Goals (USEPA, 2000c).
<http://www.epa.gov/region09/waste/sfund/prg/index.html>.
- ◆ USEPA Risk Assessment Guidance for Superfund. Human Health Evaluation Manual, Part B: Development of Risk-Based Preliminary Remediation Goals (USEPA, 1991b).
<http://www.epa.gov/superfund/programs/risk/ragsb/index.htm>.

See the Data Evaluation and Reduction Section in Chapter 8 – Baseline Risk Assessment for more information on calculating upper bound EPCs.

7.10 Evaluate the Results

The results of the risk-based screening process should be evaluated in the context of the exit criteria presented in section 7.2 Tier IA and IB Decision/Exit Criteria, to determine if a site can exit the HHRA process or if it warrants further evaluation (e.g., Tier II). If the site chemical concentrations meet the exit criteria, then the site may exit the HHRA process as a no further action site. Further evaluation may include additional sampling, consideration of background levels in the environment, reassessment of the assumptions contained in the RBC estimates, and/or performance of a baseline risk assessment.

Note: It is important that RPMs critically evaluate factors such as the limitations of RBCs, DQOs, and potential institutional controls, to determine the appropriate next step for each site on a case-by-case basis.

Ecological Risks

The RBCs discussed in this chapter are protective of human health and do not take into account potential risks to ecological receptors. Ecological impacts should also be evaluated using the Navy Guidance for Conducting Ecological Risk Assessments.

Impacts to Groundwater from Soil

In general, RBCs do not take into account potential impacts from chemicals in soil migrating to groundwater. If impacts to groundwater from soil are a concern, then RBCs for soil may need to be adjusted by evaluating USEPA Soil Screening Levels in order to account for potential groundwater impacts.



7.11 Documentation

As with all risk assessment activities, it is important that the risk-based screening process is transparent and defensible. Transparency results when all of the data and assumptions that were utilized in the evaluation are well documented so that others can easily understand and review the process. However, the level of documentation will vary based on the regulatory framework and the results of the evaluation. At a minimum, the documentation for a RBC evaluation should include:

- ◆ presentation and discussion of site characterization information;
- ◆ a CSM that documents the current and future land use and exposure scenarios;
- ◆ a table that summarizes site media concentrations that are compared to RBCs (e.g., frequency of detection, average concentration, and the maximum detected concentration [Tier IA] or the representative upper bound concentration [Tier IB]);
- ◆ a table that presents the RBCs used in the evaluation. For Tier IB, the exposure assumptions used to calculate site-specific RBCs should be identified and the sources and assumptions clearly documented;
- ◆ an appendix that presents all of the analytical data for the site; and
- ◆ an appendix that presents more detailed statistical summaries, (e.g., number of samples analyzed, number of detected results, range of nondetects, range of detects, 95% UCL, etc.)

Note: The RBC evaluation may be presented as a stand-alone document or as part of a Tier II Baseline Risk Assessment (BHHRA). For example, if the results of the Tier IA risk-based screening indicate that a Tier II BHHRA is warranted, then the Tier IA RBC screening may be presented in the BHHRA.

7.12 References

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