

**The EPA Region 4 environmental screening values (ESVs) found on Tables 5 through 20 of this document are outdated and should not be used. Updated values can be found in the Region 4 ecological risk guidance at:**

[https://www.epa.gov/sites/production/files/2015-09/documents/r4\\_era\\_guidance\\_document\\_draft\\_final\\_8-25-2015.pdf](https://www.epa.gov/sites/production/files/2015-09/documents/r4_era_guidance_document_draft_final_8-25-2015.pdf)

GUIDELINES FOR PERFORMING  
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENTS  
WITHIN THE  
NORTH CAROLINA  
DIVISION OF WASTE MANAGEMENT

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Division of Waste Management  
<http://portal.ncdenr.org/web/wm/home>

## DISCLAIMER

This guidance document presents approaches for conducting screening level ecological risk assessments. They are based on the North Carolina Division of Waste Management's knowledge and experience to date. Parties wishing to use this guidance for any other purpose should first check with the appropriate regulating agency to make sure this guidance meets all requirements.

This guidance supercedes the document entitled "Guidelines For Performing Screening Level Ecological Risk Assessments For Department Of Defense, National Priority List, And National Priority List Caliber Sites Within The North Carolina Superfund Program," which was released in draft form in November 2002. Guidance set forth in this document applies to site-specific ecological risk assessments performed under Department of Defense, National Priority List, and National Priority List Caliber (DOD/NPL/NPLC) sites within the Superfund Program. It may also be used by all other programs within the North Carolina Division of Waste Management. For non-DOD/NPL/NPLC sites, parties should check with the individual program area within NC DWM for applicability prior to using this guidance.

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## LIST OF ACRONYMS

BGS – Below ground surface  
COPC – Contaminant of potential concern  
CSM – Conceptual site model  
DOD – Department of Defense  
EPA – Environmental Protection Agency, United States  
ERA – Ecological risk assessment  
ESV – Ecological screening value  
FS – Feasibility Study  
HQ – Hazard quotient  
LULC – Land use and land cover map  
NAPL – Non-aqueous phase liquid  
NC DWM – North Carolina Division of Waste Management  
NPL – National Priority List  
NPLC – National Priority List Caliber  
OSWER – US EPA Office of Emergency and Remedial Response  
PAH – Polynuclear aromatic hydrocarbon  
PA/SI – Preliminary Assessment/Site Investigation  
RI – Remedial Investigation  
SLERA – Screening level ecological risk assessment  
SMDP – Scientific management decision point  
SQL – Sample quantitation level  
TCDD – 2,3,7,8-tetrachlorodibenzo-p-dioxin  
TEF – Toxic equivalency factor  
TEQ – Toxic equivalent  
TIC – Tentatively identified compound

## **Executive Summary**

The North Carolina Division of Waste Management's mission is to prevent the harmful release of waste to the environment and clean up existing contamination. In order to aid in the clean up of existing contamination, this document provides guidelines for conducting a screening level ecological risk assessment (SLERA) for sites under the authority of NC DWM.

In the Superfund Program, a significant component of the remedial investigation/feasibility study (RI/FS) report is the baseline risk assessment, which consists of a human health risk assessment and an ecological risk assessment (ERA).

The purpose of the ERA is to: “1) identify and characterize the current and potential threats to the environment from a hazardous substance release, 2) evaluate the ecological impacts of alternative remediation strategies, and 3) establish cleanup levels in the selected remedy that will protect those natural resources at risk.” (US EPA 1994, OSWER Directive # 9285.7-17.)

The ERA process under the Comprehensive Environmental Response, Compensation, and Liability Act consists of eight steps. These steps are:

1. Preliminary Problem Formulation and Ecological Effects Evaluation
2. Preliminary Exposure Estimate and Risk Calculation
3. Baseline Risk Assessment Problem Formulation
4. Study Design and Data Quality Objectives
5. Field Verification of Sampling Design
6. Site Investigation and Analysis of Exposure and Effects
7. Risk Characterization
8. Risk Management

Five Scientific/Management Decision Points (SMDP) are included in this process. They follow steps 2-5 and 8. An SMDP requires a meeting between the risk manager and risk assessment team to evaluate and approve or redirect the work up to that point.

This eight-step process is outlined in the United States Environmental Protection Agency's Interim Final *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*, June 1997, (referred to as the Process Document). Although the Process Document furnishes EPA's most recent approach on designing and conducting an ERA, users should continue referring to *Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual*, (US EPA 1989) for fundamental ERA information and concepts, such as factors influencing and effects of contaminants on ecosystems.

The SLERA consists of steps 1 and 2 of the eight-step process, along with the first SMDP. The SLERA provides a general indication of the *potential* for ecological risk (or lack thereof). The SLERA may also be used 1) to estimate the likelihood that a particular ecological risk exists, 2) to identify the need for site-specific data collection efforts, and 3) to focus site-specific ecological risk assessments where warranted (US EPA, 2001).

## **THE SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT PROCESS**

### **1.0 INTRODUCTION**

This guidance is intended to clarify the content of SLERAs submitted to the NC DWM. Since SLERAs are designed to be conservative assessments, risk assessors and risk managers can have a high level of confidence that contaminants eliminated by the SLERA process contribute a negligible risk to the environment. SLERAs are not designed or intended to provide definitive estimates of actual risk or generate cleanup goals. In general, they are not based upon site-specific assumptions. Rather, the purpose of the SLERA is to assess the need and, if required, the level of effort necessary to conduct a detailed, or “baseline,” ecological risk assessment for a particular site or facility. (US EPA, 2001.)

The SLERA (Steps 1 and 2 of the eight step process) should consist of the following components:

#### **Step 1: Preliminary Problem Formulation and Ecological Effects**

**Evaluation.** This step is designed to help answer the question “Is there an ecology here to protect?” Step 1 includes the following information:

- Ecological Setting
- Fate and Transport Mechanisms
- Potentially Complete Exposure Pathways

#### **Step 2: Preliminary Exposure Estimate and Risk Calculation.**

This step is designed to help answer the question “Are risks to ecological receptors present at the site?” Step 2 includes the following information:

- Data Collection and Evaluation
- Abiotic Screen
- Uncertainty and Data Gaps
- Scientific/Management Decision Point
- SLERA Summary

Although steps 1 and 2 can be conducted at any point during the remedial process, they are intended to be conducted prior to the RI and should play an important role in scoping the RI field effort. If, as is common, these steps are completed with data collected during the preliminary assessment/site investigation phase, site-specific information will probably be limited. Therefore, it is important that the SLERA not only summarize available data, but also clearly identify unavailable or inadequate data so these data gaps can be examined and the appropriate actions taken. Although the scope of this guidance is limited to screening level ecological risk assessments, it is beneficial to consider data requirements for human health and ecological risk assessments concurrently in order to streamline sampling efforts.



A SMDP follows step 2. The objective of the SMDP is two-fold. It determines whether a full ecological risk assessment is required and focuses any future risk assessment on those ecological issues that are significant to the risk managers and trustees. A list of state and federal resource trustees can be found at US EPA Region IV's Ecological Risk Assessment Bulletin Web site at: <http://www.epa.gov/region4/waste/ots/ecolbul.htm>.

## **2.0 STEP 1: PRELIMINARY PROBLEM FORMULATION AND ECOLOGICAL EFFECTS EVALUATION**

The intent of this section is to provide the reader with an idea of the types of information, level of detail, and time commitment the NC DWM expects for the completion of Step 1 of the SLERA. Depending on the program area, it is possible that much of the information listed below has already been collected for a site. For example, for Superfund sites, much of the below information is collected in the RI phase. While it is not necessary to duplicate information from another report in the SLERA, where the SLERA is produced as a “stand alone” report, the source of the information must be clearly cited.

### **2.1 Ecological Setting**

The ecological setting section of the SLERA should include as much information as is available on the following three areas:

- Facility Summary
- Regional Ecological Setting
- Site-Specific Ecological Setting

Since the information provided in these sections will be the basis of the assumptions the reader uses throughout problem formulation, it is important that these sections give a clear, straightforward and thorough description of the site.

#### **2.1.1 Facility Summary**

The facility summary section should give the reader a general idea of the processes used and how raw materials, products and wastes were handled and disposed. This section should include the following information:

- Facility history, including timelines.
- Facility process/processes summary.
- Potential non-site related sources of contamination.
- Precursors used, also products, bi-products and waste products generated.
  - Include volumes if available.
- Regulatory History.
  - Current and historic permits.
  - Regulatory actions (Consent Orders, Notices of Deficiency, etc.).
- Waste storage practices used at the site (include dates of operation).
  - Description of units used to store wastes (lagoons, landfills, tanks, piping, etc.).

- Waste disposal practices employed at the site (include dates of operation and closure).
  - Include maps of all known waste disposal areas.
  - List of expected (or potential) contaminants.

### **2.1.2 Regional Ecological Summary**

This section should provide the reader with information on the site location and general habitat types in the area. This information can be obtained from resources such as “Biodiversity of the Southeastern United States, Lowland Terrestrial Communities” (Wiley and Sons, 1993), and “Biodiversity of the Southeastern United States, Aquatic Communities” (Wiley and Sons, 1992). The regional ecological summary needs to provide enough information for the risk assessors and risk managers to be able to identify general habitat that may be present at the site, and what types of fate and transport mechanisms may occur. This section should include:

- Description of the eco-region and expected habitats.
- Identify the watershed in which the site is located.
- Average rainfall.
- Average temperatures.
- Length of growing season.
- Identify Threatened and Endangered Species that use habitats found in the eco-region.

### **2.1.3 Site-Specific Ecological Setting**

This section should include a summary of all the observations made during the site visit. Record them on the Checklist for Ecological Assessment/Sampling included as Appendix A of this document. This checklist should be completed and enclosed as an Appendix for all SLERAs. The checklist *must* be completed and enclosed with the SLERA when the SLERA is used as evidence to support a no further ecological assessment decision. Organizing this section by habitats present at the site is useful. Include a figure that shows the location and coverage of each habitat at the site. Information in this section should include:

- On-site and off-site land uses (agricultural, residential, undeveloped, etc.).
- List all types of habitats included within the site boundary.
  - Include size and/or relative area (e.g. 30 percent of the site) of each habitat.
  - Include a thorough description of man-made units that may act as habitat (lagoons, drainage ditches, etc.).
- Create a map or figure that shows the location of all habitats present.
- Note the layout and general topography of the site.
- Identify any obvious surface water runoff pathways (gullies, ditches, etc.).

- Identify soil types located at the site.
- A list of all species that would normally be expected to use the site under relatively unaffected conditions.
  - List by scientific name with common name in parenthesis.
  - Any species observed during the site visit or known to use the site should be highlighted.
  - All species of special concern (threatened, endangered, protected or regionally important) that may be present in the area should be identified.
  - All nearby critical and/or sensitive habitats should be identified.

After finishing the checklist, it may be possible to determine that present or future ecological impacts are negligible because complete exposure pathways do not currently exist and could not exist in the future. Many Superfund sites are located in highly industrialized areas where there could be few if any ecological receptors or where site-related impacts might be indistinguishable from non-site-related impacts. For such sites, remediation to reduce ecological risks might not be needed. However, all sites should be evaluated by qualified personnel to determine whether this conclusion is appropriate (US EPA, 1997).

Since many factors can influence observations made during the site visit, it is important to provide a reference frame to observations included in this section. Items to be noted include:

- Level of effort spent on site visit.
  - Time (hours) spent on-site; split into applicable habitat types.
- Time of the year site visit was made.
- Time of day site visit was made.
- Weather conditions during site visit.
- Tidal stage during site visit (if applicable).

Any other conditions that could have effected the observations made (drought information, etc.) should also be noted.

## **2.2 Fate and Transport Mechanisms**

During the problem formulation step, risk assessors and risk managers will need to make assumptions about the potential for contaminants to migrate. To support these assumptions, the risk assessment should identify all potential contaminant migration pathways (for example, windblown dust, surface water runoff, erosion, etc.) identified at the site. This information will be used when completing the preliminary screening-level conceptual site model for the site. This model should illustrate which migration pathways need additional investigation.

### **2.3 Potentially Complete Exposure Pathways**

Evaluating potentially complete exposure pathways at a site is one of the primary tasks of the SLERA. An exposure pathway is the pathway by which a contaminant travels from a source (e.g., drums, contaminated soils) to receptors. A pathway can involve multiple media, such as soil runoff to surface waters, or volatilization to the atmosphere (US EPA, 1997). Section IV of Appendix A of this document, (page 32) “Exposure Pathway Evaluation,” should be completed in order to aid with this evaluation. This portion of the SLERA should not be confused with an evaluation of the usefulness or suitability of the habitat present at the site to support ecological receptors. The input from a qualified ecologist should be sought prior to eliminating specific receptors from consideration based on habitat quality.

It is common for this section of a SLERA to focus on the ability of the habitat to support ecological receptors. Since input from a qualified ecologist should be sought before eliminating specific receptors from consideration based on habitat quality, this normally does not take place in the SLERA. A few examples of scenarios that may seem to (but do not) present incomplete exposure pathways are provided below:

- Many sites have man-made drainage ditches that are not recognized as natural habitat viable to support ecological receptors. However, most drainage ditches do provide feeding and/or foraging opportunities for many ecological receptors. Therefore, by definition, these ditches provide a potentially complete exposure pathway for those receptors and should be included in the conceptual site model as a complete exposure pathway.
- Many sites have industrial areas that include large areas of maintained grass, parking lots, bare soil, etc. While these areas do not provide what is traditionally thought of as habitat, they do provide cover and foraging opportunities for many species. These species could be soil invertebrates (as well as the receptors which feed on them), or other species more accustomed to human interaction (passerine birds, rodents, other species).

All potential exposure pathways present at a site should be presented in the SLERA. The most likely exposure pathways are often related to the physical and chemical properties discussed in the preceding section for the media and the contaminants (e.g., whether or not the contaminant is bound to a matrix, such as organic carbon). In the rare case that any of the exposure pathways are incomplete, those pathways should be identified and the rationale for assuming incompleteness must be presented. Once all exposure pathways have been identified, they should be presented in a conceptual site model (see Figure 1 in Appendix A for an example CSM).

### **2.3.1 Conceptual Site Model**

A site CSM is developed as part of the SLERA to facilitate an overall understanding of the site. The CSM includes the hypotheses that form the basis of the SLERA. It is used to communicate the understanding of the site to its stakeholders. The CSM identifies the complete and potentially complete exposure pathways. It provides a template to conduct the exposure pathway evaluation and to inventory the pathways determined to be incomplete. It also provides a means to identify relevant ecological receptors and habitats. Should it be decided that the site requires further ecological evaluation beyond the SLERA level, the CSM is updated and refined as additional data are gathered.

### **3.0 STEP 2: PRILIMINARY EXPOSURE ESTIMATE AND RISK CALCULATION**

#### **3.1 Data Collection and Evaluation**

As stated in the introduction, it is common to perform a SLERA with data collected at the PA/SI or NC DWM program-equivalent stage of site evaluation. Since this data is usually relatively limited, it is very important to not only summarize all available and relevant data, but to also determine if data are of sufficient quantity and quality to support the SLERA.

##### **3.1.1 Detection Limits**

If the SLERA indicates adverse ecological effects are possible at environmental concentrations below standard quantitation limits, a “non-detect” based on those limits cannot be used to support a “no risk “ decision (US EPA, 1997). Therefore, it is essential that all contaminants (detected and non-detected) for which analysis was completed be evaluated in the SLERA. In cases where the contaminant was not detected above detection limits, the maximum sample quantitation limit (SQL) is used as a proxy concentration for that contaminant, and that value used in the abiotic screen (section 3.2). Reasons for doing so are:

1. For some contaminants, adverse effects may be possible at concentrations below detection limits.
2. Bioaccumulative contaminants may bioaccumulate to dangerous levels in upper trophic level organisms at abiotic concentrations below detection limits.
3. If, after the first SMDP, it is determined that the site requires further evaluation, contaminants in need of special analytical methods to achieve appropriate detection levels can be highlighted for discussion.

##### **3.1.2 Hardness Dependent Screening Values**

Hardness is used as a surrogate for a number of water quality characteristics that affect the toxicity of metals. Increasing hardness has the effect of decreasing the toxicity of metals (US EPA, 2002). The Ecological screening values (ESVs) listed in Table 20 for the following analytes were derived using the assumption that hardness (mg/L as CaCO<sub>3</sub>) = 50.0. If site conditions vary, the following equations must be used to calculate screening values:

Compound	Acute Screening Value	Chronic Screening Value
Cadmium	$e^{(1.128(\ln H)-3.828)}$	$e^{(0.7825(\ln H)-3.49)}$
Chromium III	$e^{(0.819(\ln H)+3.688)}$	$e^{(0.819(\ln H)+1.561)}$
Copper	$e^{(0.9422(\ln H)-1.464)}$	$e^{(0.8545(\ln H)-1.465)}$
Lead	$e^{(1.273(\ln H)-1.46)}$	$e^{(1.273(\ln H)-4.705)}$
Nickel	$e^{(0.846(\ln H)+3.3612)}$	$e^{(0.846(\ln H)+1.1645)}$
Silver	$e^{(1.72(\ln H)-6.52)}$	NA
Zinc	$e^{(0.8473(\ln H)+0.8604)}$	$e^{(0.8473(\ln H)+0.7614)}$

e = base of natural logs  
H = hardness (mg/L as CaCO<sub>3</sub>)  
ln = natural log

The above equations can be found at US EPA Region IV's Ecological Risk Assessment Bulletin Web site at: <http://www.epa.gov/region4/waste/ots/ecolbul.htm>.

If hardness data is unavailable, the following equation can be used to calculate hardness (APHA et. al., 1995):

$$\text{Hardness} = 2.497 \times \text{Ca (mg/L)} + 4.118 \times \text{Mg (mg/L)}$$

Screening values must be calculated for each sampling location, site averages should not be used.

### 3.1.3 pH Dependent Screening Value

The ESVs for pentachlorophenol listed in Tables 14 and 18 were derived using the assumption that the pH = 7.8. If site conditions vary from this, the following equations must be used to adjust the ESVs:

Compound	Acute Screening Value	Chronic Screening Value
Pentachlorophenol	$e^{(1.005\text{pH}-4.83)}$	$e^{(1.005\text{pH}-5.29)}$

e = base of natural logs

The above equations can be found at US EPA Region IV's Ecological Risk Assessment Bulletin Web site at: <http://www.epa.gov/region4/waste/ots/ecolbul.htm>. Screening values must be calculated for each sampling location; site averages should not be used.



### **3.1.4 Dioxins and Furans**

Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans have a wide range of relative potencies and are usually found in complex mixtures in the environment. This makes analysis and therefore, the subsequent determination of risk, expensive and difficult. To simplify this process, the use of internationally recognized toxic equivalency factors (TEFs) are used to evaluate their toxicity. The TEF is an order of magnitude estimate of the toxicity of an individual congener relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). The TEF concept is based on the evidence that dioxin-like compounds share a common mechanism of action. TEFs specific to mammals, birds and fish are incorporated into Tables 1 through 4.

It is assumed that effects from different congeners are additive. The congener concentration multiplied by the TEF equals the toxic equivalent (TEQ) concentration.

The proxy concentration for non-detects should be one-half the SQL. The sum of the TEQ concentrations is then incorporated into the calculation of a hazard index. (TNRCC, 2001.)

### **3.2 Abiotic Screen**

The abiotic screening section should begin with a summary of the number and types of site related sampling investigations to date. This section should include a description of analytical data to be used in the abiotic screen for the site. Because the methodologies used to collect and/or analyze the data may be a source of uncertainty, they need to be discussed in detail. Only unfiltered water samples shall be used for screening purposes in SLERAs submitted to NC DWM. It is essential that the rationale for excluding data be clear and concise.

For the SLERA, risk is estimated by calculating screening hazard quotients (HQ). A screening HQ is calculated using the maximum concentration of each contaminant detected in each media and comparing that value to the EPA Region IV ESV for each contaminant using the following formula:

$\text{Hazard Quotient} = \text{maximum concentration} / \text{Region IV ecological screening value}$
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For contaminant groups where individual contaminants are summed (e.g. total PAHs, DDT and breakdown products, etc.) and there are both detected and nondetected contaminants, one half the SQL should be used as the proxy concentration for the nondetected contaminants. For contaminants that are neither summed nor detected, the maximum SQL is used to compare against the Region IV ESV (see Section 3.1.1). All ESVs in the attached tables, plus additional ESVs, can be found at US EPA Region IV's Ecological Risk Assessment Bulletin Web site at: <http://www.epa.gov/region4/waste/ots/ecolbul.htm>. Contaminants for which no Region IV ecological screening value is available must be retained as COPCs at the end of the SLERA process.

The following data should be summarized from the analytical data gathered from the site:

- Frequency of detection.
- Maximum detected concentration.
- Minimum detected concentration.
- Location of maximum concentration.
- Sample quantitation limit ranges.
- Sample identification numbers for all the samples used in the SLERA.

The first five bullet items should be entered into the contaminant of potential concern tables (Tables 5 through 20). The last bullet item may be presented in a separate table. The use of tables 5 through 20 is optional, but if alternate tables are used, they should include the same information. Electronic versions of these tables can be downloaded from <http://wastenot.nc.us>.

Each contaminant should be placed into the applicable category based on the review of the analytical data available:

- Category 1 – Contaminants whose maximum detection exceeds the media specific ecological screening value included in the COPC tables.
- Category 2 – Contaminants that generated a laboratory SQL that exceeds the EPA Region IV media-specific ecological screening value for that contaminant.
- Category 3 – Contaminants that have no EPA Region IV ecological screening value, but were detected above the laboratory SQLs.
- Category 4 – Contaminants that were not detected above the laboratory SQLs and have no EPA Region IV ecological screening value.
- Category 5 – Contaminants whose SQL or maximum detection exceeds the NC Surface Water Quality Standards.

Tentatively identified compounds (TICs), where required or available, must be considered in the SLERA. Although the TICs do not necessarily need to go through the data validation process, their presence should be reviewed to determine if they could be related to site operations. For example, Aroclor 1268 has been detected on several sites. It first showed up as a TIC, but it was not until the presence of this TIC was evaluated

with respect to site history that it was identified. Also, the presence of TICs should be used to determine if interferences are affecting the detection limits of other chemicals.

This section should also include a discussion of the physical parameters of the media sampled at a site, including:

#### Soils/Sediment

- Grain size analysis
- Total Organic Carbon

#### Surface Water

- pH
- Hardness

### **3.3 Uncertainty & Data Gaps**

This section of the SLERA should include ALL uncertainties, assumptions and data gaps included in the completion of the SLERA to this point. This section is vital to the risk managers who must understand the level of confidence that can be placed in the results discussed in the risk characterization section of the SLERA.

### **3.4 Scientific Management Decision Point**

This section should include an analysis of the screening HQs calculated in the abiotic screen. While there are limited analyses that can be conducted at this stage, it will assist the Baseline Risk Assessment Problem Formulation (Step 3 of the ERA process outlined in the Executive Summary) if any and all possible trends in the data are summarized at the end of the SLERA. It is important to note that the outcome of the screening steps can only be one of the following:

- There is adequate information to conclude that the ecological risks are negligible;
- Site has inadequate data to complete the risk characterization. Large data gaps need to be filled prior to completion of the screening process; or
- The information indicates a potential for adverse ecological effects and a more thorough assessment is warranted.

### **3.5 SLERA Summary**

The SLERA (Steps 1 and 2) is intended to be a simple, low level of effort, low-cost screening method. It is designed to assist risk managers identify sites that need no additional ecological investigations due to lack of unacceptable exposure to contaminants at a site. Very few sites will “screen-out” of the process at this point. However, a secondary, although equally important intent of the screening is to provide some direction and focus to the remaining investigation that needs to be completed. The end result of all SLERAs should be to provide the information needed to address major uncertainties, assumptions and data gaps identified in the screen.

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## **APPENDIX A**

### ***CHECKLIST FOR ECOLOGICAL ASSESSMENTS/SAMPLING***

## **INTRODUCTION**

This checklist has been developed as a tool to gather information about the facility property and surrounding areas. Specifically, the checklist helps compile information on the physical and biological aspects of the site. The data include the site environmental setting, use of the site, releases at the site, contaminant fate and transport mechanisms, and the area's habitats, receptors and exposure pathways. The completed checklist can then be used to construct the conceptual site model (CSM) for the site. The checklist and CSM serve as the basis for the SLERA.

In general, the checklist is designed for applicability to all sites, however, there may be unusual circumstances which require professional judgment in order to determine the need for further ecological evaluation (e.g., cave-dwelling receptors). In addition, some of the questions in the checklist may not be relevant to all sites. Some facilities may have large amounts of data available regarding contaminant concentrations and hydrogeologic conditions at the site, while other may have only limited data. In either case, the questions on the checklist should be addressed as completely as possible with the information available.

Habitats and receptors, which may be present at the site, can be identified by direct or indirect<sup>1</sup> observations and by contacting local and regional natural resource agencies. Habitat types may be determined by reviewing land use and land cover maps (LULC), which are available via the Internet at <http://www.nationalatlas.gov/mapit.html>. Since receptors are often present at a site even when they are not observed, it should be assumed they are present where viable habitat is present.

Some sources of general information available for the identification of ecological receptors and habitats include:

- U.S. Fish and Wildlife Service (<http://www.fws.gov>)
- U.S. Forest Service (USFS) (<http://www.fs.fed.us/>)
- U.S. Bureau of Land Management (USBLM) (<http://www.blm.gov/nhp/index.htm>)
- United States Geological Service (USGS) (<http://www.usgs.gov>)
- National Wetland Inventory Maps (<http://wetlands.fws.gov>)
- National Audubon Society (<http://www.audobon.com>)
- National Biological Information Infrastructure (<http://biology.usgs.gov>)
- North Carolina Division of Water Quality (<http://h2o.enr.state.nc.us/>)
- Sierra Club (<http://www.sierraclub.org>)
- National Geographic Society (<http://www.nationalgeographic.com>)
- State and National Parks System
- Local universities
- Tribal organizations

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<sup>1</sup> Examples of indirect observations that indicate the presence of receptors include: tracks, feathers, burrows or scat.

## **INSTRUCTIONS FOR COMPLETING THE CHECKLIST**

The checklist consists of four sections: Site Location, Site Characterization, Habitat Evaluation and Exposure Pathway Evaluation. Answers to the checklist should reflect existing conditions and should not consider future remedial actions at the site. Completion of the checklist should provide sufficient information for the preparation of a CSM and SLERA and allow for the identification of any data gaps.

**Section I - Site Location** provides general site information, identifies the facility being evaluated and gives specific location information. Site maps and diagrams, which should be attached to the completed report, are an important part of this section. The following elements should be clearly illustrated: 1) the location and boundaries of the site relative to the surrounding area, 2) any buildings, structures or important features of the facility or site, and 3) all ecological areas or habitats identified during completion of the checklist. It is possible that several maps will be needed to clearly and adequately illustrate the required elements. Although topographical information should be illustrated on at least one map, it is not required for every map. Simplified diagrams (preferably to scale) of the site and surrounding areas will usually suffice.

**Section II - Site Characterization** is intended to provide additional temporal and contextual information about the site. It may have an impact on determining whether a certain area should be characterized as ecologically viable habitat or contains receptors. Answers to the questions in Section II will help the reviewer develop a broader and more complete evaluation of the ecological aspects of a site.

**Section III - Habitat Evaluation** provides information regarding the physical and biological characteristics of the different habitat types present at or in the locality of the site. The applicable portions of Section III of the checklist should be completed for each individual habitat identified. For example, the questions in Section III.C of the checklist should be answered for each wetland area identified at or in the locality of the site. The individual areas must be identified on a map or maps.

**Section IV- Exposure Pathway Evaluation** is used to determine if contaminants at the site have the potential to impact habitat identified in Section III. An exposure pathway is the course a chemical or physical agent takes from a source to an exposed organism. Each exposure pathway includes a source (or release from a source), an environmental transport mechanism, an exposure point and an exposure route. A complete exposure pathway is one in which each of these components, as well as a receptor to be exposed, are present. Essentially, this section addresses the fate and transport of contaminants that are known or suspected to have been released at the site. In the rare cases where a potentially complete exposure pathway does not exist, additional ecological evaluation is usually not warranted.

Potential transport pathways addressed in this checklist include migration of contaminants via air dispersion, leaching into groundwater, soil erosion/runoff and groundwater discharge to surface water.

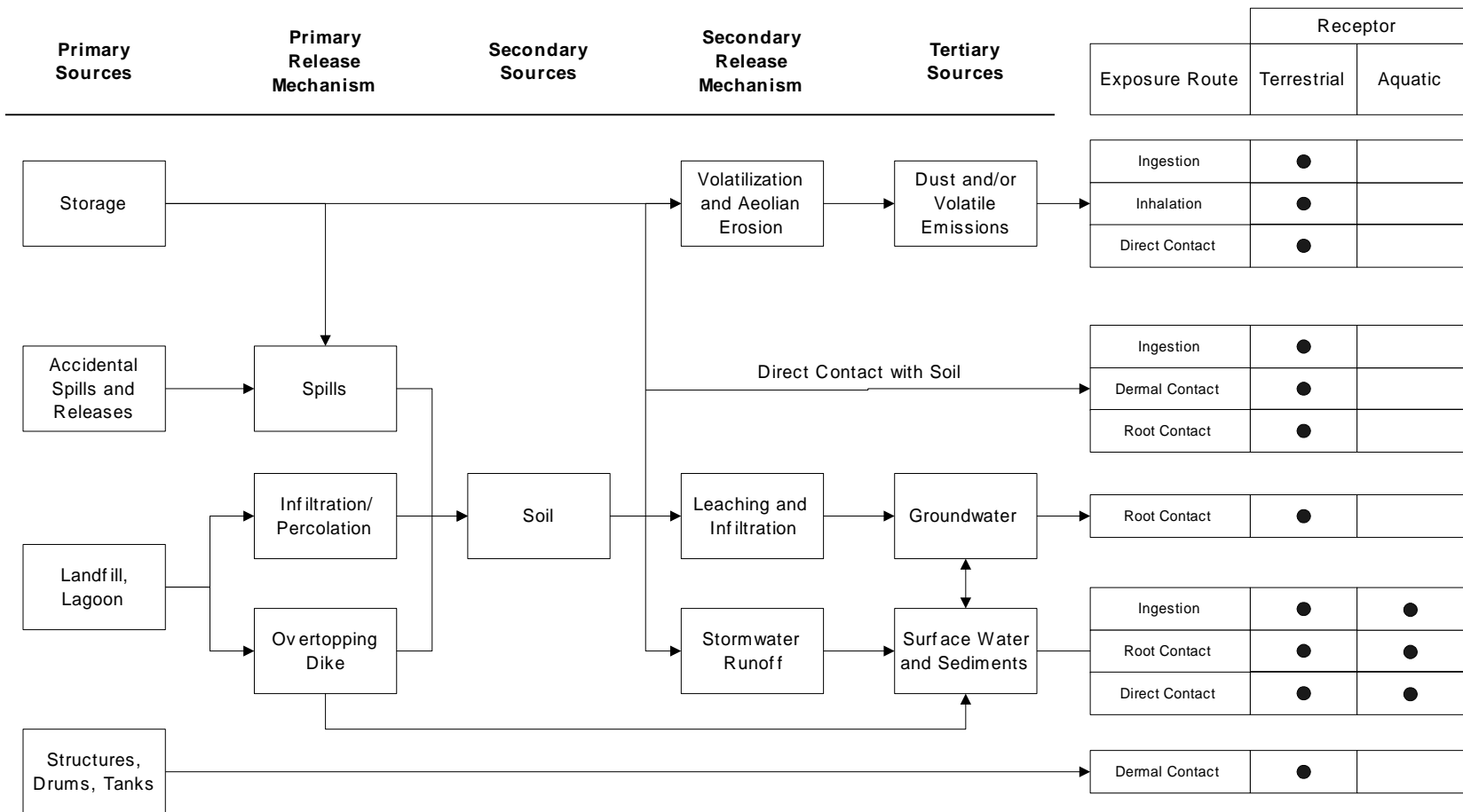


## **USING THE CHECKLIST TO DEVELOP THE CONCEPTUAL SITE MODEL**

The completed Site Assessment Checklist can be used to construct the CSM. An example of a CSM diagram is presented in Figure 1. The CSM illustrates actual and potential contaminant migration and exposure pathways to associated receptors. The components of a complete exposure pathway are simplified and grouped into three main categories: sources, release mechanisms and potential receptors. As a contaminant migrates and/or is transformed in the environment, sources and release mechanisms may expand into primary, secondary and tertiary levels. For example, Figure 1 illustrates releases from inactive lagoons (primary sources) through spills (primary release mechanism), which migrate to surface and subsurface soils (secondary sources), which are then leached (secondary release mechanism) to groundwater (tertiary source). Similarly, exposures of various trophic levels to the contaminant(s) and consequent exposures via the food chain may lead to multiple groups of receptors. For example, Figure 1 illustrates groups of both aquatic and terrestrial receptors which may be exposed and subsequently serve as tertiary release mechanisms to receptors which prey on them.

Although completing the checklist will not provide the user with a readymade CSM, a majority of the CSM's components can be found in the answers to the checklist. It is then up to the user to put the pieces together into a comprehensive whole. The answers from Section II of the checklist, Site Characterization, can be used to identify sources of releases. The answers to Section IV, Exposure Pathway Evaluation, will assist users in tracing the migration pathways of releases in the environment, thus helping to identify release mechanisms and sources. The results of Section III, Habitat Evaluation, can be used to both identify secondary and tertiary sources and to identify the types of receptors which may be exposed.

Once all of the components have been identified, one can begin tracing the steps between the primary releases and the potential receptors. For each potential receptor, the user should consider all possible exposure points (e.g., prey items, direct contact with contaminated soil or water, etc.), then begin eliminating pathways which are not expected to result in exposure to the contaminant at the site. Gradually, the links between the releases and receptors can be filled in, resulting in potentially complete exposure pathways.



**Figure 1. Example Preliminary Conceptual Site Exposure Model Diagram**

**CHECKLIST FOR ECOLOGICAL ASSESSMENTS/SAMPLING**

**I. SITE LOCATION**

1. Site Name \_\_\_\_\_  
US EPA ID Number \_\_\_\_\_  
Location \_\_\_\_\_  
County \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_
2. Latitude \_\_\_\_\_ Longitude \_\_\_\_\_
3. Attach site maps, including a topographical map, a diagram which illustrates the layout of the facility (e.g., site boundaries, structures, etc.), and maps showing all habitat areas identified in Section III of the checklist. Also, include maps which illustrate known and suspected release areas, sampling locations and any other important features, if available.

**II. SITE CHARACTERIZATION**

1. Indicate the approximate area of the site (i.e., acres or sq. ft.)
2. Is this the first site visit?  Yes  No  
If no, attach trip report of previous site visit(s), if available.  
Dates(s) of previous site visit(s) \_\_\_\_\_
3. Are aerial or other site photographs available?  Yes  No  
If yes, please attach any available photo(s) to the site map to the report.
4. Provide an approximate breakdown of the land uses on the site:  
\_\_\_\_\_% Heavy Industrial      \_\_\_\_% Light Industrial      \_\_\_\_% Urban  
\_\_\_\_\_% Residential      \_\_\_\_% Rural      \_\_\_\_% Agricultural<sup>b</sup>  
\_\_\_\_\_% Recreational<sup>a</sup>      \_\_\_\_% Undisturbed      \_\_\_\_% Other<sup>c</sup>

<sup>a</sup>For recreational areas, please describe the use of the area (e.g., park, playing field, etc).

\_\_\_\_\_

<sup>b</sup>For agricultural areas, please list the crops and/or livestock which are present.

\_\_\_\_\_

<sup>c</sup>For areas designated as "other," please describe the use of the area.

\_\_\_\_\_

5. Provide an approximate breakdown of the land uses in the area surrounding the site. Indicate the radius (in miles) of the area described: \_\_\_\_\_

\_\_\_\_\_% Heavy Industrial      \_\_\_\_\_% Light Industrial      \_\_\_\_\_% Urban  
\_\_\_\_\_% Residential      \_\_\_\_\_% Rural      \_\_\_\_\_% Agricultural<sup>b</sup>  
\_\_\_\_\_% Recreational<sup>a</sup>      \_\_\_\_\_% Undisturbed      \_\_\_\_\_% Other<sup>c</sup>

<sup>a</sup>For recreational areas, please describe the use of the area (e.g., park, playing field, golf course, etc).

\_\_\_\_\_

<sup>b</sup>For agricultural areas, please list the crops and/or livestock which are present.

\_\_\_\_\_

<sup>c</sup>For areas designated as "other," please describe the use of the area.

\_\_\_\_\_

\_\_\_\_\_

6. Has any movement of soil taken place at the site?  Yes  No  
If yes, indicate the likely source of the disturbance, (e.g., erosion, agricultural, mining, industrial activities, removals, etc.) degree of disturbance, and estimate when these events occurred.

\_\_\_\_\_

\_\_\_\_\_

7. Do any sensitive environmental areas exist adjacent to or in proximity to the site, (e.g. Federal and State parks, National and State monuments, wetlands)?  
*Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information. See Table 1 for a list of contacts.*

Please provide the source(s) of information used to identify these sensitive areas, and indicate their general location on the site map.

8. What type of facility is located at the site?

Chemical       Manufacturing       Mixing  
 Waste Disposal       Other (specify)

\_\_\_\_\_

\_\_\_\_\_

9. Identify the contaminants of potential concern (COPCs) at the site. If known, include the maximum contaminant levels. Please indicate the source of data cited (e.g., RFI, confirmatory sampling, etc).

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

10. Check any potential routes of off-site migration of contaminants observed at the site:
- Swales                       Depressions                       Drainage Ditches
- Runoff                       Windblown Particulates                       Vehicular Traffic
- Other (specify):
11. Indicate the approximate depth to groundwater (in feet below ground surface [(bgs)]).
- 
12. Indicate the direction of groundwater flow (e.g., north, southeast, etc.)
- 
13. Is the direction of surface runoff apparent from site observations?  Yes  No  
 If yes, to which of the following does the surface runoff discharge? Indicate all that apply.
- Surface water                       Groundwater                       Sewer
- Collection Impoundment
14. Is there a navigable water body or tributary to a navigable water body?  
 Yes  No
15. Is there a water body anywhere on or in the vicinity of the site? If yes, also complete Section III.B.1: Aquatic Habitat Checklist -- Non-Flowing Systems and/or Section III.B.2: Aquatic Habitat Checklist -- Flowing Systems.
- Yes (approx. distance \_\_\_\_\_)                       No
16. Is there evidence of flooding?  Yes  No  
*Wetlands and flood plains are not always obvious. Do not answer "no" without confirming information.* If yes, complete Section III.C: Wetland Habitat Checklist.
17. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. (Use a blank sheet if additional space is needed for text.)
18. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site?  Yes  No  
 If yes, you are required to verify this information with the U.S. Fish and Wildlife Service or other appropriate agencies (see Table 1 for a list of contacts). If species' identities are known, please list them next.

19. Record weather conditions at the site at the time of the site visit when information for completion of this checklist was prepared:

DATE \_\_\_\_\_

\_\_\_\_\_Temperature (°C/°F)

Wind (direction/speed):

Cloud Cover:

Normal daily high temperature (°C/°F):

Precipitation (rain, snow):

20. Describe reasonable and likely future land and/or water use(s) at the site.

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21. Describe the historical uses of the site. Include information on chemical releases that may have occurred as a result of previous land uses. For each chemical release, provide information on the form of the chemical released (i.e., solid, liquid, vapor) and the known or suspected causes or mechanism of the release (i.e., spills, leaks, material disposal, dumping, explosion, etc.).

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22. Identify the media (e.g., soil [surface or subsurface], surface water, air, groundwater) which are known or suspected to contain COCs.

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### **III. HABITAT EVALUATION**

#### **III.A Terrestrial Habitat Checklist**

##### **III.A.1 Wooded**

Are any wooded areas on or adjacent to the site?  Yes  No

If yes, indicate the wooded area on the attached site map and answer the following questions. If more than one wooded area is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual wooded area. Distinguish between wooded areas by using names or other designations, and clearly identify each area on the site map.

If no, proceed to Section III.A.2: Shrub/Scrub



## Wooded Area Questions

On-site  Off-site

Name or Designation: \_\_\_\_\_

1. Estimate the approximate size of the wooded area (\_\_\_\_\_ % \_\_\_\_\_ acres)  
Please identify what information was used to determine the wooded area of the site (e.g., direct observation, photos, etc).
2. Indicate the dominant type of vegetation in the wooded area. Provide photographs, if available.
  - Evergreen
  - Deciduous
  - Mixed

Dominant plant species, if known: \_\_\_\_\_

3. Estimate the vegetation density of the wooded area.
  - Dense (i.e., greater than 75% vegetation)
  - Moderate (i.e., 25% to 75% vegetation)
  - Sparse (i.e., less than 25% vegetation)
4. Indicate the predominant size of the trees at the site. Use diameter at breast height.
  - 0-6 inches
  - 6-12 inches
  - >12 inches
  - No single size range is predominant
5. Specify type of understory present, if known. Provide a photograph, if available.

### **III.A.2 Shrub/Scrub**

Are any shrub/scrub areas on or adjacent to the site?  Yes  No

If yes, indicate the shrub/scrub area on the attached site map and answer the following questions. If more than one shrub/scrub area is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual shrub/scrub area. Distinguish between shrub/scrub areas, using names or other designations, and clearly identify each area on the site map.

If no, proceed to Section III.A.3: Open Field

## Shrub/Scrub Area Questions

On-site  Off-site

Name or Designation: \_\_\_\_\_

1. Estimate the approximate size of the shrub/scrub area (\_\_\_\_\_ % \_\_\_\_\_ acres). Please identify what information was used to determine the shrub/scrub area of the site (e.g., direct observation, photos, etc).
2. Indicate the dominant type of shrub/scrub vegetation present, if known.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. Estimate the vegetation density of the shrub/scrub area.
  - Dense (i.e., greater than 75% vegetation)
  - Moderate (i.e., 25% to 75% vegetation)
  - Sparse (i.e., less than 25% vegetation)
4. Indicate the approximate average height of the scrub/shrub vegetation.
  - 0-2 feet
  - 2-5 feet
  - >5 feet
5. Specify type of understory present, if known. Provide a photograph, if available.

### **III.A.3 Open Field**

Are any open field areas on or adjacent to the site?  Yes  No

If yes, indicate the open field area on the attached site map and answer the following questions. If more than one open field area is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual open field area. Distinguish between open field areas, using names or other designations, and clearly identify each area on the site map.

If no, proceed to Section III.A.4: Miscellaneous

## Open Field Area Questions

On-site  Off-site

Name or Designation: \_\_\_\_\_

1. Estimate the approximate size of the open field area (\_\_\_\_\_ % \_\_\_\_\_ acres). Please identify what information was used to determine the open field area of the site.
2. Indicate the dominant type of vegetation present, if known.  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
3. Estimate the vegetation density of the shrub/scrub area.
  - Dense (i.e., greater than 75% vegetation)
  - Moderate (i.e., 25% to 75% vegetation)
  - Sparse (i.e., less than 25% vegetation)
4. Indicate the approximate average height of the dominant plant:

### **III.A.4 Miscellaneous**

Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub and open field?  Yes  No

If yes, indicate the area on the attached site map and answer the following questions. If more than one of these areas are present on or adjacent to the site, make additional copies of the following questions and fill out for each individual area. Distinguish between areas by using names or other designations. Clearly identify each area on the site map.

If no, proceed to Section III.B: Aquatic Habitats.

### Miscellaneous Area Questions

On-site  Off-site

Name or Designation: \_\_\_\_\_

1. Provide a description of the terrestrial miscellaneous habitat and identify the area on the site map.
  
2. Estimate the approximate size of the area (\_\_\_\_\_ % \_\_\_\_\_ acres)
  
3. What observations, if any, were made at the site regarding the presence and/or absence of insects, birds, mammals, etc.?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
  
4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

### **III.B Aquatic Habitats**

*Note: Aquatic systems are often associated with wetland habitats. Please refer to Section III.C, Wetland Habitat Checklist.*

#### **III.B.1 Non-Flowing Systems**

Are any non-flowing aquatic features (such as ponds or lakes) located at or adjacent to the site?

Yes  No

If yes, indicate the aquatic feature on the attached site map and answer the following questions regarding the non-flowing aquatic features. If more than one non-flowing aquatic feature is present on or adjacent to the site, make additional copies of the following questions and fill out for each individual aquatic feature. Distinguish between aquatic features by using names or other designations. Clearly identify each area on the site map.

If no, proceed to Section III.B.2: Flowing Systems



## Non-Flowing Aquatic Feature Questions

On-site  Off-site

Name or Designation: \_\_\_\_\_

1. Indicate the type of aquatic feature present:
  - Natural (e.g., pond or lake)
  - Man-made (e.g., impoundment, lagoon, canal, etc.)
2. Estimate the approximate size of the water body (in acres or sq. ft.) \_\_\_\_\_
3. If known, indicate the depth of the water body (in ft. or in.). \_\_\_\_\_
4. If a water body is present, what are its known uses (e.g.: recreation, navigation, etc.)?
5. Is aquatic vegetation present?  Yes  No  
If yes, please identify the type of vegetation present if known.
  - Emergent
  - Submergent
  - Floating
6. Indicate the general composition of the bottom substrate. Mark all sources that apply from the following list.
  - Bedrock
  - Sand
  - Concrete
  - Boulder (>10 in.)
  - Silt
  - Debris
  - Cobble (2.5 - 10 in.)
  - Clay
  - Detritus
  - Gravel (0.1 - 2.5 in.)
  - Muck (fine/black)
  - Other (please specify): \_\_\_\_\_
7. Indicate the source(s) of the water in the aquatic feature. Mark all sources that apply from the following list.
  - River/Stream/Creek
  - Groundwater
  - Industrial Discharge
  - Surface Runoff
  - Other (please specify): \_\_\_\_\_

**Non-Flowing Aquatic Feature Questions (Continued)**

8. Is there a discharge from the facility to the aquatic feature?  Yes  No  
If yes, describe the origin of each discharge and its migration path.

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9. Does the aquatic feature discharge to the surrounding environment?  Yes  No  
If yes, indicate the features from the following list into which the aquatic feature discharges, and indicate whether the discharge occurs onsite or offsite:

- River/Stream/Creek  on-site  off-site
- Groundwater  on-site  off-site
- Wetland  on-site  off-site
- Impoundment  on-site  off-site
- Other (please describe) \_\_\_\_\_

10. Identify any field measurements and observations of water quality that were made.  
Provide the measurement and the units of measure in the appropriate space below:

\_\_\_\_\_ Area

\_\_\_\_\_ Depth (average)

\_\_\_\_\_ Temperature (depth of water where the reading was taken) \_\_\_\_\_

\_\_\_\_\_ pH

\_\_\_\_\_ Dissolved oxygen

\_\_\_\_\_ Salinity

\_\_\_\_\_ Turbidity (clear, slightly turbid, turbid, opaque)  
(Secchi disk depth \_\_\_\_\_)

\_\_\_\_\_ Other (specify)

11. Describe observed color and area of coloration.

**Non-Flowing Aquatic Feature Questions (Continued)**

12. Mark the open-water, non-flowing system on the site map attached to this checklist.
  
13. What observations, if any, were made at the water body regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc?

### **III.B.2 Flowing Systems**

*Note: Aquatic systems are often associated with wetland habitats. Please refer to Section III.C, Wetland Habitat Checklist.*

Are any flowing aquatic features (such as streams or rivers) located at or adjacent to the site?

Yes  No

If yes, indicate the system on the attached site map and answer the following questions regarding the flowing system. If more than one flowing system is present on or adjacent to the site, make additional copies of the following questions and complete one set for each individual aquatic feature. Distinguish between flowing systems by using names or other designation. Clearly identify each area on the site map

If no, proceed to Section III.C: Wetlands Habitats.

## Flowing Aquatic Systems Questions

On-site  Off-site

Name or Designation: \_\_\_\_\_

1. Indicate the type of flowing aquatic feature present.

- River
- Stream/Creek/Brook
- Intermittent stream
- Artificially created (ditch, etc.)
- Channeling
- Other (specify)

2. For natural systems, are there any indicators of physical alteration (e.g., channeling, debris, etc.)?  Yes  No

If yes, please describe the indicators observed.

3. Indicate the general composition of the bottom substrate.

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> Bedrock                       | <input type="checkbox"/> Sand (course)     | <input type="checkbox"/> Concrete      |
| <input type="checkbox"/> Boulder (>10 in.)             | <input type="checkbox"/> Silt (fine)       | <input type="checkbox"/> Debris        |
| <input type="checkbox"/> Cobble (2.5 - 10 in.)         | <input type="checkbox"/> Clay (slick)      | <input type="checkbox"/> Detritus      |
| <input type="checkbox"/> Gravel (0.1 - 2.5 in.)        | <input type="checkbox"/> Muck (fine/black) | <input type="checkbox"/> Marl (Shells) |
| <input type="checkbox"/> Other (please specify): _____ |  |  |

4. Describe the condition of the bank (e.g., height, slope, extent of vegetative cover).

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5. Is the system influenced by tides?  Yes  No

What information was used to make this determination?

6. Is the flow intermittent?  Yes  No

If yes, please note the information used to make this determination.

**Flowing System Questions (Continued)**

7. Is there a discharge from the site to the water body?  Yes  No  
If yes, describe the origin of each discharge and its migration path.

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8. Indicate the discharge point of the water body. Specify name of the discharge, if known.

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9. Identify any field measurements and observations of water quality that were made.  
Provide the measurement and the units of measure in the appropriate space below:

\_\_\_\_\_ Width (ft.)

\_\_\_\_\_ Depth (average)

\_\_\_\_\_ Velocity (specify units):\_\_\_\_\_

\_\_\_\_\_ Temperature (depth of water where the reading was taken)\_\_\_\_\_

\_\_\_\_\_ pH

\_\_\_\_\_ Dissolved oxygen

\_\_\_\_\_ Salinity

\_\_\_\_\_ Turbidity (clear, slightly turbid, turbid, opaque)  
(Secchi disk depth\_\_\_\_\_)

\_\_\_\_\_ Other (specify)

10. Describe observed color and area of coloration.

11. Is any aquatic vegetation present?  Yes  No  
If yes, please identify the type of vegetation present, if known.

Emergent       Submergent       Floating

### **Flowing System Questions (Continued)**

12. Mark the flowing water system on the attached site map.
13. What observations were made at the water body regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc?

### III.C Wetland Habitats

Are any wetland<sup>2</sup> areas such as marshes or swamps on or adjacent to the site?

Yes  No

If yes, indicate the wetland area on the attached site map and answer the following questions regarding the wetland area. If more than one wetland area is present on or adjacent to the site, make additional copies of the following questions and fill out one for each individual wetland area. Distinguish between wetland areas by using names or other designations (such as location). Clearly identify each area on the site map. Also, obtain and attach a National Wetlands Inventory Map (or maps) to illustrate each wetland area.

Identify the sources of the observations and information (e.g., National Wetland Inventory, Federal or State Agency, USGS topographic maps) used to make the determination whether or not wetland areas are present.

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If no wetland areas are present, proceed to Section III.D: Sensitive Environments and Receptors.

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<sup>2</sup>Wetlands are defined in 40 CFR §232.2 as “ Areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” Examples of typical wetlands plants include: cattails, cordgrass, willows and cypress trees. National wetland inventory maps may be available at <http://nwi.fws.gov>. Additional information on wetland delineation criteria is also available from the Army Corps of Engineers.



## Wetland Area Questions

On-site    Off-site

Name or Designation: \_\_\_\_\_

1.     Indicate the approximate area of the wetland (acres or ft.<sup>2</sup>) \_\_\_\_\_
  
2.     Identify the type(s) of vegetation present in the wetland.
  - Submergent (i.e., underwater) vegetation
  - Emergent (i.e., rooted in the water, but rising above it) vegetation
  - Floating vegetation
  - Scrub/shrub
  - Wooded
  - Other (Please describe): \_\_\_\_\_
  
3.     Provide a general description of the vegetation present in and around the wetland (height, color, etc). Provide a photograph of the known or suspected wetlands, if available.
  
  
  
  
  
  
  
  
  
  
4.     Estimate the vegetation density of the wetland area.
  - Dense (i.e., greater than 75% vegetation)
  - Moderate (i.e., 25% to 75% vegetation)
  - Sparse (i.e., less than 25% vegetation)
  
5.     Is standing water present?    Yes     No  
       If yes, is the water primarily:    Fresh    Brackish  
       Indicate the approximate area of the standing water (ft.<sup>2</sup>) \_\_\_\_\_  
       Indicate the approximate depth of the standing water, if known (ft. or in.) \_\_\_\_\_

**Wetland Area Questions (Continued)**

6. Identify any field measurements and observations of water quality that were made. Provide the measurement and the units of measure in the appropriate space below:

- \_\_\_\_\_ Area
- \_\_\_\_\_ Depth (average)
- \_\_\_\_\_ Temperature (depth of water where the reading was taken)\_\_\_\_\_
- \_\_\_\_\_ pH
- \_\_\_\_\_ Dissolved oxygen
- \_\_\_\_\_ Salinity
- \_\_\_\_\_ Turbidity (clear, slightly turbid, turbid, opaque)  
(Secchi disk depth\_\_\_\_\_)
- \_\_\_\_\_ Other (specify)

7. Describe observed color and area of coloration.

8. If known, indicate the source of the water in the wetland.

- Stream/River/Creek/Lake/Pond
- Flooding
- Groundwater
- Surface runoff

9. Is there a discharge from the site to the wetland?  Yes  No

If yes, please describe:

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**Wetland Area Questions (Continued)**

10. Is there a discharge from the wetland?  Yes  No  
If yes, to what water body is discharge released?
- Marine (Name: \_\_\_\_\_)
  - Surface stream/River (Name: \_\_\_\_\_)
  - Lake/Pond (Name: \_\_\_\_\_)
  - Groundwater
  - Not sure
11. Does the area show evidence of flooding?  Yes  No  
If yes, indicate which of the following are present (mark all that apply).
- Standing water
  - Water-saturated soils
  - Water marks
  - Buttressing
  - Debris lines
  - Mud cracks
  - Other (Please describe): \_\_\_\_\_
11. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.
- Color (blue/gray, brown, black, mottled) \_\_\_\_\_
- Water content (dry, wet, saturated/unsaturated) \_\_\_\_\_
13. Mark the observed wetland area(s) on the attached site map.

### III.D Sensitive Environments and Receptors

1. Do any other potentially sensitive environmental areas<sup>3</sup> exist adjacent to or within one-half mile of the site? If yes, list these areas and provide the source(s) of information used to identify sensitive areas. *Do not answer "no" without confirmation from the U.S. Fish and Wildlife Service and other appropriate agencies. See Table 1 for a list of contacts.*

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2. Are any areas on or near (i.e., within one-half mile) the site owned or used by local tribes? If yes, describe.

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3. Does the site serve or potentially serve as a habitat, foraging area or refuge by rare, threatened, endangered, candidate and/or proposed species (plants or animals), or any otherwise protected species? If yes, identify species. *This information should be obtained from the U.S. Fish and Wildlife Service and other appropriate agencies. See Table 1 for a list of contacts.*

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4. Is the site potentially used as a breeding, roosting or feeding area by migratory bird species? If yes, identify which species.

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<sup>3</sup> Areas that provide unique and often protected habitat for wildlife species. These areas are typically used during critical life stages such as breeding, hatching, rearing of young and overwintering. Refer to Table 2 at the end of this document for examples of sensitive environments.

## Sensitive Environments and Receptors Questions (continued)

5. Is the site used by any ecologically<sup>4</sup>, recreationally or commercially important species? If yes, explain.

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<sup>4</sup> Ecologically important species include populations of species which provide a critical (i.e., not replaceable) food resource for higher organisms. These species' functions would not be replaced by more tolerant species or perform a critical ecological function (such as organic matter decomposition) and will not be replaced by other species. Ecologically important species include pest and opportunistic species that populate an area if they serve as a food source for other species, but do not include domesticated animals (e.g., pets and livestock) or plants/animals whose existence is maintained by continuous human interventions (e.g., fish hatcheries, agricultural crops, etc).

**IV. EXPOSURE PATHWAY EVALUATION**

1. Do existing data provide sufficient information on the nature, rate and extent of contamination at the site?

- Yes
- No
- Uncertain

Please provide an explanation for your answer. \_\_\_\_\_

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2. Do existing data provide sufficient information on the nature, rate and extent of contamination in offsite affected areas?

- Yes
- No
- Uncertain
- No offsite contamination

Please provide an explanation for your answer. \_\_\_\_\_

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3. Do existing data address potential migration pathways of contaminants at the site?

- Yes
- No
- Uncertain

Please provide an explanation for your answer. \_\_\_\_\_

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4. Do existing data address potential migration pathways of contaminants in offsite affected areas?

- Yes
- No
- Uncertain
- No offsite contamination

Please provide an explanation for your answer. \_\_\_\_\_

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5. Are there visible indications of stressed habitats or receptors on or near (i.e., within one-half mile) the site that may be the result of a chemical release? If yes, explain. Attach photographs if available.

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6. Is the location of the contamination such that receptors might be reasonably expected to come into contact with it? For soil, this means contamination in the soil 0 to 1 foot below ground surface (bgs). If yes, explain.

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7. Are receptors located in or using habitats where chemicals exist in air, soil, sediment or surface water? If yes, explain.

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8. Could chemicals reach receptors via groundwater? Can chemicals leach or dissolve to groundwater? Are chemicals mobile in groundwater? Does groundwater discharge into receptor habitats? If yes, explain.

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9. Could chemicals reach receptors through runoff or erosion? Answer the following questions.

What is the approximate distance from the contaminated area to the nearest watercourse?

- 0 feet (i.e., contamination has reached a watercourse)
- 1-10 feet
- 11-20 feet
- 21-50 feet
- 51-100 feet
- 101-200 feet
- > 200 feet
- > 500 feet
- > 1000 feet

What is the slope of the ground in the contaminated area?

- 0-10%
- 10-30%
- > 30%

What is the approximate amount of ground and canopy vegetative cover in the contaminated area?

- < 25%
- 25-75%
- > 75%

Is there visible evidence of erosion (e.g., a rill or gully) in or near the contaminated area?

- Yes
- No
- Do not know



Do any structures, pavement or natural drainage features direct run-on flow (i.e., surface flows originating upstream or uphill from the area of concern) into the contaminated area?

- Yes
- No
- Do not know

10. Could chemicals reach receptors through the dispersion of contaminants in air (e.g., volatilization, vapors, fugitive dust)? If yes, explain.

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11. Could chemicals reach receptors through migration of non-aqueous phase liquids (NAPLs)? Is a NAPL present at the site that might be migrating towards receptors or habitats? Could NAPL discharge contact receptors or their habitat?

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**TABLE 1**  
**SENSITIVE ENVIRONMENT CONTACTS**

<b>CONTACT</b>	<b>TELEPHONE #</b>	<b>SENSITIVE ENVIRONMENT</b>
<b>NC Division of Parks and Recreation</b> – National Heritage Program	(919) 733-4181 Fax: (919) 715-3085	State Parks  Areas Important to Maintenance of Unique Natural Communities  Sensitive Areas Identified Under The National Estuary Program  Designated State Natural Areas  State Seashore, Lakeshore, and River Recreational Areas  Rare species (state and federal Threatened and Endangered)  Sensitive Aquatic Habitat
NC Planning and Natural Resources	(919) 846-9991	State Wild & Scenic Rivers
<b>National Park Service</b> Public Affairs Office	(404) 562-3103	National Seashore, Lakeshore and River Recreational Areas  National Parks or Monuments
Internet	<a href="http://www.nps.gov/rivers">www.nps.gov/rivers</a>	Federal Designated Wild & Scenic Rivers
<b>US Forest Service</b>	(828) 257-4253	Designated and Proposed Federal Wilderness and Natural Areas
	(828) 257-4864	National Preserves and Forests
	(828) 257-4810	Federal Land Designated for the protection of natural ecosystems.

<b>CONTACT</b>	<b>TELEPHONE #</b>	<b>SENSITIVE ENVIRONMENT</b>
<b>NC Division of Water Quality</b>	(919) 733-6510	Critical Areas Identified Under the Clean Lakes Program
	(919) 733-5083 <i>Ask for Clean Water Act 305b report</i>	State-Designated Areas for Protection or Maintenance of Aquatic Life
<b>NC Division of Forest Resources</b>	(919) 733-2162 x 234	State Preserves and Forests
<b>US Fish &amp; Wildlife Service</b>	(919) 856-4520 x 11	Terrestrial Areas Utilized for Breeding by Large or Dense Aggregations of Animals
<b>NC Wildlife Resources Commission</b>	(252) 451-2534	National or State Wildlife Refuges
<b>NOAA</b>	(301) 713-3145 x 173	Marine Sanctuaries
<b>NC Department of Cultural Resources</b>	(919) 733-4763	National and State Historical Sites
<b>NC Division of Coastal Management</b>	(919) 733-2293	Areas Identified Under Coastal Protection Legislation
Internet	<a href="http://dcm2.enr.state.nc.us">http://dcm2.enr.state.nc.us</a>	Coastal Barriers or Units of a Coastal Barrier Resources System
<b>NC Wildlife Resources Commission</b>	(919) 733-3633	Spawning Areas Critical for the Maintenance of Fish/Shellfish Species within River, Lake or Coastal Tidal Waters.  Migratory Pathways and Feeding Areas Critical for Maintenance of Anadromous Fish Species within River Reaches or Areas in Lakes or Coastal Tidal Waters in Which such Fish Spend Extended Periods of Time  State Lands Designated for Wildlife or Game Management
<b>US Army Corps of Engineers</b>	(919) 876-8441, ext. 28	Wetlands

**TABLE 2**  
**EXAMPLES OF SENSITIVE ENVIRONMENTS**

National Parks and National Monuments

Designated or Administratively Proposed Federal Wilderness Areas

National Preserves

National or State Wildlife Refuges

National Lakeshore Recreational Areas

Federal land designated for protection of natural ecosystems

State land designated for wildlife or game management

State designated Natural Areas

Federal or state designated Scenic or Wild River

All areas that provide or could potentially provide critical habitat<sup>1</sup> for state and federally listed Threatened or Endangered Species, those species that are currently petitioned for listing, and species designated by other agencies as sensitive or species of concern.

Marine Sanctuary

Areas identified under the Coastal Zone Management Act

Sensitive areas identified under the National Estuary Program or Near Coastal Waters Program

Critical areas identified under the Clean Lakes Program

National Seashore Recreational Area

Habitat known to be used by Federal designated or proposed endangered or threatened species

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<sup>1</sup> Critical habitats are defined by the Endangered Species Act (50 CFR §424.02(d)) as:

1) Specific areas within the geographical area currently occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (i) essential to the conservation of the species and (ii) that may require special management considerations or protection, and  
2) Specific areas outside the geographical area occupied by a species at the time it is listed upon a determination by the Secretary [ of Interior] that such areas are essential for the conservation of the species.

Unit of Coastal Barrier Resources System

Coastal Barrier (undeveloped)

Spawning areas critical for the maintenance of fish/shellfish species within river, lake, or coastal tidal waters

Migratory pathways and feeding areas critical for maintenance of anadromous fish species within river reaches or areas in lakes or coastal tidal waters in which the fish spend extended periods of time

Terrestrial areas utilized for breeding by large or dense aggregations of animals

National river reach designated as Recreational

Habitat known to be used by state designated endangered or threatened species

Habitat known to be used by species under review as to its Federal endangered or threatened status

Coastal Barrier (partially developed)

Particular areas, relatively small in size, important to maintenance of unique biotic communities

State-designated areas for protection or maintenance of aquatic life

Wetlands

**TABLE 1  
CALCULATION OF DIOXIN TOXICITY EQUIVALENTS (TEQ)  
SOIL**

Analyte	Maximum Detected Concentration	Maximum SQL	Comparison Concentration <sup>1</sup>	Mammal TEF <sup>2</sup>	Mammal Value <sup>3</sup>	Fish TEF <sup>2</sup>	Fish Value <sup>3</sup>	Avian TEF <sup>2</sup>	Avian Value <sup>3</sup>
<b>Dioxin/Furan Congener (ng/kg)</b>									
2,3,7,8-TCDD				1		1		1	
1,2,3,7,8-PentaCDD				1		1		1	
1,2,3,4,7,8-HexaCDD				0.1		0.5		0.05	
1,2,3,6,7,8-HexaCDD				0.1		0.01		0.01	
1,2,3,7,8,9-HexaCDD				0.1		0.01		0.1	
1,2,3,4,6,7,8-HeptaCDD				0.01		0.001		0.001	
OctaCDD				0.0001		0.0001		0.0001	
2,3,7,8-TetraCDF				0.1		0.05		1	
1,2,3,7,8-PentaCDF				0.05		0.05		0.1	
2,3,4,7,8-PentaCDF				0.5		0.5		1	
1,2,3,4,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,6,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,7,8,9-HexaCDF				0.1		0.1		0.1	
2,3,4,6,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,4,6,7,8-HeptaCDF				0.01		0.01		0.01	
1,2,3,4,7,8,9-HeptaCDF				0.01		0.01		0.01	
OctaCDF				0.0001		0.0001		0.0001	
<b>Toxicity Equivalents (TEQ)</b>									

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If congener was not detected, enter one half the maximum SQL.

<sup>2</sup> = Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife, Martin Van den Berg et al., "Environmental Health Perspectives," 106:775-792 (1998).

<sup>3</sup> = Mammal, Fish, and Avian Values = Comparison Concentration x Respective TEF

SQL = Sample Quantitation Limit

TEF = Toxic Equivalency Factor

TEQ = Toxic Equivalents relative to 2,3,7,8-tetrachlorodibenzo(p)dioxin (2,3,7,8-TCDD)

**TABLE 2  
CALCULATION OF DIOXIN TOXICITY EQUIVALENTS (TEQ)  
SEDIMENT**

Analyte	Maximum Detected Concentration	Maximum SQL	Comparison Concentration <sup>1</sup>	Mammal TEF <sup>2</sup>	Mammal Value <sup>3</sup>	Fish TEF <sup>2</sup>	Fish Value <sup>3</sup>	Avian TEF <sup>2</sup>	Avian Value <sup>3</sup>
<b>Dioxin/Furan Congener (ng/kg)</b>									
2,3,7,8-TCDD				1		1		1	
1,2,3,7,8-PentaCDD				1		1		1	
1,2,3,4,7,8-HexaCDD				0.1		0.5		0.05	
1,2,3,6,7,8-HexaCDD				0.1		0.01		0.01	
1,2,3,7,8,9-HexaCDD				0.1		0.01		0.1	
1,2,3,4,6,7,8-HeptaCDD				0.01		0.001		0.001	
OctaCDD				0.0001		0.0001		0.0001	
2,3,7,8-TetraCDF				0.1		0.05		1	
1,2,3,7,8-PentaCDF				0.05		0.05		0.1	
2,3,4,7,8-PentaCDF				0.5		0.5		1	
1,2,3,4,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,6,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,7,8,9-HexaCDF				0.1		0.1		0.1	
2,3,4,6,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,4,6,7,8-HeptaCDF				0.01		0.01		0.01	
1,2,3,4,7,8,9-HeptaCDF				0.01		0.01		0.01	
OctaCDF				0.0001		0.0001		0.0001	
<b>Toxicity Equivalents (TEQ)</b>									

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If congener was not detected, enter one half the maximum SQL.

<sup>2</sup> = Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife, Martin Van den Berg et al., "Environmental Health Perspectives," 106:775-792 (1998).

<sup>3</sup> = Mammal, Fish, and Avian Values = Comparison Concentration x Respective TEF

SQL = Sample Quantitation Limit

TEF = Toxic Equivalency Factor

TEQ = Toxic Equivalents relative to 2,3,7,8-tetrachlorodibenzo(p)dioxin (2,3,7,8-TCDD)

**TABLE 3  
CALCULATION OF DIOXIN TOXICITY EQUIVALENTS (TEQ)  
SALTWATER**

Analyte	Maximum Detected Concentration	Maximum SQL	Comparison Concentration <sup>1</sup>	Mammal TEF <sup>2</sup>	Mammal Value <sup>3</sup>	Fish TEF <sup>2</sup>	Fish Value <sup>3</sup>	Avian TEF <sup>2</sup>	Avian Value <sup>3</sup>
<b>Dioxin/Furan Congener (ng/kg)</b>									
2,3,7,8-TCDD				1		1		1	
1,2,3,7,8-PentaCDD				1		1		1	
1,2,3,4,7,8-HexaCDD				0.1		0.5		0.05	
1,2,3,6,7,8-HexaCDD				0.1		0.01		0.01	
1,2,3,7,8,9-HexaCDD				0.1		0.01		0.1	
1,2,3,4,6,7,8-HeptaCDD				0.01		0.001		0.001	
OctaCDD				0.0001		0.0001		0.0001	
2,3,7,8-TetraCDF				0.1		0.05		1	
1,2,3,7,8-PentaCDF				0.05		0.05		0.1	
2,3,4,7,8-PentaCDF				0.5		0.5		1	
1,2,3,4,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,6,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,7,8,9-HexaCDF				0.1		0.1		0.1	
2,3,4,6,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,4,6,7,8-HeptaCDF				0.01		0.01		0.01	
1,2,3,4,7,8,9-HeptaCDF				0.01		0.01		0.01	
OctaCDF				0.0001		0.0001		0.0001	
<b>Toxicity Equivalents (TEQ)</b>									

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If congener was not detected, enter one half the maximum SQL.

<sup>2</sup> = Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife, Martin Van den Berg et al., "Environmental Health Perspectives," 106:775-792 (1998).

<sup>3</sup> = Mammal, Fish, and Avian Values = Comparison Concentration x Respective TEF

SQL = Sample Quantitation Limit

TEF = Toxic Equivalency Factor

TEQ = Toxic Equivalents relative to 2,3,7,8-tetrachlorodibenzo(p)dioxin (2,3,7,8-TCDD)



**TABLE 4  
CALCULATION OF DIOXIN TOXICITY EQUIVALENTS (TEQ)  
FRESHWATER**

Analyte	Maximum Detected Concentration	Maximum SQL	Comparison Concentration <sup>1</sup>	Mammal TEF <sup>2</sup>	Mammal Value <sup>3</sup>	Fish TEF <sup>2</sup>	Fish Value <sup>3</sup>	Avian TEF <sup>2</sup>	Avian Value <sup>3</sup>
<b>Dioxin/Furan Congener (ng/kg)</b>									
2,3,7,8-TCDD				1		1		1	
1,2,3,7,8-PentaCDD				1		1		1	
1,2,3,4,7,8-HexaCDD				0.1		0.5		0.05	
1,2,3,6,7,8-HexaCDD				0.1		0.01		0.01	
1,2,3,7,8,9-HexaCDD				0.1		0.01		0.1	
1,2,3,4,6,7,8-HeptaCDD				0.01		0.001		0.001	
OctaCDD				0.0001		0.0001		0.0001	
2,3,7,8-TetraCDF				0.1		0.05		1	
1,2,3,7,8-PentaCDF				0.05		0.05		0.1	
2,3,4,7,8-PentaCDF				0.5		0.5		1	
1,2,3,4,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,6,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,7,8,9-HexaCDF				0.1		0.1		0.1	
2,3,4,6,7,8-HexaCDF				0.1		0.1		0.1	
1,2,3,4,6,7,8-HeptaCDF				0.01		0.01		0.01	
1,2,3,4,7,8,9-HeptaCDF				0.01		0.01		0.01	
OctaCDF				0.0001		0.0001		0.0001	
<b>Toxicity Equivalents (TEQ)</b>									

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If congener was not detected, enter one half the maximum SQL.

<sup>2</sup> = Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife, Martin Van den Berg et al., "Environmental Health Perspectives," 106:775-792 (1998).

<sup>3</sup> = Mammal, Fish, and Avian Values = Comparison Concentration x Respective TEF

SQL = Sample Quantitation Limit

TEF = Toxic Equivalency Factor

TEQ = Toxic Equivalents relative to 2,3,7,8-tetrachlorodibenzo(p)dioxin (2,3,7,8-TCDD)

**TABLE 5  
SELECTION OF COPCs  
VOCs IN SOIL**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV ESV <sup>2</sup>	Maximum Hazard Quotient	Soil COPC?	Contaminant Category <sup>7</sup>
		Min.	Q	Max.	Q							
<b>Organics-VOCs (µg/kg)</b>												
1,1,1-Trichloroethane <sup>3</sup>									100			
1,1,2,2-Tetrachloroethane <sup>3</sup>									100			
1,1,2-Trichloro-1,2,2-trifluoroethane <sup>3</sup>									100			
1,1,2-Trichloroethane <sup>3</sup>									100			
1,1-Dichloroethane <sup>3</sup>									100			
1,1-Dichloroethene <sup>3</sup>									100			
1,2,3-Trichlorobenzene <sup>6</sup>									10			
1,2,4-Trichlorobenzene <sup>6</sup>									10			
1,2-Dibromo-3-chloropropane <sup>3</sup>									100			
1,2-Dibromoethane									NA			
1,2-Dichlorobenzene <sup>5</sup>									10			
1,2-Dichloroethane									400			
1,2-Dichloropropane									700,000			
1,3-Dichlorobenzene <sup>5</sup>									10			
1,4-Dichlorobenzene <sup>5</sup>									10			
2-Butanone									NA			
2-Hexanone									NA			
4-Methyl-2-pentanone									NA			
Acetone									NA			
Benzene									50			
Bromochloromethane <sup>3</sup>									100			
Bromodichloromethane <sup>3</sup>									100			
Bromoform									NA			
Bromomethane									NA			
Carbon Disulfide									NA			
Carbon Tetrachloride									1,000,000			
Chlorobenzene									50			
Chloroethane <sup>3</sup>									100			
Chloroform									1			
Chloromethane <sup>3</sup>									100			
cis-1,2-Dichloroethene <sup>3</sup>									100			
cis-1,3-Dichloropropene <sup>3</sup>									100			
Cyclohexane									100			
Dibromochloromethane <sup>3</sup>									100			
Dichlorodifluoromethane <sup>3</sup>									100			
Ethylbenzene									50			
Isopropylbenzene <sup>4</sup>									100			
Methyl Acetate									NA			
Methyl tert-Butyl Ether									NA			
Methylcyclohexane <sup>4</sup>									100			
Methylene Chloride									2,000			
Styrene									100			
Tetrachloroethene									10			
Toluene									50			
trans-1,2-Dichloroethene <sup>3</sup>									100			
trans-1,3-Dichloropropene <sup>3</sup>									100			
Trichloroethene									1			
Trichlorofluoromethane <sup>3</sup>									100			
Vinyl Chloride									10			
Xylenes (Total)									50			

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>2</sup> = Friday, G.P. "Ecological Screening Values for Surface Water, Sediment, and Soil." Westinghouse Savannah River Company, Savannah River Technology Center, Aiken, SC. November 1998.

<sup>3</sup> = Aliphatic chlorinated hydrocarbon screening value used as a surrogate screening value.

<sup>4</sup> = Monocyclic aromatic hydrocarbon screening value used as a surrogate screening value.

<sup>5</sup> = Dichlorobenzene screening value used as a surrogate screening value.

<sup>6</sup> = Trichlorobenzene screening value used as a surrogate screening value.

<sup>7</sup> = Blank space means analyte eliminated as a COPC.

COPC = Contaminant Of Potential Concern.

ESV = Ecological Screening Value

Maximum Hazard Quotient = Concentration Used For Screening/ESV

NA = Not Available

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- |   |  |
|---|--|
| 1 | Contaminant is found in concentrations exceeding its screening value.  |
| 2 | Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.                 |
| 3 | Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant. |
| 4 | Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.   |

**TABLE 6  
SELECTION OF COPCs  
SVOCs IN SOIL**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV ESV <sup>2</sup>	Maximum Hazard Quotient	Soil COPC?	Contaminant Category
		Min.	Q	Max.	Q							
<b>Organics - SVOCs (µg/kg)</b>												
1,1-Biphenyl								60,000				
1,2,4,5-Tetrachlorobenzene <sup>3</sup>								10				
2,2'-oxybis(1-chloropropane) <sup>4</sup>								100				
2,4,5-Trichlorophenol								4,000				
2,4,6-Trichlorophenol								10,000				
2,4-Dichlorophenol <sup>5</sup>								3				
2,4-Dimethylphenol <sup>5</sup>								500				
2,4-Dinitrophenol								20,000				
2,4-Dinitrotoluene								NA				
2,6-Dinitrotoluene								NA				
2-Chloronaphthalene <sup>8</sup>								1,000				
2-Methylphenol <sup>6</sup>								500				
2-Nitroaniline								NA				
2-Nitrophenol <sup>11</sup>								7,000				
3,3'-Dichlorobenzidine <sup>9</sup>								100				
3-Nitroaniline								NA				
4,6-Dinitro-2-methylphenol								NA				
4-Bromophenyl phenyl ether								NA				
4-Chloroaniline								NA				
4-Chlorophenyl phenyl ether <sup>10</sup>								10				
4-Methylphenol <sup>6</sup>								500				
4-Nitroaniline								NA				
4-Nitrophenol								7,000				
Acetaphenone								NA				
Atrazine								0.05				
Benzaldehyde <sup>7</sup>								100				
bis(2-Chloroethoxy)methane <sup>4</sup>								100				
bis(2-Chloroethyl)ether <sup>4</sup>								100				
Caprolactam								NA				
Dibenzofuran								NA				
Hexachlorobenzene								2.5				
Hexachlorobutadiene <sup>4</sup>								100				
Hexachlorocyclopentadiene								10,000				
Hexachloroethane <sup>4</sup>								100				
Isophorone								NA				
n-Nitroso-di-n-propylamine								NA				
n-Nitrosodiphenylamine								20,000				
Nitrobenzene								40,000				
Pentachlorophenol								2				
Phenol								50				
Diethylphthalate								100,000				
Dimethylphthalate								200,000				
Di-n-butylphthalate								200,000				
bis(2-Ethylhexyl)phthalate								NA				
Butyl benzyl phthalate								NA				
Di-n-octylphthalate								NA				
Total Phthalates								100				

**TABLE 6  
SELECTION OF COPCs  
SVOCs IN SOIL  
(continued)**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV ESV <sup>2</sup>	Maximum Hazard Quotient	Soil COPC?	Contaminant Category <sup>12</sup>
		Min.	Q	Max.	Q							
<b>Organics - SVOCs (µg/kg)</b>												
2-Chlorophenol								NA				
4-Chloro-3-methylphenol								NA				
Total Monochlorophenols								2.5				
2-Methylnaphthalene								NA				
Acenaphthene								NA				
Acenaphthylene								NA				
Anthracene								NA				
Benzo(a)anthracene								NA				
Benzo(a)pyrene								NA				
Benzo(b)fluoranthene								NA				
Benzo(g,h,i)perylene								NA				
Benzo(k)fluoranthene								NA				
Carbazole								NA				
Chrysene								NA				
Dibenz(a,h)anthracene								NA				
Fluoranthene								NA				
Fluorene								NA				
Indeno(1,2,3-cd)pyrene								NA				
Naphthalene								NA				
Phenanthrene								NA				
Pyrene								NA				
Total PAHs								1,000				

**NOTES:**

- <sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.
- <sup>2</sup> = Friday, G.P. "Ecological Screening Values for Surface Water, Sediment, and Soil." Westinghouse Savannah River Company, Savannah River Technology Center, Aiken, SC. November 1998.
- <sup>3</sup> = Tetrachlorobenzene screening value used as a surrogate screening value.
- <sup>4</sup> = Aliphatic chlorinated hydrocarbon screening value used as a surrogate screening value.
- <sup>5</sup> = Total dichlorophenols screening value used as a surrogate screening value.
- <sup>6</sup> = Cresols screening value used as a surrogate screening value.
- <sup>7</sup> = Monocyclic aromatic hydrocarbon screening value used as a surrogate screening value.
- <sup>8</sup> = Chloronaphthalene screening value used as a surrogate screening value.
- <sup>9</sup> = Total polycyclic chlorinated hydrocarbons screening value used as a surrogate screening value.
- <sup>10</sup> = Chlorophenols screening value used as a surrogate screening value.
- <sup>11</sup> = 4-nitrophenol screening value used as a surrogate screening value.
- <sup>12</sup> = Blank space means analyte eliminated as a COPC.

COPC = Contaminant Of Potential Concern  
 ESV = Ecological Screening Value  
 Maximum Hazard Quotient = Concentration Used For Screening/ESV  
 NA = Not Available  
 Q = Data Qualifier  
 SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.

**TABLE 7  
SELECTION OF COPCs  
PESTICIDES IN SOIL**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV ESV <sup>2</sup>	Maximum Hazard Quotient	Soil COPC?	Contaminant Category <sup>4</sup>
		Min.	Q	Max.	Q							
<b>Pesticides (µg/kg)</b>												
p,p'-DDD								NA				
DDD								NA				
p,p'-DDE								NA				
DDE								NA				
p,p'-DDT								NA				
DDT								NA				
DDT/DDE/DDD (Total)								2.5				
Aldrin								2.5				
Alpha Chlordane <sup>3</sup>								100				
Gamma Chlordane <sup>3</sup>								100				
alpha-BHC								2.5				
beta-BHC								1				
delta-BHC <sup>3</sup>								100				
gamma-BHC (Lindane)								0.05				
alpha-Endosulfan <sup>3</sup>								100				
beta-Endosulfan <sup>3</sup>								100				
Endosulfan sulfate <sup>3</sup>								100				
Dieldrin								0.5				
Endrin aldehyde <sup>3</sup>								100				
Endrin ketone <sup>3</sup>								100				
Endrin								1				
Heptachlor <sup>3</sup>								100				
Heptachlor epoxide <sup>3</sup>								100				
Methoxychlor <sup>3</sup>								100				
Toxaphene <sup>3</sup>								100				
Dioxin TEQs (ng/kg)								NA				
Total PCBs								20				

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>2</sup> = Friday, G.P. "Ecological Screening Values for Surface Water, Sediment, and Soil." Westinghouse Savannah River Company, Savannah River Technology Center, Aiken, SC. November 1998.

<sup>3</sup> = Organochlorinated pesticides screening value used as a surrogate screening value.

<sup>4</sup> = Blank space means analyte eliminated as a COPC.

COPC = Contaminant Of Potential Concern

ESV = Ecological Screening Value

Maximum Hazard Quotient = Concentration Used For Screening/ESV

NA = Not Available

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.

**TABLE 8  
SELECTION OF COPCs  
INORGANICS IN SOIL**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV ESV <sup>2</sup>	Maximum Hazard Quotient	Soil COPC?	Contaminant Category <sup>3</sup>
		Min.	Q	Max.	Q							
<b>Inorganics (mg/kg)</b>												
Aluminum								50				
Antimony								3.5				
Arsenic								10				
Barium								165				
Beryllium								1.1				
Cadmium								1.6				
Calcium								NA				
Chromium								0.4				
Cobalt								20				
Copper								40				
Iron								200				
Lead								50				
Magnesium								NA				
Manganese								100				
Mercury								0.1				
Nickel								30				
Potassium								NA				
Selenium								0.81				
Silver								2				
Sodium								NA				
Thallium								1				
Vanadium								2				
Zinc								50				

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>2</sup> = Friday, G.P. "Ecological Screening Values for Surface Water, Sediment, and Soil." Westinghouse Savannah River Company, Savannah River Technology Center, Aiken, SC. November 1998.

<sup>3</sup> = Blank space means analyte eliminated as a COPC.

COPC = Contaminant Of Potential Concern

ESV = Ecological Screening Value

Maximum Hazard Quotient = Concentration Used For Screening/ESV

NA = Not Available

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.

**TABLE 10  
SELECTION OF COPCs  
SVOCs IN SEDIMENT**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>2</sup>	EPA Region IV Effects Value <sup>3</sup>	CLP PQL	EPA Screening Value	Site Screening Value <sup>4</sup>	Maximum Hazard Quotient	Sediment COPC?	Contaminant Category
		Min.	Q	Max.	Q										
<b>Organics - SVOCs (µg/kg)</b>															
1,1-Biphenyl								NA	330	NA					
1,2,4,5-Tetrachlorobenzene								NA	NA	NA					
2,2'-oxybis(1-chloropropane)								NA	330	NA					
2,4,5-Trichlorophenol								NA	830	NA					
2,4,6-Trichlorophenol								NA	330	NA					
2,4-Dichlorophenol								NA	330	NA					
2,4-Dimethylphenol								NA	330	NA					
2,4-Dinitrophenol								NA	830	NA					
2,4-Dinitrotoluene								NA	330	NA					
2,6-Dinitrotoluene								NA	330	NA					
2-Chloronaphthalene								NA	330	NA					
2-Chlorophenol								NA	330	NA					
2-Methylphenol								NA	330	NA					
2-Nitroaniline								NA	830	NA					
2-Nitrophenol								NA	330	NA					
3,3'-Dichlorobenzidine								NA	330	NA					
3-Nitroaniline								NA	830	NA					
4,6-Dinitro-2-methylphenol								NA	830	NA					
4-Bromophenyl phenyl ether								NA	330	NA					
4-Chloro-3-methylphenol								NA	330	NA					
4-Chloroaniline								NA	330	NA					
4-Chlorophenyl phenyl ether								NA	330	NA					
4-Methylphenol								NA	330	NA					
4-Nitroaniline								NA	830	NA					
4-Nitrophenol								NA	830	NA					
Acetaphenone								NA	330	NA					
Atrazine								NA	330	NA					
Benzaldehyde								NA	330	NA					
bis(2-Chloroethoxy)methane								NA	330	NA					
bis(2-Chloroethyl)ether								NA	330	NA					
Caprolactam								NA	330	NA					
Dibenzofuran								NA	330	NA					
Hexachlorobenzene								NA	330	NA					
Hexachlorobutadiene								NA	330	NA					
Hexachlorocyclopentadiene								NA	330	NA					
Hexachloroethane								NA	330	NA					
Isophorone								NA	330	NA					
n-Nitroso-di-n-propylamine								NA	330	NA					
n-Nitrosodiphenylamine								NA	330	NA					
Nitrobenzene								NA	330	NA					
Pentachlorophenol								NA	830	NA					
Phenol								NA	330	NA					
Butyl benzyl phthalate								NA	330	NA					
Di-n-butylphthalate								NA	330	NA					
Di-n-octylphthalate								NA	330	NA					
Diethylphthalate								NA	330	NA					
Dimethylphthalate								NA	330	NA					
bis(2-Ethylhexyl)phthalate								182	3.6	182					
Total Phthalates <sup>1</sup>								182	330	182					

**TABLE 10  
SELECTION OF COPCs  
SVOCs IN SEDIMENT  
(continued)**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>2</sup>	EPA Region IV Effects Value <sup>3</sup>	CLP PQL	EPA Screening Value	Site Screening Value <sup>4</sup>	Maximum Hazard Quotient	Sediment COPC?	Contaminant Category <sup>5</sup>
		Min.	Q	Max.	Q										
<b>Organics - SVOCs (µg/kg)</b>															
2-Methylnaphthalene								20.2	330	330					
Acenaphthene								6.71	330	330					
Acenaphthylene								5.87	330	330					
Anthracene								46.9	330	330					
Benzo(a)anthracene								74.8	330	330					
Benzo(a)pyrene								88.8	330	330					
Benzo(b)fluoranthene								NA	330	NA					
Benzo(g,h,i)perylene								NA	330	NA					
Benzo(k)fluoranthene								NA	330	NA					
Carbazole								NA	330	NA					
Chrysene								108	330	330					
Dibenz(a,h)anthracene								6.22	330	330					
Fluoranthene								113	330	330					
Fluorene								21.2	330	330					
Indeno(1,2,3-cd)pyrene								NA	330	NA					
Naphthalene								34.6	330	330					
Phenanthrene								86.7	330	330					
Pyrene								153	330	330					
Total PAHs								1,684	330	1,684					

**NOTES:**

<sup>1</sup> = Since no effects value is available, the value for bis(2-Ethylhexyl)phthalate is used as a surrogate value for total phthalates.

<sup>2</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>3</sup> = Values obtained from MacDonald, D.D. "Approach to the Assessment of Sediment Quality in Florida Coastal Waters." Florida Department of Environmental Protection. 1994.

<sup>4</sup> = When the PQL > Effects Value, Site Screening Value defaults to PQL. For contaminants whose screening value is based on the PQL, data reported below the required quantification limit (e.g., J-flagged data) should be compared to the EPA Region IV Effects Value.

<sup>5</sup> = Blank space means analyte eliminated as a COPC.

CLP PQL = Contract Laboratory Program Practical Quantitation Limit

COPC = Contaminant Of Potential Concern

Maximum Hazard Quotient = Concentration Used For Screening/ESV

NA = Not Available

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.



**TABLE 11  
SELECTION OF COPCs  
PESTICIDES IN SEDIMENT**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV Effects Value	CLP PQL	EPA Screening Value	Site Screening Value <sup>2</sup>	Maximum Hazard Quotient	Sediment COPC?	Contaminant Category <sup>9</sup>
		Min.	Q	Max.	Q										
<b>Pesticides (µg/kg)</b>															
p,p'-DDD <sup>3</sup>								1.22	3.3	3.3					
DDD <sup>4</sup>								2	3.3	3.3					
p,p'-DDE <sup>3</sup>								2.07	3.3	3.3					
DDE <sup>4</sup>								2	3.3	3.3					
p,p'-DDT <sup>3</sup>								1.19	3.3	3.3					
DDT <sup>4</sup>								1	3.3	3.3					
DDT/DDE/DDD (Total) <sup>5</sup>								1.58	3.3	3.3					
Aldrin								NA	1.7	NA					
Alpha Chlordane								NA	1.7	NA					
Gamma Chlordane <sup>4</sup>								0.5	1.7	1.7					
Total Chlordanes <sup>6</sup>								1.7	1.7	1.7					
alpha-BHC								NA	1.7	NA					
beta-BHC								NA	1.7	NA					
delta-BHC								NA	1.7	NA					
gamma-BHC (Lindane) <sup>4</sup>								0.32	3.3	3.3					
Total BHCs <sup>7</sup>								0.32	3.3	3.3					
alpha-Endosulfan								NA	1.7	NA					
beta-Endosulfan								NA	3.3	NA					
Endosulfan sulfate								NA	3.3	NA					
Dieldrin <sup>4</sup>								0.02	3.3	3.3					
Endrin aldehyde								NA	3.3	NA					
Endrin ketone								NA	3.3	NA					
Endrin <sup>4</sup>								0.02	3.3	3.3					
Total Endrins <sup>8</sup>								0.02	3.3	3.3					
Heptachlor								NA	1.7	NA					
Heptachlor epoxide								NA	1.7	NA					
Methoxychlor								NA	17	NA					
Toxaphene								NA	170	NA					
Dioxin TEQs (ng/kg)								2.5	5	2.5					
Total PCBs								21.6	33	33					

**NOTES:**

- <sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.
- <sup>2</sup> = When the PQL > Effects Value, Site Screening Value defaults to PQL. For contaminants whose screening value is based on the PQL, data reported below the required quantification limit (e.g., J-flagged data) should be compared to the EPA Region IV Effects Value.
- <sup>3</sup> = Values obtained from MacDonald, D.D. "Approach to the Assessment of Sediment Quality in Florida Coastal Waters." Florida Department of Environmental Protection. 1994.
- <sup>4</sup> = Value obtained from Long, Edward R., and Lee G. Morgan. "The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program." 1991. NOAA Technical Memorandum NOS OMA 52
- <sup>5</sup> = Values obtained from Long, Edward R., Donald D. MacDonald, Sherri L. Smith, and Fred D. Calder. "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments." Environmental Management, 19 (1):81-97.
- <sup>6</sup> = US EPA Region 4 recommends that, since no effects value is available, the CLP PQL is used as a surrogate value for total chlordane.
- <sup>7</sup> = US EPA Region 4 recommends that, since no effects value is available, the value for gamma BHC is used as a surrogate value for total BHCs.
- <sup>8</sup> = US EPA Region 4 recommends that, since no effects value is available, the value for endrin is used as a surrogate value for total endrins.
- <sup>9</sup> = Blank space means analyte eliminated as a COPC.

CLP PQL = Contract Laboratory Program Practical Quantitation Limit  
 COPC = Contaminant Of Potential Concern.  
 Maximum Hazard Quotient = Concentration Used For Screening/ESV  
 NA = Not Available  
 Q = Data Qualifier  
 SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.

**TABLE 12  
SELECTION OF COPCs  
INORGANICS IN SEDIMENT**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV Effects Value	CLP PQL	EPA Screening Value	Site Screening Value <sup>2</sup>	Maximum Hazard Quotient	Sediment COPC?	Contaminant Category <sup>6</sup>
		Min.	Q	Max.	Q										
<b>Inorganics (mg/kg)</b>															
Aluminum								NA	40	NA					
Antimony <sup>3</sup>								2	12	12					
Arsenic <sup>4</sup>								7.24	2	7.24					
Barium								NA	40	NA					
Beryllium								NA	1	NA					
Cadmium <sup>4</sup>								0.676	1	1					
Calcium								NA	1,000	NA					
Chromium <sup>4</sup>								52.3	2	52.3					
Cobalt								NA	10	NA					
Copper <sup>4</sup>								18.7	5	18.7					
Iron								NA	20	NA					
Lead <sup>4</sup>								30.2	0.6	30.2					
Magnesium								NA	1,000	NA					
Manganese								NA	3	NA					
Mercury <sup>4</sup>								0.13	0.02	0.13					
Nickel <sup>5</sup>								15.9	8	15.9					
Potassium								NA	1,000	NA					
Selenium								NA	1	NA					
Silver <sup>4</sup>								0.733	2	2					
Sodium								NA	1,000	NA					
Thallium								NA	2	NA					
Vanadium								NA	10	NA					
Zinc <sup>4</sup>								124	4	124					

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>2</sup> = When the PQL > Effects Value, Site Screening Value defaults to PQL. For contaminants whose screening value is based on the PQL, data reported below the required quantification limit (e.g., J-flagged data) should be compared to the EPA Region IV Effects Value.

<sup>3</sup> = Value obtained from Long, Edward R., and Lee G. Morgan. "The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program." 1991. NOAA Technical Memorandum NOS OMA 52

<sup>4</sup> = Values obtained from MacDonald, D.D. "Approach to the Assessment of Sediment Quality in Florida Coastal Waters." Florida Department of Environmental Protection. 1994.

<sup>5</sup> = Values obtained from Long, Edward R., Donald D. MacDonald, Sherri L. Smith, and Fred D. Calder. "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments." Environmental Management, 19 (1):81-97.

<sup>6</sup> = Blank space means analyte eliminated as a COPC.

CLP PQL = Contract Laboratory Program Practical Quantitation Limit

COPC = Contaminant Of Potential Concern

Maximum Hazard Quotient = Concentration Used For Screening/ESV

NA = Not Available

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.

**TABLE 13  
SELECTION OF COPCs  
VOCs IN SALTWATER**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV CSV <sup>2</sup>	Maximum Hazard Quotient	NC Water Quality Standard <sup>3</sup>	Exceed NCWQS?	Saltwater COPC?	Contaminant Category <sup>4</sup>
		Min.	Q	Max.	Q									
<b>Organics - VOCs (µg/L)</b>														
1,1,1-Trichloroethane								312		NA	NA			
1,1,1,2-Tetrachloroethane								90.2		NA	NA			
1,1,2-Trichloro-1,2,2-trifluoroethane								NA		NA	NA			
1,1,2-Trichloroethane								NA		NA	NA			
1,1-Dichloroethane								NA		NA	NA			
1,1-Dichloroethene								2,240		NA	NA			
1,2,3-Trichlorobenzene								NA		NA	NA			
1,2,4-Trichlorobenzene								4.5		NA	NA			
1,2-Dibromo-3-chloropropane								NA		NA	NA			
1,2-Dibromoethane								NA		NA	NA			
1,2-Dichlorobenzene								19.7		NA	NA			
1,2-Dichloroethane								1,130		NA	NA			
1,2-Dichloropropane								2,400		NA	NA			
1,3-Dichlorobenzene								28.5		NA	NA			
1,4-Dichlorobenzene								19.9		NA	NA			
2-Butanone								NA		NA	NA			
2-Hexanone								NA		NA	NA			
4-Methyl-2-pentanone								NA		NA	NA			
Acetone								NA		NA	NA			
Benzene								109		NA	NA			
Bromochloromethane								NA		NA	NA			
Bromodichloromethane								NA		NA	NA			
Bromoform								640		NA	NA			
Bromomethane								120		NA	NA			
Carbon Disulfide								NA		NA	NA			
Carbon Tetrachloride								1,500		NA	NA			
Chlorobenzene								105		NA	NA			
Chloroethane								NA		NA	NA			
Chloroform								815		NA	NA			
Chloromethane								2,700		NA	NA			
cis-1,2-Dichloroethene								NA		NA	NA			
cis-1,3-Dichloropropene								7.9		NA	NA			
Cyclohexane								NA		NA	NA			
Dibromochloromethane								NA		NA	NA			
Dichlorodifluoromethane								NA		NA	NA			
Ethylbenzene								4.3		NA	NA			
Isopropylbenzene								NA		NA	NA			
Methyl Acetate								NA		NA	NA			
Methyl tert-Butyl Ether								NA		NA	NA			
Methylcyclohexane								NA		NA	NA			
Methylene Chloride								2,560		NA	NA			
Styrene								NA		NA	NA			
Tetrachloroethene								45		NA	NA			
Toluene								37		NA	NA			
trans-1,2-Dichloroethene								NA		NA	NA			
trans-1,3-Dichloropropene								7.9		NA	NA			
Trichloroethene								NA		NA	NA			
Trichlorofluoromethane								NA		NA	NA			
Vinyl Chloride								NA		NA	NA			
Xylenes (Total)								NA		NA	NA			

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>2</sup> = Based on US EPA's Region 4 Water Management Division, Water Quality Standards Unit's Screening List.

<sup>3</sup> = NC DENR, "North Carolina Surface Water Quality Standard for Aquatic Life." NC Administrative Code 15A NCAC 02B .0100 & .0200. April 2003.

<sup>4</sup> = Available on the Internet at <http://h2o.enr.state.nc.us/admin/rules/rb040103.pdf>

**PLEASE NOTE: COPCs can only be retained, not eliminated, based on comparison to this value. COPCs can only be eliminated if the maximum concentration or detection limit is less than the EPA Screening Value. Contaminants may belong to more than one contaminant category if one of those categories is 5.**

<sup>4</sup> = Blank space means analyte eliminated as a COPC.

COPC = Contaminant Of Potential Concern

CSV = Chronic Screening Value

Maximum Hazard Quotient = Concentration Used For Screening/CSV

NA = Not Available

NC DENR = North Carolina Department of Environment and Natural Resources

NCSWQS = North Carolina Surface Water Quality Standard

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.
- 5 Contaminant's SQL or maximum concentration exceeds the NC Surface Water Quality Standard.

**TABLE 14  
SELECTION OF COPCs  
SVOCs IN SALTWATER**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV CSV <sup>2</sup>	Maximum Hazard Quotient	NC Water Quality Standard <sup>3</sup>	Exceed NCWQS?	Saltwater COPC?	Contaminant Category
		Min.	Q	Max.	Q									
<b>Organics - SVOCs (µg/L)</b>														
1,1-Biphenyl								NA		NA				
1,2,4,5-Tetrachlorobenzene								129		NA				
2,2'-oxybis(1-chloropropane)								NA		NA				
2,4,5-Trichlorophenol								NA		NA				
2,4,6-Trichlorophenol								NA		NA				
2,4-Dichlorophenol								NA		NA				
2,4-Dimethylphenol								NA		NA				
2,4-Dinitrophenol								48.5		NA				
2,4-Dinitrotoluene								NA		NA				
2,6-Dinitrotoluene								NA		NA				
2-Chloronaphthalene								NA		NA				
2-Chlorophenol								NA		NA				
2-Methylphenol								NA		NA				
2-Nitroaniline								NA		NA				
2-Nitrophenol								NA		NA				
3,3'-Dichlorobenzidine								NA		NA				
3-Nitroaniline								NA		NA				
4,6-Dinitro-2-methylphenol								NA		NA				
4-Bromophenyl phenyl ether								NA		NA				
4-Chloro-3-methylphenol								NA		NA				
4-Chloroaniline								NA		NA				
4-Chlorophenyl phenyl ether								NA		NA				
4-Methylphenol								NA		NA				
4-Nitroaniline								NA		NA				
4-Nitrophenol								71.7		NA				
Acetaphenone								NA		NA				
Atrazine								NA		NA				
Benzaldehyde								NA		NA				
bis(2-Chloroethoxy)methane								NA		NA				
bis(2-Chloroethyl)ether								NA		NA				
Caprolactam								NA		NA				
Dibenzofuran								NA		NA				
Hexachlorobenzene								NA		NA				
Hexachlorobutadiene								0.32		NA				
Hexachlorocyclopentadiene								0.07		NA				
Hexachloroethane								9.4		NA				
Isophorone								129		NA				
n-Nitroso-di-n-propylamine								NA		NA				
n-Nitrosodiphenylamine								33,000		NA				
Nitrobenzene								66.8		NA				
Pentachlorophenol								7.9		NA				
Phenol								58		NA				
Butyl benzyl phthalate								29.4		NA				
Di-n-butylphthalate								3.4		NA				
Di-n-octylphthalate								NA		NA				
Diethylphthalate								75.9		NA				
Dimethylphthalate								580		NA				
bis(2-Ethylhexyl)phthalate								NA		NA				
Total Phthalates <sup>5</sup>								3.4		NA				

**TABLE 14  
SELECTION OF COPCs  
SVOCs IN SALTWATER  
(continued)**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV CSV <sup>2</sup>	Maximum Hazard Quotient	NC Water Quality Standard <sup>3</sup>	Exceed NCWQS?	Saltwater COPC?	Contaminant Category <sup>7</sup>
		Min.	Q	Max.	Q									
<b>Organics - SVOCs (µg/L)</b>														
2-Methylnaphthalene								NA		NA				
Acenaphthene								9.7		NA				
Acenaphthylene								NA		NA				
Anthracene								NA		NA				
Benzo(a)anthracene								NA		NA				
Benzo(a)pyrene								NA		NA				
Benzo(b)fluoranthene								NA		NA				
Benzo(g,h,i)perylene								NA		NA				
Benzo(k)fluoranthene								NA		NA				
Carbazole								NA		NA				
Chrysene								NA		NA				
Dibenz(a,h)anthracene								NA		NA				
Fluoranthene								1.6		NA				
Fluorene								NA		NA				
Indeno(1,2,3-cd)pyrene								NA		NA				
Naphthalene								23.5		NA				
Phenanthrene								NA		NA				
Pyrene								NA		NA				
Total PAHs <sup>6</sup>								1.6		NA				

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>2</sup> = Based on US EPA's Region 4 Water Management Division, Water Quality Standards Unit's Screening List.

<sup>3</sup> = NC DENR, "North Carolina Surface Water Quality Standard for Aquatic Life." NC Administrative Code 15A NCAC 02B .0100 & .0200. April 2003.

Available on the Internet at <http://h2o.enr.state.nc.us/admin/rules/rb040103.pdf>

**PLEASE NOTE: COPCs can only be retained, not eliminated, based on comparison to this value. COPCs can only be eliminated if the maximum concentration or detection limit is less than the EPA Screening Value. Contaminants may belong to more than one contaminant category if one of those categories is 5.**

<sup>4</sup> = pH Dependent. See text, Section 3.5.

<sup>5</sup> = Since no CSV was available for di-n-octylphthalate and bis(2-ethylhexyl)phthalate, the value for di-n-butylphthalate was used as a surrogate for total phthalates.

<sup>6</sup> = Since no CSV exists for many PAHs, the value for fluoranthene was used as a surrogate for total PAHs.

<sup>7</sup> = Blank space means analyte eliminated as a COPC.

COPC = Contaminant Of Potential Concern

CSV = Chronic Screening Value

Maximum Hazard Quotient = Concentration Used For Screening/CSV

NA = Not Available

NCWQS = North Carolina Surface Water Quality Standard

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.
- 5 Contaminant's SQL or maximum concentration exceeds the NC Surface Water Quality Standard.

**TABLE 15  
SELECTION OF COPCs  
PESTICIDES IN SALTWATER**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV CSV <sup>2</sup>	Maximum Hazard Quotient	NC Water Quality Standard <sup>3</sup>	Exceed NCWQS?	Saltwater COPC?	Contaminant Category <sup>7</sup>
		Min.	Q	Max.	Q									
<b>Pesticides (µg/L)</b>														
p,p'-DDD								0.025		NA				
DDD								NA		NA				
p,p'-DDE								0.14		NA				
DDE								NA		NA				
p,p'-DDT								0.001		NA				
DDT								NA		NA				
DDT/DDE/DDD (Total)								NA		0.001				
Aldrin								0.13		0.003				
Alpha Chlordane								NA		NA				
Gamma Chlordane								NA		NA				
Total Chlordanes								0.004		0.004				
alpha-BHC								1.400		NA				
beta-BHC								NA		NA				
delta-BHC								NA		NA				
gamma-BHC (Lindane)								0.016		0.004				
Total BHCs <sup>4</sup>								0.016		NA				
alpha-Endosulfan								0.0087		NA				
beta-Endosulfan								0.0087		NA				
Endosulfan sulfate								NA		NA				
Total Endosulfans <sup>5</sup>								0.0087		0.009				
Dieldrin								0.0019		0.002				
Endrin aldehyde								NA		NA				
Endrin ketone								NA		NA				
Endrin								0.0023		NA				
Total Endrins <sup>6</sup>								0.0023		0.002				
Heptachlor								0.0036		NA				
Heptachlor epoxide								0.0036		NA				
Total Heptachlors								NA		0.004				
Methoxychlor								0.03		0.03				
Toxaphene								0.0002		0.0002				
2,3,7,8-TCDD-Dioxin								0.00001		NA				
Total PCBs								0.21		0.001				

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>2</sup> = Based on US EPA's Region 4 Water Management Division, Water Quality Standards Unit's Screening List.

<sup>3</sup> = NC DENR, "North Carolina Surface Water Quality Standard for Aquatic Life." NC Administrative Code 15A NCAC 02B .0100 & .0200. April 2003.

Available on the Internet at <http://h2o.enr.state.nc.us/admin/rules/rb040103.pdf>

**PLEASE NOTE: COPCs can only be retained, not eliminated, based on comparison to this value. COPCs can only be eliminated if the maximum concentration or detection limit is less than the EPA Screening Value. Contaminants may belong to more than one contaminant category if one of those categories is 5.**

<sup>4</sup> = Since no CSV exists for beta and delta BHC, the value for gamma BHC is used as a surrogate value for total chlordanes.

<sup>5</sup> = Since no CSV exists for endosulfan sulfate, the value for alpha and beta endosulfan is used as a surrogate value for total endosulfans.

<sup>6</sup> = Since no CSV exists for endrin aldehyde and endrin ketone, the value for endrin is used as a surrogate value for total endrins.

<sup>7</sup> = Blank space means analyte eliminated as a COPC.

COPC = Contaminant Of Potential Concern

CSV = Chronic Screening Value

Maximum Hazard Quotient = Concentration Used For Screening/CSV

NA = Not Available

NCWQS = North Carolina Surface Water Quality Standard

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.
- 5 Contaminant's SQL or maximum concentration exceeds the NC Surface Water Quality Standard.

**TABLE 16  
SELECTION OF COPCs  
INORGANICS IN SALTWATER**

Analyte	Frequency of Detection	Range of Detection			Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV CSV <sup>2</sup>	Maximum Hazard Quotient	NC Water Quality Standard <sup>3</sup>	Exceed NCWQS?	Saltwater COPC?	Contaminant Category <sup>4</sup>
		Min.	Q	Max.									
<b>Inorganics (ug/L)</b>													
Aluminum (pH 6.5 - 9)							NA		NA				
Antimony							NA		NA				
Arsenic III							36		50				
Barium							NA		NA				
Beryllium							NA		NA				
Cadmium							9.3		5				
Calcium							NA		NA				
Chromium (III)							103		NA				
Chromium (VI)							50		NA				
Total Chromium							NA		20				
Cobalt							NA		NA				
Copper							2.9		3				
Iron							NA		NA				
Lead							8.5		25				
Magnesium							NA		NA				
Manganese							NA		NA				
Mercury							0.025		0.025				
Nickel							8.3		8.3				
Potassium							NA		NA				
Selenium							71		71				
Silver							0.23		0.1				
Sodium							NA		NA				
Thallium							21.3		NA				
Vanadium							NA		NA				
Zinc							86		86				

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>2</sup> = Based on US EPA's Region 4 Water Management Division, Water Quality Standards Unit's Screening List.

<sup>3</sup> = NC DENR, "North Carolina Surface Water Quality Standard for Aquatic Life." NC Administrative Code 15A NCAC 02B .0100 & .0200. April 2003.

Available on the Internet at <http://h2o.enr.state.nc.us/admin/rules/rb040103.pdf>

**PLEASE NOTE: COPCs can only be retained, not eliminated, based on comparison to this value. COPCs can only be eliminated if the maximum concentration or detection limit is less than the EPA Screening Value. Contaminants may belong to more than one contaminant category if one of those categories is 5.**

<sup>4</sup> = Blank space means analyte eliminated as a COPC.

COPC = Contaminant Of Potential Concern

CSV = Chronic Screening Value

Maximum Hazard Quotient = Concentration Used For Screening/CSV

NA = Not Available

NCWQS = North Carolina Surface Water Quality Standard

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.
- 5 Contaminant's SQL or maximum concentration exceeds the NC Surface Water Quality Standard.

**TABLE 18  
SELECTION OF COPCs  
SVOCs IN FRESHWATER  
(continued)**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV CSV <sup>2</sup>	Maximum Hazard Quotient	NC Water Quality Standard <sup>3</sup>	Exceed NCWQS?	Freshwater COPC?	Contaminant Category <sup>7</sup>
		Min.	Q	Max.	Q									
<b>Organics - SVOCs (µg/L)</b>														
2-Methylnaphthalene								NA		NA				
Acenaphthene								17		NA				
Acenaphthylene								NA		NA				
Anthracene								NA		NA				
Benzo(a)anthracene								NA		NA				
Benzo(a)pyrene								NA		NA				
Benzo(b)fluoranthene								NA		NA				
Benzo(g,h,i)perylene								NA		NA				
Benzo(k)fluoranthene								NA		NA				
Carbazole								NA		NA				
Chrysene								NA		NA				
Dibenz(a,h)anthracene								NA		NA				
Fluoranthene								39.8		NA				
Fluorene								NA		NA				
Indeno(1,2,3-cd)pyrene								NA		NA				
Naphthalene								62		NA				
Phenanthrene								NA		NA				
Pyrene								NA		NA				
Total PAHs <sup>6</sup>								17		NA				

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>2</sup> = Based on US EPA's Region 4 Water Management Division, Water Quality Standards Unit's Screening List.

<sup>3</sup> = NC DENR, "North Carolina Surface Water Quality Standard for Aquatic Life." NC Administrative Code 15A NCAC 02B .0100 & .0200. April 2003.

Available on the Internet at <http://h2o.enr.state.nc.us/admin/rules/rb040103.pdf>

**PLEASE NOTE: COPCs can only be retained, not eliminated, based on comparison to this value. COPCs can only be eliminated if the maximum concentration or detection limit is less than the EPA Screening Value. Contaminants may belong to more than one contaminant category if one of those categories is 5.**

<sup>4</sup> = pH Dependent. See text, Section 3.1.3.

<sup>5</sup> = Since no CSV was available for di-n-octylphthalate, the CSV for bis(2-ethylhexyl)phthalate was used as a surrogate.

<sup>6</sup> = Since no CSV exists for many PAHs, the value for acenaphthene was used as a surrogate for total PAHs

<sup>7</sup> = Blank space means analyte eliminated as a COPC.

COPC = Contaminant Of Potential Concern

CSV = Chronic Screening Value

Maximum Hazard Quotient = Concentration Used For Screening / CSV

NA = Not Available

NC DENR = North Carolina Department of Environment and Natural Resources

NCSWQS = North Carolina Surface Water Quality Standard

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.
- 5 Contaminant's SQL or maximum concentration exceeds the NC Surface Water Quality Standard.



**TABLE 19  
SELECTION OF COPCs  
PESTICIDES IN FRESHWATER**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV CSV <sup>2</sup>	Maximum Hazard Quotient	NC Water Quality Standard <sup>3</sup>	Exceed NCSWQS?	Freshwater COPC?	Contaminant Category <sup>7</sup>
		Min.	Q	Max.	Q									
<b>Pesticides (µg/L)</b>														
p,p'-DDD								0.0064		NA				
DDD								NA		NA				
p,p'-DDE								10.5		NA				
DDE								NA		NA				
p,p'-DDT								0.001		NA				
DDT								NA		NA				
DDT/DDE/DDD (Total)								NA		0.001				
Aldrin								0.3		0.002				
Alpha Chlordane								NA		NA				
Gamma Chlordane								NA		NA				
Total Chlordanes								0.0043		0.004				
alpha-BHC								500		NA				
beta-BHC								5,000		NA				
delta-BHC <sup>4</sup>								0.08		NA				
gamma-BHC (Lindane)								0.08		0.01				
Total BHCs								NA		NA				
alpha-Endosulfan								0.056		NA				
beta-Endosulfan								0.056		NA				
Endosulfan sulfate								NA		NA				
Total Endosulfan <sup>5</sup>								0.056		0.05				
Dieldrin								0.0019		0.002				
Endrin aldehyde								NA		NA				
Endrin ketone								NA		NA				
Endrin								0.0023		NA				
Total Endrins <sup>6</sup>								0.0023		0.002				
Heptachlor								0.0038		NA				
Heptachlor epoxide								0.0038		NA				
Total Heptachlor								NA		0.004				
Methoxychlor								0.03		0.03				
Toxaphene								0.0002		0.0002				
Dioxin TEQs								0.00001		NA				
Total PCBs								0.1		0.001				

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>2</sup> = Based on US EPA's Region 4 Water Management Division, Water Quality Standards Unit's Screening List.

<sup>3</sup> = NC DENR, "North Carolina Surface Water Quality Standard for Aquatic Life." NC Administrative Code 15A NCAC 02B .0100 & .0200. April 2003.

Available on the Internet at <http://h2o.enr.state.nc.us/admin/rules/rb040103.pdf>

**PLEASE NOTE: COPCs can only be retained, not eliminated, based on comparison to this value. COPCs can only be eliminated if the maximum concentration or detection limit is less than the EPA Screening Value. Contaminants may belong to more than one contaminant category if one of those categories is 5.**

<sup>4</sup> = Since no CSV exists for delta-BHC, the value for gamma-BHC is used as a surrogate value.

<sup>5</sup> = Since no CSV exists for endosulfan sulfate, the value for alpha and beta endosulfan is used as a surrogate value for total endosulfans.

<sup>6</sup> = Since no CSV exists for endrin aldehyde and endrin ketone, the value for endrin is used as a surrogate value for total endrins.

<sup>7</sup> = Blank space means analyte eliminated as a COPC.

COPC = Contaminant Of Potential Concern

CSV = Chronic Screening Value

Maximum Hazard Quotient = Concentration Used For Screening / CSV

NA = Not Available

NC DENR = North Carolina Department of Environment and Natural Resources

NCSWQS = North Carolina Surface Water Quality Standard

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.
- 5 Contaminant's SQL or maximum concentration exceeds the NC Surface Water Quality Standard.

**TABLE 20  
SELECTION OF COPCs  
INORGANICS IN FRESHWATER**

Analyte	Frequency of Detection	Range of Detection				Location of Maximum Concentration	Range of Detection Limits	Concentration Used For Screening <sup>1</sup>	EPA Region IV CSV <sup>2</sup>	Maximum Hazard Quotient	NC Water Quality Standard <sup>3</sup>	Exceed NCWQS?	Freshwater COPC?	Contaminant Category <sup>5</sup>
		Min.	Q	Max.	Q									
<b>Inorganics (ug/L)</b>														
Aluminum (pH 6.5 - 9)								87		NA				
Antimony								160		NA				
Arsenic III								190		50				
Barium								NA		NA				
Beryllium								0.53		6.5				
Cadmium <sup>4</sup>								0.66		0.4				
Calcium								NA		NA				
Chromium (III) <sup>4</sup>								117.32		NA				
Chromium (VI)								11		NA				
Total Chromium								NA		50				
Cobalt								NA		NA				
Copper <sup>4</sup>								6.54		7				
Iron								1,000		1,000				
Lead <sup>4</sup>								1.32		25				
Magnesium								NA		NA				
Manganese								NA		NA				
Mercury								0.012		0.012				
Nickel <sup>4</sup>								87.71		88				
Potassium								NA		NA				
Selenium								5		5				
Silver <sup>4</sup>								0.012		0.06				
Sodium								NA		NA				
Thallium								4		NA				
Vanadium								NA		NA				
Zinc <sup>4</sup>								58.91		50				

**NOTES:**

<sup>1</sup> = Enter maximum concentration. If contaminant was not detected, enter the maximum SQL.

<sup>2</sup> = Based on US EPA's Region 4 Water Management Division, Water Quality Standards Unit's Screening List.

<sup>3</sup> = NC DENR, "North Carolina Surface Water Quality Standard for Aquatic Life." NC Administrative Code 15A NCAC 02B .0100 & .0200. April 2003.

Available on the Internet at <http://h2o.enr.state.nc.us/admin/rules/rb040103.pdf>

**PLEASE NOTE: COPCs can only be retained, not eliminated, based on comparison to this value. COPCs can only be eliminated if the maximum concentration or detection limit is less than the EPA Screening Value. Contaminants may belong to more than one contaminant category if one of those categories is 5.**

<sup>4</sup> = Hardness dependent. See text, Section 3.1.2.

<sup>5</sup> = Blank space means analyte eliminated as a COPC.

COPC = Contaminant Of Potential Concern

CSV = Chronic Screening Value

Maximum Hazard Quotient = Concentration Used For Screening / CSV

NA = Not Available

NC DENR = North Carolina Department of Environment and Natural Resources

NCSWQS = North Carolina Surface Water Quality Standard

Q = Data Qualifier

SQL = Sample Quantitation Limit

**Contaminant Categories**

- 1 Contaminant is found in concentrations exceeding its screening value.
- 2 Contaminant was not found in concentrations exceeding the SQL; however, the SQLs exceed its screening value.
- 3 Contaminant was found in concentrations exceeding its SQL; however, there is no current screening value for the contaminant.
- 4 Contaminant was not found in concentrations exceeding the SQL and there is no current screening value for the contaminant.
- 5 Contaminant's SQL or maximum concentration exceeds the NC Surface Water Quality Standard.