MARTIN MARIETTA ENERGY SYSTEMS LIBRARIES
3 4456 0354766 9

ornl

ORNL/ER-8

OAK RIDGE NATIONAL LABORATORY

MARTIN MARIETTA

Screening Level Risk Assessment for Off-Site Ecological Effects in Surface Waters Downstream from the U.S. Department of Energy Oak Ridge Reservation

G. W. Suter II

(ESD-3483)

OAK RIDGE NATIONAL LABORATORY
CENTRAL RESEARCH LIBRARY
CIRCULATION SECTION
4500N ROOM 175
LIBRARY LOAN COPY
DO NOT TRANSFER TO ANOTHER PERSON
If you wish someone else to see this report, send in name with report and the library will arrange a loan.
UCN-7969 (3 9-77)

MANAGED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

This report has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831; prices available from 615-576-8401, FTS 626-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

ORNL/ER-8

Environmental Restoration Division
Off-Site Investigations Environmental Restoration Program

Screening Level Risk Assessment for Off-Site Ecological Effects in Surface Waters Downstream from the U.S. Department of Energy Oak Ridge Reservation

G. W. Suter II

Date Issued—May 1991

Prepared by
Environmental Sciences Division
Oak Ridge National Laboratory
ESD Publication 3483

Prepared for
U.S. Department of Energy
Office of Environmental Restoration and Waste Management
under budget and reporting codes CD 10 72 and EW 20

Oak Ridge National Laboratory
Oak Ridge, Tennessee 37831-6285
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

MARTIN MARIETTA ENERGY SYSTEMS LIBRARIES

3 4456 0354766 9

Author Affiliation

Glenn W. Suter II is a member of the Environmental Sciences Division, Oak Ridge National Laboratory, Martin Marietta Energy Systems, Inc.

CONTENTS

LIST OF TABLES v

EXECUTIVE SUMMARY vii

1. INTRODUCTION 1
   1.1 BACKGROUND INFORMATION 1
   1.2 ECOLOGICAL RISK ASSESSMENT 2

2. SCOPE OF THE ASSESSMENT 4
   2.1 SOURCE TERMS 4
   2.2 SPATIAL SCOPE OF THE ASSESSMENT 4
   2.3 ASSESSMENT END POINTS 6

3. METHODS 8
   3.1 SCREENING CRITERIA 8
      3.1.1 Water 9
      3.1.2 Sediment 11
      3.1.3 Tissue Concentrations as Indicators of Effects on Fish 12
      3.1.4 Tissue Concentrations and Aquatic Food Chains . . . 13
   3.2 DATA FOR INDIVIDUAL CRITERIA 16
      3.2.1 Metals and Metaloids in Water 16
      3.2.2 Organics in Water 17
      3.2.3 Metals and Metaloids in Fish 19
      3.2.4 Organics in Fish 22
      3.2.5 Radionuclides 27
   3.3 AMBIENT CONCENTRATIONS 27
   3.4 CALCULATIONS 28

4. RESULTS 29
   4.1 RESULTS FOR METALS AND TOXIC INORGANIC CHEMICALS 37
   4.2 RESULTS FOR ORGANIC CHEMICALS 41
   4.3 SUMMARY OF RESULTS 43

5. DATA NEEDS FOR ECOLOGICAL RISK ASSESSMENT 46
   5.1 DATA NEEDS FOR SOURCE CHARACTERIZATION 46
   5.2 DATA NEEDS TO CHARACTERIZE EXPOSURE 48
   5.3 DATA NEEDS TO CHARACTERIZE EFFECTS 48

6. APPROACHES FOR ECOLOGICAL RISK ASSESSMENT 50

7. REFERENCES 52

APPENDIX A. CONCENTRATIONS IN AMBIENT MEDIA, SCREENING CRITERIA, AND QUOTIENTS 61

LIST OF TABLES

Table		Page
1	Stream and river reaches for the off-site assessment . . .	5
2	Summary of results: Media in which maximum values or limits of detection exceeded criteria, media for which critical reaches were measured, and necessary and desired sensitivity of chemical analyses	30
A-1.	Maximum water concentrations by reach, criteria, and quotients for aquatic biota	A-3
A-2.	Mean water concentrations, criteria, and quotients for aquatic biota	A-8
A-3.	Maximum sediment concentrations, criteria, and quotients	A-15
A-4.	Mean sediment concentrations, criteria, and quotients for benthic biota	A-32
A-5.	Maximum concentrations in surface sediment by reach, criteria, and quotients for benthic	A-43
A-6.	Maximum concentrations in fish flesh, water concentrations estimated from bioaccumulation factors (BAF), and quotients for aquatic biota	A-54
A-7.	Mean concentrations in fish flesh, water concentrations estimated from bioaccumulation factors (BAF), criteria, and quotients for aquatic biota	A-66
A-8.	Maximum concentrations in fish flesh by reach, criteria, and quotients for piscivorous wildlife	A-78
A-9.	Mean concentrations in fish flesh by reach, criteria, and quotients for piscivorous wildlife	A-95

EXECUTIVE SUMMARY

This assessment provides guidance for monitoring the environment off the Department of Energy (DOE) Oak Ridge Reservation for the purpose of estimating risks to the nonhuman environment. It is a companion to the screening assessment for human health effects (Hoffman et al. 1990). The approach taken in both assessments was to screen contaminant chemicals into categories that reflect the need for monitoring. In this ecological assessment, the upper screening criterion is a level that indicates acute lethality or other severe effects. The intermediate screening criterion indicates a level of exposure that would be expected to cause low levels of effect in chronic exposures. The lower screening criterion is a "safe" concentration that is based on the intermediate criterion divided by a safety factor. The safety factors are based on consideration of the distribution of sensitivity among species, population and ecosystem processes that can amplify organism-level effects, and the appropriateness of the measures of exposure.

Screening criteria were developed for aquatic organisms, benthic organisms, and piscivorous wildlife and were applied to contaminant concentrations in water, sediment, and fish flesh. The criteria for aquatic and benthic organisms were based on national water quality criteria (NWQC) for protection of aquatic life or equivalent toxicity data. Because there are no sediment quality criteria and no suitable body of sediment toxicity data, the screening criteria for aquatic organisms were compared to estimated concentrations of organic chemicals in interstitial water and concentrations of metals in whole sediment. In addition, bioaccumulation factors were applied to concentrations in fish flesh to estimate water concentrations to which fish had been exposed, and these were compared to the screening criteria. The screening criteria for piscivorous wildlife were developed for this assessment from the best available data.

The exposure data were categorized into ten reaches: Melton Hill Reservoir (MHR), the portion of the Clinch River most influenced by White Oak Creek (WOCC), the Poplar Creek embayment (PCE), the portion of the Clinch River most influenced by Poplar Creek (PCC), Watts Bar Reservoir

(WBR), Norris Reservoir (NR), Poplar Creek (PC), East Fork Poplar Creek (EF), Tennessee River (TR), and White Oak Lake (WOL). The off-site reaches most influenced by the operations at Oak Ridge facilities are MHR, WOCC, PCE, PCC, and WBR. Negative reference reaches, those that are not influenced by DOE facilities are NR and TR. Positive reference reaches, those that are on-site and heavily influenced by Oak Ridge facilities, are PC, EF, and WOL.

The reported maximum aqueous concentrations of aluminum, arsenic, boron, calcium, cadmium, chromium, copper, cyanide, lead, lithium, mercury, nickel, silver, sodium, uranium, and zinc exceeded upper or intermediate criteria (acute or chronic NWQC or estimated equivalent values) in off-site reaches that are influenced by Oak Ridge operations (MHR, WOCC, PCE, PCC). In addition, the maximum aqueous concentration of pentachlorophenol exceeded the upper criterion and PCB and phthalate ester concentrations exceeded the intermediate criterion in the PCE. Application of bioaccumulation factors to concentrations of arsenic, cadmium, copper, lead, selenium, and silver in fish tissues appears to confirm that exposures to high aqueous concentrations have occurred. However, concentrations of chromium, mercury, nickel, zinc, and PCBs in fish tissues suggest exposure concentrations that are lower than NWQC. Taken together, these results suggest that toxic effects have occurred in these waters. The magnitude and extent of these effects cannot be estimated because the form of the chemicals and their temporal and spatial distributions are undefined. Because the measurements may include biologically unavailable forms of the chemicals, the effects may be much smaller than these results suggest.

The available sediment concentrations for metals other than mercury are uninterpretable. Estimated pore-water concentrations of mercury exceed the intermediate criterion, suggesting that benthic organisms are affected. Intermediate criteria were also exceeded by the maximum estimated pore-water concentrations of Bis(2-ethylhexyl)phthalate in PCE and of phenanthrene in PCE and PCC. The detection limits for many other organic chemicals would result in pore-water concentrations that greatly exceed criteria.

Fish tissue concentrations of mercury are sufficient to cause toxic effects in piscivorous wildlife in all measured reaches including TR, but particularly in PCE and PCC. Selenium in fish from PCC and thallium in fish from MHR may be toxic to wildlife. DDT in the most contaminated fish from MHR and WOCC is sufficient to cause eggshell thinning in piscivorous birds. Mean PCB concentrations in fish are sufficient to cause reproductive failure in mink in all measured reaches but MHR and TR, and mean fish concentrations in those reaches are barely below the observed effects level. These results indicate that piscivorous wildlife along the Clinch River are at risk.

Although this screening assessment was intended primarily to eliminate chemicals from further consideration, it has eliminated relatively few. Metals in general cannot be eliminated because of the inability to interpret sediment concentrations and the high concentrations of several metals in water, sediment, and fish flesh, discussed above. Most of the organic chemicals measured in water were undetected and below screening criteria. However, only chloroform, bromodichloromethane, phenols, and total PCBs were measured in any reach other than the PCE, and they were measured only in WOCC. Therefore, organics in water cannot be eliminated. Most priority organics were measured in sediments from MHR, WOCC, PCE, PCC, and NR. Most were undetected, and some can be eliminated because the estimated pore-water concentration is below the lower criterion, but many are not eliminated. Most priority organics were measured in fish flesh from MHR, WOCC, and PCE, but not from reference reaches. Most were undetected, and many can be eliminated, but it is not possible to determine whether concentrations are elevated or what the sources are because of the absence of reference values. Finally, the occurrence of several chemicals in multiple media at potentially toxic concentrations raises the issue of combined toxic effects that are greater than those induced by any single chemical. Given these results, it is advisable to deemphasize measurement of sources of exposure relative to the measurement of biological indicators of exposure and effects.

1. INTRODUCTION

1.1 BACKGROUND INFORMATION

Operations and waste disposal activities at the Y-12 plant, the Oak Ridge National Laboratory (ORNL), and the Oak Ridge Gaseous Diffusion Plant (ORGDP), located on the U.S. Department of Energy (DOE) Oak Ridge Reservation (ORR) in eastern Tennessee, have introduced a variety of airborne, liquid, and solid wastes into the surrounding environment (Rodgers et al. 1988, 1989). Some of these wastes may affect off-site areas (i.e., areas beyond the ORR boundary) by entering local streams that ultimately drain into the Clinch and Tennessee river systems. Previously reported concentrations of radionuclides, metals, and organic compounds in water, sediment, and biota of the Clinch River and Watts Bar Reservoir suggest the presence of a variety of contaminants of possible concern with regard to the protection of human health and the environment.

The DOE has initiated a comprehensive waste management and environmental restoration effort to achieve the comprehensive remediation of releases of hazardous substances, pollutants, or contaminants from the Oak Ridge Reservation (Jones et al. 1990). This effort has been undertaken in accordance with a draft Federal Facility Agreement (FFA) between the Environmental Protection Agency (EPA) Region IV, the State of Tennessee, and the DOE. The FFA requires that the cleanup of the ORR and environs be conducted in compliance with both the Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HWSA), and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

This preliminary screening of contaminants in the off-site surface water environment downstream of the DOE ORR represents part of the scoping phase of the Clinch River RCRA Facility Investigation (CRRFI), which is a component of the DOE Environmental Restoration Program at Oak Ridge. The primary objectives of the CRRFI are to (1) define the nature and extent of off-site surface-water contamination, (2) quantify the potential risk to human health and to the environment associated with off-site contamination, and (3) identify and preliminarily evaluate potential remediation alternatives.

The purpose of this preliminary screening analysis is to use existing data on off-site contaminant concentrations to identify and prioritize potential contaminants of concern for further evaluation and investigation. The primary objective of this screening analysis is to ensure that CRRFI sampling and analysis efforts focus on those contaminants that may possibly contribute to environmental risk. This analysis is a preliminary scoping exercise based on existing data; it does not constitute a baseline risk assessment, and it is not intended to address issues regarding compliance with regulatory limits.

1.2 ECOLOGICAL RISK ASSESSMENT

Risk assessments, particularly those for hazardous wastes, have largely ignored ecological effects and emphasized human health effects. This bias results in part from anthropocentricity and in part from the mistaken idea that protection of humans will automatically protect the environment. Some chemicals that pose no risk or a negligible risk to humans in drinking or bathing water, such as elevated ammonia, chlorine, and aluminum, or depressed dissolved oxygen, commonly cause mass mortality of aquatic organisms, and many of the national water quality criteria for aquatic life are lower than those for human health. In some cases the greater nonhuman risk is due to routes of exposure that are not credible for humans such as respiring water, drinking from waste sumps, oral cleaning of the pelt or plumage, and root uptake. Other chemicals are inherently more toxic to nonhuman organisms; this is due to modes of action that do not occur in humans (e.g., eggshell thinning by DDT metabolites) or for unknown reasons (e.g., the presence of chlorinated dibenzo-dioxins). There are also modes of action at the ecosystem level, such as eutrophication by nutrients and blockage of light by suspended sediments, that have no analog in human health effects. Finally, even when routes of exposure and modes of action are the same, nonhuman organisms commonly receive a much higher dose than humans. For example, humans eat a few meals a week that have fish as one component, while a bald eagle or otter eats very little other than fish and eats the whole fish, not just the relatively uncontaminated muscle. As a result, the EPA has recently begun to emphasize assessment of ecological effects at waste

sites and has provided guidance for ecological investigations (but not risk assessment) at waste sites (Warren-Hicks et al. 1989).

This screening assessment is not intended to determine what chemicals are causing effects, the nature of effects, or the sources of contamination. Rather, it is intended to guide studies in the off-site surface-water environment by identifying missing information and determining which risks cannot be well defined from existing information. The former task is performed by comparing the existing data concerning off-site contamination with the data set that would be needed to perform a reliable ecological risk assessment. The latter task is performed by applying screening criteria to the available data concerning the concentrations of chemicals in the off-site environment that may be attributable to DOE activities.

2. SCOPE OF THE ASSESSMENT

2.1 SOURCE TERMS

This off-site assessment does not address the individual points of release of chemicals into the environment (e.g., effluent pipes or leaking tanks). Rather, the sources of exposure are the contaminated waters and sediments coming off the Oak Ridge Reservation (ORR). The descriptors of the ongoing off-site contamination are the concentrations of chemicals in waters at the point where they are deemed to leave the site. The primary descriptors of past releases are the concentrations of chemicals in sediments. The source data, which are drawn from various documents and data bases, will be described in a separate document.

2.2 SPATIAL SCOPE OF THE ASSESSMENT

This assessment considers that portion of the environment that receives effluents from DOE's ORR, and that lies beyond the bounds of prior on-site assessments. For aquatic effects, the bounds are the Clinch River from the Solway Bridge over Melton Hill Reservoir to the Watts Bar Dam. This includes the White Oak Creek embayment up to White Oak Dam and the Poplar Creek embayment to the confluence of Poplar Creek and East Fork Poplar Creek.

The streams and rivers are divided into reaches, each of which is given a number, name, and abbreviation (Table 1). The potentially affected reaches are: Melton Hill Reservoir (MHR) (1), which receives leachate from an ash disposal area on McCoy Branch; the White Oak Creek-Clinch (WOCC) (2), which is the portion of the Clinch River that is most influenced by contaminants in White Oak Creek; the Poplar Creek embayment (PCE) (3); the Poplar Creek-Clinch (PCC) (4), which is the portion of the Clinch River most influenced by Poplar Creek; and Watts Bar Reservoir (WBR) (5), which extends from the confluence of the Tennessee River to Watts Bar Dam. There are two negative reference reaches, reaches not influenced by effluents from Oak Ridge operations. They are Norris Reservoir (NR) (10) and the Tennessee River (TR) (18) between Fort Loudon Dam and the confluence of the Clinch River. There are three positive reference reaches, stream reaches that convey emitted chemicals to the

Table 1. Stream and river reaches for the off-site assessment

Reach number	Reach name (description)	Abbreviation
1	Melton Hill Reservoir (from the Solway Bridge to Melton Hill Dam)	MHR
2	White Oak Creek-Clinch (White Oak Creek below White Oak Dam and the Clinch River from Melton Hill Dam to Poplar Creek)	WOCC
3	Poplar Creek embayment (Poplar Creek below the confluence of the East Fork)	PCE
4	Poplar Creek Clinch (the Clinch River from the mouth of Poplar Creek to the confluence with the Tennessee River)	PCC
5	Watts Bar Reservoir (the Tennessee River from the confluence of the Clinch River to Watts Bar Dam)	WBR
10	Norris Reservoir (the Clinch River above Norris Dam)	NR
13	Poplar Creek (Poplar Creek above the confluence of the East Fork)	PC
14	East Fork (the east fork of Poplar Creek)	EF
18	Tennessee River (the reach between Fort Loudon and Tellico Dams and the confluence of the Clinch River)	TR
99	White Oak Lake (White Oak Creek above White Oak Dam)	WOL

off-site reaches. They are Poplar Creek (PC) (13), East Fork Poplar Creek (EF) (14), and White Oak Lake (WOL) (99).

2.3 ASSESSMENT END POINTS

Assessment end points are expressions of the environmental values that are to be protected (Suter 1989). The EPA manual for ecological assessment of hazardous waste sites (Warren-Hicks et al. 1989) indicates that assessment end points should be (1) socially relevant, (2) biologically relevant, (3) operationally definable, (4) measurable or predictable, (5) susceptible to the hazard, and (6) logically related to the decision. For the ecological portion of this assessment, the following end points were chosen as meeting those criteria: (1) a 10% or greater reduction in the abundance or production of the local populations of any fish species, (2) a 10% or greater reduction in the abundance or production of the local populations of any bird species, (3) a 10% or greater reduction in the abundance or production of the local populations of any wild mammal species other than small rodents, (4) a 10% or greater reduction in the production of any local terrestrial plant population (this endpoint is not considered in this assessment), and (5) any toxic effect on individuals of an endangered species sufficient to impair survival or reproduction. It should be noted that effects on species that are not included explicitly in the end points are nonetheless included in the assessment. For example, the only end point species in the aquatic community are fish, but effects on all foodchain species must be included in the assessment of risks to fish.

Except for endangered species, the end points are effects at the population level of biological organization. Unlike human health assessments, ecological risk assessments are not concerned with effects on individual organisms (the exception is endangered species). The fact that hunting, fishing, and harvesting of plants are encouraged implies that individuals are not protected. Higher levels of biological organization (i.e., communities and ecosystems) are not used at present because there is little information on toxic effects at these levels, the toxicity data that are available are highly inconsistent, and effects at higher levels are nearly always less sensitive than those at the

population level. The 10% level of population effects was chosen as approximately the limit of detection of field measurement techniques and is probably below the detection limits of the public (i.e., fishermen would probably not notice a 10% reduction in the abundance of fish).

The end point is defined at the individual level for endangered species because of the greater legal and societal concern for these species. The only federally listed endangered or threatened species that is known to occur in the area being assessed is the bald eagle (Kroodsma 1987). Bald eagles regularly winter along the Clinch River, but not in large numbers, and occasionally appear in the summer. Because they feed primarily on fish, eagles are potentially exposed to contaminants accumulated from water and sediment.

3. METHODS

3.1 SCREENING CRITERIA

A purpose of this assessment is to separate contaminants into three classes: those that require further assessment, those that are clearly unacceptably hazardous, and those that clearly pose no hazard. Therefore, screening criteria must be established to distinguish the three classes of chemicals. The upper criterion is one at which serious effects occur (i.e., an assessment end point is clearly exceeded); the lower criterion is one at which no significant effects occur (i.e., the assessment end points clearly will not be reached). Because of the considerable uncertainty in assessing ecological effects, the lower criteria must be set at very low concentrations to ensure that no chemical that may cause effects is excluded from future monitoring and assessment. For that reason we also use an intermediate screening criterion that corresponds to a concentration that is expected to cause small effects.

In all cases, the upper limit is set at a median acutely lethal concentration or dose (LC_{50} or LD_{50}). Killing half of the members of an exposed population is clearly a serious effect. One can be reasonably certain that unacceptable effects on some population would occur as a result of chronic exposure to a concentration that is acutely lethal in the laboratory, even though there are numerous differences between the circumstances of the test and the field.

The lower criteria are not as consistent as the upper criteria. In setting this criterion, the goal is to approximate a concentration that, with allowance for uncertainties, could not cause a decrease in any population as great as 10%. The intermediate criterion is set at a concentration that has been reported to be a threshold level or a minimal effects level for some effect that could lead to reductions in the productivity of a population (e.g., reduced fecundity, reduced growth, damage to some organ, or low levels of mortality). The methods for deriving screening criteria for each of the contaminated media are discussed below.

3.1.1 Water

The national water quality criteria (NWQC) for protection of freshwater aquatic life provide the basis for the screening criteria for contaminants in water. The acute NWQC are calculated by the EPA as the fifth percentile of the distribution of 48- to 96-hr LC_{50} values or equivalent effective concentration (EC_{50}) values for each criterion chemical (Stephan et al. 1985). Hence, the acute NWQC correspond to concentrations that would cause 50% mortality in 5% of exposed populations in a few days. This is a reasonable upper screening criterion because this assessment is concerned with continuous exposures, rather than the episodic exposures to which the acute NWQC is applied.

The chronic NWQC are based on the threshold for statistically significant effects in chronic or subchronic toxicity tests, adjusted to estimate the concentration that would exceed that threshold in 5% of species (Stephan et al. 1985). This is the intermediate criterion. The lower screening criterion must be lower than the chronic NWQC for three reasons. First, the chronic NWQC are based on a threshold for statistical significance rather than biological significance. In some chronic tests, because of highly variable results, the statistical threshold corresponds to greater than 50% effect on a response parameter (Stephan and Rogers 1985, Suter et al. 1987). Second, not all important responses are included in the subchronic toxicity tests that are used to calculate many chronic NWQC. In particular, effects on fecundity, which is the most sensitive response parameter on average in fish toxicity tests (Suter et al. 1987), are not included. Third, the chronic NWQC are based on the most statistically sensitive of the measured response parameters in each chronic or subchronic test. Therefore, cumulative effects over the life cycle of fish and invertebrates are not considered. Fourth, the criteria are set at a level that protects "most species most of the time." A lower screening criterion should protect all species nearly all of the time.

Ideally, the lower screening criteria would be generated by calculating a threshold for population-level effects on local fish, invertebrates, and plants for each of the assessed chemicals. However, that would require a large effort, including extraction of the raw data for every chronic toxicity test for fish and invertebrates, fitting

concentration-response models, developing population models for local species, deriving model parameters from the toxicity data, and running the models to estimate threshold effects levels.

Instead, we have calculated lower screening criteria by dividing the chronic NWQC by a correction factor based on prior risk assessments of effects on fish populations. The factor is set at 100, based on two pieces of evidence. First, biologically significant effects on particular response parameters (i.e., 25% mortality or reduction in growth or fecundity) can occur at as little as 1/50 of the statistical threshold concentrations (chronic values) used for the chronic NWQC (Suter et al. 1987). Second, 10% reductions in the relative reproductive potential or the abundance of fish populations are estimated to occur at concentrations between 1/2 and 1/100 of the statistical threshold concentrations used for the chronic NWQC (Barnthouse et al. 1987, Barnthouse et al. 1990). This evidence is not directly applicable to aquatic plants and invertebrates, but we believe that the chosen factor is sufficiently conservative for these organisms also. Aquatic plants do not need a large safety factor because their tests involve all life stages and the end points are based on effects levels. Invertebrates require a safety factor because their chronic test end points are not based on effects levels, but we believe that the factor need not be as large on average as for fish because all life stages are included in common invertebrate chronic tests. It should be emphasized that the lower criterion is not a threshold for effects; it is a concentration that is certain to not cause effects.

NWQC for several metals are functions of water hardness; the criteria are lower for lower hardness levels. We obtained daily hardness measurements from water plants on the reach of the Clinch River covered by this assessment. More than 95% of these are greater than 100 mg/L (the range was 88 to 161 mg/L), so 100 mg/L was used to calculate criteria that are conservative but not extreme.

Some chemicals have no NWQC. In those cases, we use the lowest reported 48- or 96-hr LC_{50} for the upper screening criterion and the lowest reported threshold for effects in a chronic or subchronic toxicity test of a fish or invertebrate species as the intermediate criteria and to calculate the lower screening criterion. The acute and chronic NWQC would

be as low as these values or lower. If there are only acute lethality data for a chemical, the lowest LC_{50} or incipient lethal level (ILL) is divided by a correction factor to obtain the intermediate screening criterion. For LC_{50}s the factor is 100, and for ILLs the factor is 20. These are conservative factors in that most measured chronic values would be higher than those estimated from these factors (Suter et al. 1983).

3.1.2 Sediment

The sediment composition data available for this assessment are concentrations in dry sediment. However, effects of a particular dry sediment concentration on sediment-dwelling (benthic) organisms are highly inconsistent. This is because benthic organisms are exposed primarily to chemicals in the aqueous phase of sediments (Adams et al. 1985, OWRS 1989). Therefore, it is necessary to estimate the concentration in pore (interstitial) water. Pore-water concentrations of neutral (non-ionic) organic chemicals can be calculated by assuming equilibrium partitioning between the pore water and the organic matter fraction of the sediment (OWRS 1989). The partitioning coefficient (K_p) is the product of the organic matter/water partitioning coefficient (K_{oc}) and the fractional organic matter content of the sediment (f_{oc}). Because sediment-dwelling organisms are approximately as sensitive to chemicals in water as the population of species used to derive the NWQC (OWRS 1989), the same screening criteria can be used as for water but corrected for partitioning. The formula is:

$$C_s = K_p C_w \text{ , or}$$
$$C_s = K_{oc} f_{oc} C_w \text{ ,}$$

where C_s and C_w are the screening criteria for sediment and water, respectively. K_{oc} is seldom available, but it is quite accurately approximated by the octanol/water partitioning coefficient (K_{ow}) (DiToro 1985).

Concentrations of ionic organic chemicals and inorganic chemicals in pore water could, in theory, also be calculated from an equilibrium partitioning model. However, these chemicals are sorbed to multiple sediment components so they would require several-phase partitioning

models with a partitioning coefficient and concentration in sediment for each phase, information that is not available. We assume that ionic organics behave like neutral organics, only partitioning between water and sediment organic matter. This is a conservative assumption because partitioning to other phases would lower the aqueous concentration, thereby lowering the toxicity of a given whole-sediment concentration. For metals in sediments, we use the even more conservative assumption that all of the metal is available.

Another approach is to derive site-specific sediment-water partitioning coefficients. Blaylock et al. (in review) have proposed a sediment-water partitioning coefficient for mercury in Watts Bar Reservoir of 10^5. This value is derived from concentrations of mercury in suspended particulate matter and filtered water from Tennessee River Mile 545. It is probably a reasonable estimate of the mercury K_p, although suspended solids differ from bed sediments, and K_p varies with solids concentration (OWRS 1989) and redox potential.

Besides the risks to benthic organisms, it is necessary to consider risks to water-column species from chemicals associated with resuspended sediments. We believe that the screening criteria for benthic organisms are sufficiently conservative for this purpose. That belief is based on the following arguments: (1) the screening criteria are based on an assumption of chronic exposure, but exposures to suspended sediments would be acute; (2) dilution would rapidly decrease the aqueous concentration outside the plume and also within the plume once the particulate concentration dropped sufficiently to prevent attainment of equilibrium; and (3) the biological component of the sediment criteria is applicable because it is based primarily on water-column species.

3.1.3 Tissue Concentrations as Indicators of Effects on Fish

Tissue concentrations can be used in two ways to derive screening criteria. First, for a few chemicals there are data on the tissue concentrations at which effects occurred. When they are available, these data will be used to derive criteria. When they are not available, it is necessary to use conventional aquatic toxicity data that are expressed as aqueous concentrations. In that case, bioaccumulation factors (BAFs) are

used to estimate the average water concentrations to which fish have been exposed (fish tissue concentration/BAF = water concentration). When available, field-derived BAFs are used. Otherwise, laboratory-derived BAFs, or BAFs derived from models of laboratory data [i.e., quantitative structure-activity relationships (QSARs)], are used. The laboratory-derived factors are likely to overestimate the water concentrations for those chemicals that are accumulated through food chains, but these overestimates will tend to highlight those chemicals. The same upper, intermediate, and lower criteria that are used for water concentrations are then applied to the calculated water concentration to serve as a screen for the fish tissue concentrations.

3.1.4 Tissue Concentrations and Aquatic Food Chains

The contamination in fish and aquatic invertebrate tissues represents a route of exposure for piscivorous mammals, birds, reptiles, and fish. As with the other analyses, the upper screening criteria for piscivores are based on acute lethality. Usually these are acute median lethal doses (LD_{50}) but lethal concentrations in food (LC_{50} or LC_x) are preferred. Doses (mg of chemical/kg of animal) must be converted to concentrations in food by dividing by consumption (kg of food/kg of animal). Local piscivorous birds range from kingfishers to great blue herons, ospreys, and bald eagles. The highest dose would be obtained by the smallest bird (because of higher metabolism), and a predatory bird the size of a kingfisher consumes food equivalent to approximately 8% of its body weight per day (Kenaga 1973). The principal piscivorous mammal in the area is the mink. We assume that mink consume food equal to 5% of their body weight per day. The 8% figure is used to calculate the screening criteria because it is more conservative, but we consider effects on mink in the discussion of results. For the conversion of acute dose to concentration in diet, we assume that one day's consumption is equivalent to an acute dose.

The lower screening criteria for aquatic foodchain exposures are quite diverse because test data for chronic oral exposures to birds and mammals are quite diverse. When data are available concerning the dietary toxicity of a chemical to wildlife, the lowest test concentration that

reflects a potential effect on populations is used. If there are no wildlife data, any available data on domestic animals other than ruminants are used. In many cases, there are no useful wildlife or domestic animal data, and the same laboratory rodent data that are used for human health effects are used in the screening criteria. Toxicity data for ruminants are the least desirable because their peculiar digestive systems make their responses unrepresentative of nonruminants. Data from dietary toxicity tests are preferred to chronic oral dosing tests. The effects include systemic toxicity, reduced reproduction, severe histological damage, and terata. We do not assess cancer induction in nonhuman species because the higher wildlife exposure is not sufficient to overcome the extremely low frequencies of cancer induction (i.e., 10^{-6}) used for the human health screening analysis. Although tumors have frequently been found in fish in other studies, effects of cancer on fish population size or productivity have not been demonstrated.

Unlike the screening criteria that are based on NWQC, these criteria do not reflect the diversity of organisms that are exposed by this route. If chronic sublethal effects data are available for either mammals or birds but not both, a correction factor of 10 for differences in sensitivity is applied. This factor is based on limited studies that indicate that birds and mammals can differ in sensitivity by more than an order of magnitude and either can be more sensitive (Sigal and Suter 1989). If there are data for both birds and mammals, but fewer than five species with fewer than two birds, a factor-of-5 correction for differences in sensitivity is assumed. If there are data for five or more species including at least two avian species, we assume that the variance in sensitivity of the test species approximates the variance in all avian and mammalian species and apply no factor for differences among species. If the most sensitive test end point is death or another severe effect (e.g., reproductive failure), a factor of 5 is applied to estimate the threshold for effects on individuals that could result in population reductions (Tucker and Lietzke 1979). These factors are not applied to the upper criterion, which is intended to be a concentration at which effects are certain.

Because the studies of chemical concentrations in fish that were conducted in the Oak Ridge area were designed for human health risk assessments, the reported concentrations refer to the "edible portion." Piscivores typically consume the entire fish, and the organs and bones contain higher levels than the muscles of nearly all chemical contaminants. Metals concentrations in whole fish (minus gut contents) tend to be approximately 1.5 to 2 times as high as in fillets or carcasses (Lemly and Smith n.d., Brumbaugh and Kane 1985). Hydrophobic organic chemicals like PCBs occur in whole fish at 2 to 3 times the concentration in fillets. Therefore, we apply a factor of 2 to metal concentrations in fish and a factor of 3 to organic chemical concentrations in fish when calculating lower and intermediate criteria.

Another source of error is the moisture content of the food. The concentrations reported from dietary toxicity data are usually based on the weight of the food as consumed by the animal (i.e., fresh weight), but may be reported as dry weight. In addition, the water content of foods is variable and is often unreported in dietary toxicity studies. The concentrations in fish provided for this assessment are fresh weight. We assume, unless the source indicates otherwise, that the toxic concentrations are also fresh weight and that the water content of the diet and of fish fillets is approximately equal. This assumption could result in an error of approximately a factor of 5 in the results.

In addition to the uncertainties discussed above, this analysis of risks to piscivorous birds and mammals does not include other animals that feed on aquatic organisms. Reptiles and amphibians feed on aquatic invertebrates and fish but hardly any data exist on dietary toxicity for these taxa. Raccoons and diving ducks consume aquatic invertebrates, but tissue analyses are not available for invertebrates in the waters being assessed. We assume that, because they feed from a variety of sources other than aquatic invertebrates, these populations will be protected by the criteria for piscivores. Dabbling ducks consume aquatic macrophytes, but there are not enough data concerning contamination of these sources to perform an assessment and too few macrophytes in the Clinch River to serve as a significant source of exposure. Dietary exposure of predatory fish to contaminated fish and invertebrates is not a significant route of

exposure except for the most bioaccumulative chemicals. These are discussed along with the results on exposure to water.

3.2 DATA FOR INDIVIDUAL CRITERIA

The values for NWQC are taken from EPA (1986a). Bioaccumulation factors and K_{ow} values are from Barnthouse et al. (1988). Other sources of data used to derive criteria for individual chemicals are discussed below.

3.2.1 Metals and Metaloids in Water

Aluminum. The proposed acute and chronic NWQC for aluminum for circumneutral waters are 750 and 87 μg/L, respectively (EPA 1988b). These are used as the upper and intermediate criteria; applying the factor of 100 yields a lower screening criterion for these waters of 0.87 μg/L.

Mercury. Because the chronic NWQC for mercury is based on bioaccumulation and effects on humans, the intermediate criterion for concentrations in water must be estimated from the lowest freshwater "chronic value," which is 0.26 μg/L for inorganic divalent mercury and 0.07 μg/L for methylmercury (EPA 1986a, Snarski and Olson 1982). Applying the factor of 100 for population thresholds yields lower criteria of 0.0026 μg/L and 0.0007 μg/L. Inorganic mercury accumulates to 1.36 mg/kg in whole fathead minnows at the 0.26-μg/L exposure concentration (Snarski and Olson 1982). Brook trout exposed to methylmercury experienced toxic effects at carcass concentrations of 1.6-4.4 mg/kg and whole-body concentrations of 3.4-9.4 mg/kg (McKim et al. 1976).

Phosphorus. The form of phosphorus in some measurements is not indicated. Although the most common forms are expected to be organic phosphorus and phosphates, for the sake of screening we must assume that it is elemental phosphorus, which is highly toxic. A recommended chronic criterion for elemental phosphorus of 0.04 μg/L (Bentley et al. 1978) is used as the intermediate criterion. The upper criterion is set at 6 μg/L based on the lowest reported LC_{50} (Bentley et al. 1978, EPA 1986a).

Phosphate phosphorous. Phosphate in excess of 25 μg/L can cause nuisance algal blooms (EPA 1976).

Vanadium. The threshold for chronic toxicity of vanadium to flagfish was 0.08 mg/L (Holdway and Sprague 1979). This value serves as the estimate of a chronic NWQC.

Other metals. The estimate of the chronic NWQC for barium, calcium, cobalt, magnesium, manganese, potassium, sodium, strontium, and tin is the threshold for reproductive effects on *Daphnia magna* reported by Biesinger and Christensen (1972). The estimated chronic NWQC for boron, lithium, molybdenum, thorium, titanium, and uranium is the lowest ILL or LC_{50} from Cushman et al. (1977) or AQUIRE (EPA 1988a) divided by the appropriate correction factor.

3.2.2 Organics in Water

Benzene. There is no freshwater chronic NWQC for benzene, but application of the saltwater acute/chronic ratio to the freshwater final acute value (EPA 1980s) yields an estimated chronic NWQC (intermediate criterion) of 0.727 mg/L.

Benzidine. There are no chronic aquatic toxicity data for benzidine. Applying the acute/chronic ratio of 100 to the acute NWQC (2.5 mg/L) yields an intermediate criterion of 0.025 mg/L.

Chlorinated naphthalenes. There are no suitable freshwater chronic toxicity data, but application of the saltwater acute/chronic ratio to the freshwater final acute value (EPA 1980t) yields an intermediate criterion of 0.444 mg/L.

Chloroalkyl ethers. The only chronic aquatic toxicity test for this class of chemicals gave a no-observed-effect concentration (NOEC) of >19 mg/L (EPA 1980u). This value is used as a conservative intermediate criterion.

Chloroethane. No aquatic toxicity data were found for chloroethane. Because the toxicity of hydrocarbons generally increases with the number of chlorine substitutions, the value for dichloroethane, 20 mg/L (EPA 1986a), is used as a conservative value for the monochloro form.

Dichloroethene. The only chronic aquatic toxicity test for this chemical gave a NOEC of >2.8 mg/L (EPA 1980v). This value is used as a conservative intermediate criterion.

Ethylbenzene. The only chronic aquatic toxicity test for this class of chemicals gave a NOEC of >0.44 mg/L (EPA 1980w). This value is used as a conservative intermediate criterion.

Fluoranthene. In the absence of NWQC, the upper criterion for fluoranthene is the lowest LC_{50} for freshwater organisms (4 mg/L) and the intermediate criterion is the lowest chronic value for aquatic life (0.016 mg/L) (EPA 1986a).

Fluorene. There are no chronic aquatic toxicity data for fluorene. The lowest freshwater LC_{50} is 600 μg/L (Eisler 1987b) which, divided by the generic acute/chronic ratio of 100, yields an intermediate criterion of 6 μg/L. The BAF of 600 is the mean of the range given by Eisler (1987b).

Halomethanes. There is no freshwater chronic NWQC for halomethanes, but application of the saltwater acute/chronic ratio to the freshwater final acute value (EPA 1980x) yields an intermediate criterion of 4 mg/L.

Hexachlorobenzene. This chemical is too sparingly soluble to induce acute lethality and has not been tested for chronic toxicity (Call et al. 1983). A LC_{50} for pentachlorobenzene (the most similar chemical for which there are doxicity data) of 0.25 mg/L divided by the acute chronic ratio for 1,2,4,5-tetrachlorobenzene (the most similar chemical for which there are chronic toxicity data) (EPA 1980i) yields an intermediate criterion of 0.038 mg/L.

Isophorone. There is no freshwater chronic NWQC for isophorone, but chronic values for fathead minnows and *Daphnia magna* are 14 and 15 mg/L, respectively (Cairns and Nebeker 1982). Hence we use 14 mg/L as the intermediate criterion.

Nitrobenzene. The only chronic aquatic toxicity test for this chemical gave a NOEC of >32 mg/L (EPA 1980k). This value is used as a conservative intermediate criterion.

Nitrosamines. There are no chronic aquatic toxicity data for nitrosamines. Applying the acute/chronic ratio of 100 to the lowest LC_{50} [5.85 mg/L (EPA 19801)], yields an intermediate criterion of 0.058 mg/L.

PCBs. The chronic NWQC for protection of aquatic life is based on effects on mink, so it is not applicable to fish and aquatic invertebrates. The lowest freshwater chronic value of 0.2 μg/L (EPA 1980d) serves as the intermediate criterion.

Phenanthrene. In the absence of chronic toxicity data, the lowest LC_{50} [370 μg/L (Eisler 1987b)] was divided by the generic acute/chronic ratio to obtain an intermediate criterion of 3.7 μg/L. The BAF of 325 is the value for *Daphnia magna* from Eisler (1987b).

Pyrene. The BAF for pyrene of 69 is the value for rainbow trout in Eisler (1987b).

Toluene. There is no freshwater chronic NWQC for toluene, but application of the mean saltwater acute/chronic ratio to the freshwater final acute value (EPA 1980y) yields an estimated chronic NWQC of 0.23 mg/L.

3.2.3 Metals and Metaloids in Fish

Antimony. Antimony causes liver damage in rabbits at 5.5 mg/kg in diet (NRC 1980). Application of a factor of 10 for variance in sensitivity and 2 for the whole-fish conversion yields a lower criterion for piscivores of 0.3 mg/kg.

Arsenic. The toxicity and bioaccumulation of arsenic are highly dependent on the form. The most toxic and bioaccumulative form is inorganic trivalent arsenic (arsenite salts). Median lethal dietary concentrations for wildlife range from 99.8 mg/kg in cowbirds to >5000 mg/kg in mallards depending on the arsenical species as well as the biological test species (NRC 1977, NIOSH 1988), so the upper criterion for piscivores is set at an approximate median of 1000 mg/kg. Reported sublethal effects of inorganic arsenic largely fall in this interval, but there is very little information on sublethal effects on birds. The most sensitive reported dietary effect in mammals or birds is the NOEC for growth of rats of 31 mg/kg (NRC 1977, EPA 1985). Applying a factor of 5 for species sensitivities and 2 for whole fish results in a lower criterion for effects on piscivores of 3 mg/kg.

Beryllium. Beryllium is a serious respiratory toxin and carcinogen, but has not been noted to cause dietary toxicity. The oral LD_{50} in rats is 9.7 mg/kg (EPA 1980r), giving a dietary upper screening criterion of 120 mg/kg. Weight loss occurred in rats fed a diet containing 500 mg/kg beryllium (EPA 1987). Applying a factor of 10 for variance in sensitivity

and 2 for the whole-fish conversion yields a lower screening criterion for piscivores of 25 mg/kg.

Cadmium. The National Research Council (1980) set the maximum tolerable level for cadmium in animal feed at 0.5 mg/kg based on observed toxic effects in mammals on 1-mg/kg diets. This appears to be sufficient to protect birds because the lowest-reported-effects level in birds is 4 mg/kg (Heinz et al. 1983). The factor of 2 for whole-fish concentrations gives a lower screening criterion for piscivores of 0.25 mg/kg.

Chromium. Chromium is most toxic to aquatic organisms in the hexavalent form. That is the form used in cooling towers, and it is the form that we assume for the aqueous chromium concentrations used in this assessment. However, it is likely that much of the chromium has been reduced to the trivalent form in fish tissues. There are little appropriate data for estimating chromium effects on wildlife, but young black ducks experienced reduced growth and survival at 10 mg/kg chromium (III) in diet (Eisler 1986). We apply a factor of 5 for variance in sensitivity and 2 for whole fish to derive a lower screening criterion for piscivores of 1 mg/kg.

Copper. Copper is a well-regulated essential nutrient that is seldom toxic in terrestrial vertebrates. The National Research Council (1980) set the maximum tolerable level for the most sensitive mammal (sheep) at 25 mg/kg, for nonruminant mammals at 100 to 800 mg/kg, and for chickens and turkeys at 300 mg/kg. Applying a factor of 2 to the lowest nonruminant level yields a lower screening criterion for piscivores of 50 mg/kg.

Lead. The National Research Council (1980) recommended that lead in livestock food be limited to 30 mg/kg, which appears to be protective of other species (EPA 1984a, Eisler 1988). We apply a factor of 2 for whole fish to derive a lower screening criterion for piscivores of 15 mg/kg.

Mercury. A U.S. Fish and Wildlife Service report has recommended that mercury in wildlife food be limited to 0.1 mg/kg because this concentration of methylmercury caused reduced reproduction in ducks (Eisler 1987a). Applying a factor of 5 for threshold effects and 2 for

whole fish yields a lower criterion for piscivores of 0.01 mg/kg. Lethal dietary concentrations of methylmercury range from 1 mg/kg for mink to 250 mg/kg for chickens (NRC 1980, Sheffy and St. Amant 1982, Wren et al. 1987, Eisler 1987a). We use 30 mg/kg, the approximate median LC_{50}, as an upper criterion for piscivores. Inorganic mercury is not relevant to this end point because the mercury in local fish is almost entirely methylmercury (R. R. Turner, ORNL Environmental Sciences Division, personal communication).

Nickel. The National Research Council (1980) set the maximum tolerable level of nickel at 50 mg/kg based on weight loss of cattle at 100 mg/kg in diet but no observed effects at 50 mg/kg. Chickens, the only tested bird, showed a statistically significant decrease in growth at 500 mg/kg in diet but not at 300 mg/kg (NRC 1980). Application of factors of 5 for variance in sensitivity and 2 for whole-fish concentration yields a lower chronic criterion for piscivores of 50 mg/kg. The oral LD_{50} in rats is 350 mg/kg (NRC 1980). Conversion to dietary concentration yields an upper criterion of 4400 mg/kg, which is consistent with the sublethal dietary toxicity data.

Selenium. Dietary selenium effects are difficult to assess because the toxic levels are near the deficiency levels, uptake is highly variable among species, and uptake is highly dependent on the form of the selenium and how it is incorporated into food. Rats experience histological damage and reduced longevity in lifetime exposures to 3 mg/kg in naturally contaminated feed, but the same effects occurred at 0.75 mg/kg in spiked feed (Eisler 1985). Five mg/kg was a no-observed-effects level in feeding studies of mallards, and 6-9 mg/kg in feed reduced the hatchability of chicken eggs (Eisler 1985). Mortality and severe reproductive effects in birds occurred in an area with concentrations of 22-175 mg/kg in food items (Ohlendorf et al. 1986). Based on these data, the intermediate criterion is set at 1 mg/kg, which is just above recommended concentrations in diet to prevent selenium deficiency of 0.1-0.05 mg/kg (Eisler 1985). That threshold value is divided by 2 for the whole-fish conversion for a lower screening criterion for piscivores of 0.5 mg/kg in fish. The upper criterion is set at 100 mg/kg, the lethal dietary concentration in mallards (Eisler 1985).

Silver. The National Research Council (1980) set the maximum tolerable level for silver in animal food at 100 mg/kg based on studies of rats, chickens, and turkeys. Application of factors of 5 for variance in sensitivity and 2 for the whole-fish conversion yields a lower screening criterion for piscivores of 10 mg/kg.

Thallium. Thallium is highly toxic to mammals, and thallium salts have been used as rodenticides (Venugopal and Luckey 1978). It is also highly toxic to birds with an acute lethal threshold in diet of 12 mg/kg in bobwhite quail (EPA 1980a). The no-observed-effect level for thallium in the diet of rats is 5 mg/kg (EPA 1980a). Applying factors of 5 for variance in sensitivity and 2 for the whole-fish conversion yields a lower screening criterion for piscivores of 0.5 mg/kg. The upper criterion is set at the dietary LC_{50} in rats of 30 mg/kg (EPA 1980a).

Zinc. The National Research Council (1980) set the maximum tolerable level for zinc in sheep feed at 300 mg/kg and in swine and poultry feed at 1000 mg/kg, but adverse effects on young Japanese quail fed laboratory diets occurred at 125 mg/kg (Hamilton et al. 1979). Using the Japanese quail datum as the intermediate criterion and applying a factor of 2 for the whole-fish conversion yield a lower screening criterion for piscivores of 60 mg/kg.

3.2.4 Organics in Fish

DDT and metabolites. DDT and its metabolites DDD and DDE are notorious for their effects on piscivorous birds. Birds experience reduced survival or reproduction at 3-0.15 mg/kg in diet (Lincer 1975, Anderson et al. 1975). Applying a factor of 5 for an effects threshold and 3 for the whole-fish conversion yields a lower criterion for piscivores of 0.01 mg/kg. The acute oral LD_{50} for birds is approximately 1000 mg/kg (Matsumura 1985), which is equivalent to a dietary concentration in kingfishers of approximately 12,500 mg/kg, the upper criterion for piscivores. Fish themselves experience effects at 3-11 mg/kg body burden (EPA 1980c). Since 3 mg/kg is lethal to cutthroat trout fry, we apply the factors of 5 for an effects threshold and 3 for whole-fish-basis to obtain a lower criterion for protection of fish of 0.2 mg/kg.

Polychlorinated biphenyls (PCBs). PCBs are persistent, bioaccumulative, and highly toxic. Mink are the most sensitive species to PCBs, experiencing reproductive failure at 0.64 mg/kg in diet (Ringer 1983, Fuller and Hobson 1986). Birds experience reproductive and immunotoxic effects at 10-40 mg/kg in diet (Peakall 1986). Because these levels induce catastrophic reproductive effects, the International Joint Commission [IJC (1988)] recommends a concentration in fish of 0.1 mg/kg to protect piscivores. Using the mink effects level as the intermediate criterion and applying the factor of 5 for effects thresholds approximately yield the IJC criterion. Applying the factor of 3 for organics in whole fish yields a lower criterion for piscivores of 0.04 mg/kg. The acute dietary LC_{50} in birds is 747-12,000 mg/kg (Peakall 1986). Using 1000 mg/kg and dividing by 3 for the whole-fish conversion yields an upper criterion of 300 mg/kg.

Other organics. All 104 of the other organic chemicals that were analyzed in fish tissues were not detectable. The detection limits ranged from 0.01 to 33 mg/kg with more than 10 fish sampled for all chemicals. Except for the pesticides, which are not generated or used in large amounts by DOE operations, there are very few dietary toxicity data or avian toxicity data of any sort for these chemicals.

The undetected chemicals that pose the greatest risk (absent toxicity data) are those with the highest detection limits. The three undetected chemicals with detection limits greater than 10 mg/kg are dinitrophenol, dinitrocresol, and benzidine. Dinitrophenols are intermediates in various industrial syntheses and are specific uncouplers of oxidative phosphorylation. The acute oral lethal dose to mammals ranges from 1 to 200 mg/kg with a median of approximately 20 mg/kg (EPA 1980f, NIOSH 1988). The threshold for dietary toxicity in male rats was 500 mg/kg. Dinitrocresols, which were formerly used as pesticides, have acute oral lethal doses in mammals and birds ranging from 8.3 to 85 mg/kg, with birds being a factor of 2 to 10 more sensitive than rodents (EPA 1980f, NIOSH 1988). The median LD_{50} is 30 mg/kg. In one rat dietary test, 63 mg/kg of dinitrocresols was a no-observed-effects level, but 125 mg/kg caused lethalities (EPA 1980f). We could find no appropriate data for noncarcinogenic effects of benzidine, but sublethal injury in rodent

dietary studies occurred at 100 and 430 mg/kg for chloro- and acetyl-substituted benzidine, respectively (EPA 1980e, NIOSH 1988). We use the diacetylbenzidine result because we judge that it is more likely to approximate benzidine toxicity than the dichlorobenzidine result. Applying a factor of 5 for variance in sensitivity and 3 for whole fish results in lower screening criteria of 30 mg/kg for benzidine and dinitrophenols and 4 mg/kg for dinitrocresols. Converting to a dietary basis yields upper screening criteria of 250 mg/kg for dinitrophenols and 375 mg/kg for dinitrocresols.

Several undetected organic chemicals had detection limits of 3.3 mg/kg in fish. Many of these are polycyclic aromatic hydrocarbons (PAHs). Effects other than carcinogenicity are poorly documented for this class of chemicals. Acute oral LD_{50}s for rats range from 50 to 9430 mg/kg with a median of approximately 1000 mg/kg (EPA 1980h, Eisler 1987b, NIOSH 1988). Converting to dietary concentration yields an upper screening criterion for all PAHs of approximately 12,500 mg/kg. There is not sufficient information to develop a lower screening criterion for exposure of piscivores to PAHs (EPA 1980g, EPA 1980h, Eisler 1987b, NIOSH 1988). However, the detection limit (3.3 mg/kg) is almost 100 times the lower criterion for PCBs, and the high biological activity of the 4-6 condensed ring PAHs suggests that they could have more than one one-hundredth of the toxicity to wildlife of PCBs. On that relatively weak basis, we estimate that dietary toxic effects might occur below the detection limit.

The next most common class of undetected chemicals with detection limits of 3.3 mg/kg is nonpesticide, nonphenolic chlorinated aromatic hydrocarbons. Because the oral toxicity of these chemicals is poorly characterized, the relatively well studied compound hexachlorobenzene (HCB) is used as a model compound for this group. The acute lethal dose is 1000 mg/kg or greater (EPA 1980i, EPA 1984b, NIOSH 1988), so the upper criterion for concentrations in fish is 12,500 mg/kg. HCB causes liver damage in Japanese quail at 5 mg/kg in diet (EPA 1980i) and causes immunosuppression in mink and ferrets (by different criteria) at 25 and 1 mg/kg in diet (Bleavins et al. 1983). Using the 1-mg/kg level as the intermediate criterion and applying a factor of 3 for whole-fish basis yield a lower screening criterion of 0.3 mg/kg for piscivores.

A third class of undetected chemicals with detection limits of 3.3 mg/kg is the chlorinated phenols. Median oral LD_{50}s are 500, 1000, and 100 mg/kg for monochloro, trichloro, and pentachloro phenols, respectively, and 1000 mg/kg for chlorinated cresols (EPA 1980o, EPA 1980p, EPA 1980q), yielding upper screening criteria of 6250, 12,500, 1250, and 12,500 mg/kg. Appropriate dietary or chronic oral toxicity data were found only for trichloro and pentachloro phenols. 2,4,5-Trichlorophenol caused mild histological damage at 3000 mg/kg in the diet of rats (EPA 1980p). This effect level is used as the intermediate criterion for all monochloro, dichloro, and trichlo phenols and the dichloro cresol because toxicity generally increases with increased chlorination. Pentachlorophenol caused decreased weight in parental rats and increased stillbirths at 30 mg/kg in the diet (EPA 1980q). Application of a factor of 10 for variance in sensitivity and 3 for whole fish yields a lower screening criterion for piscivores of 1 mg/kg for pentachlorophenol and 100 for the other chlorinated phenols.

Another class of undetected chemicals with detection limits of 3.3 mg/kg is phthalate esters. Oral LD_{50} values for mammals range from 1000 to 34,000 mg/kg, with a median across esters and species of approximately 10,000 mg/kg (EPA 1980j, NIOSH 1988). Converting to whole-fish dietary basis yields an upper screening criterion for all phthalate esters and piscivores of 125,000 mg/kg. Threshold dietary effects levels in rats are 40,000 mg/kg for dimethyl phthalate; 50,000 mg/kg for diethyl phthalate; 2500 mg/kg for dibutyl phthalate; and 2000 mg/kg for bis-2-ethylhexyl phthalate (EPA 1980j, NIOSH 1988). Because we found no avian toxicity data, we apply a factor of 10 for variance in sensitivity and a factor of 3 for the whole-fish conversion to obtain lower screening criteria of 1000, 2000, 80, and 70 mg/kg for dimethyl, diethyl, dibutyl, and bis-2-ethylhexyl phthalate, respectively. Because we could not find appropriate data for dioctyl phthalate or butyl benzyl phthalate, we assigned them the same lower criterion as the ethylhexyl phthalate, 70 mg/kg.

Mononitrophenols also are undetected at detection limits of 3.3 mg/kg. Oral LD_{50}s for mononitrophenols range from 350 to 2800 mg/kg with a median of approximately 1000 mg/kg (EPA 1980f, NIOSH 1988). Converting

to dietary basis yields an upper screening criterion for piscivores of 12,500 mg/kg for mononitrophenols. We could find no dietary toxicity data or chronic oral dosing data for mononitrophenols. We assume that the relative chronic toxicity of nitrophenols is equal to their relative acute toxicities. Since dinitrophenols are three times as acutely toxic as mononitrophenols, the proportional lower screening criterion for mononitrophenols is 240 mg/kg.

Nitrobenzene is acutely lethal to mammals at a dose of approximately 700 mg/kg (EPA 1980k), which gives an upper dietary criterion of 8750 mg/kg. It causes degeneration of guinea pig organs at 50 mg/kg in diet (EPA 1980k). Applying a factor of 10 for variance in sensitivity and 3 for the whole-fish conversion yields a lower screening criterion for piscivores of 2 mg/kg.

Dinitrotoluenes (DNT) are primarily products of munitions industries. The median oral LD_{50} for rodents is approximately 1000 mg/kg (Etnier 1986), which gives a dietary upper criterion of 12,500 mg/kg. A threshold dietary concentration for effects in rats is 1.5 mg/kg/day for 2,4-DNT, and the 2,6 isomer has approximately equal chronic toxicity (Etnier 1986). Applying a factor of 10 for variance in sensitivity and 3 for whole fish yields 0.05 mg/kg for DNT.

N-nitroso dimethyl, di-n-isopropyl, and diphenyl amines have LD_{50}s in rats of 40, 480, and 3000 mg/kg (EPA 19801), which yield upper criteria of 500, 6000, and 37,500 mg/kg. Dietary effects of nitrosamines other than carcinogenicity are not sufficiently well documented to allow estimation of intermediate and lower criteria.

LD_{50}s for isophorone range from 1870 to 2370 mg/kg (EPA 1980m, NIOSH 1988). Using a median of 2000 mg/kg yields a whole-fish dietary upper criterion of 25,000 mg/kg. Isophorone reduced the growth of rats at 3000 mg/kg (EPA 1980m). Applying a factor of 10 for variance in sensitivity and 3 for whole fish yields a lower screening criterion for piscivores of 100 mg/kg.

LD_{50}s for phenol range from 100 to 600 mg/kg (EPA 1980n, NIOSH 1988). Using a median of 500 mg/kg yields a whole-fish dietary upper criterion of 6250 mg/kg. Phenol reduced the growth of rats consuming 55 mg per day in drinking water (EPA 1980n). Consumption of 20 g of food daily by a

200-g rat corresponds to an equivalent dietary concentration of 2750 mg/kg. Applying a factor of 10 for variance in sensitivity and 3 for whole fish yields a lower screening criterion for piscivores of 90 mg/kg. The phenol criteria are also used for methyl phenols.

All other organic chemicals were undetected, and the detection limits were 0.5 mg/kg or less. These chemicals were either not associated with DOE operations (e.g., toxaphene), are unlikely to cause toxic effects at the detection limits (e.g., toxaphene), or are unlikely to persist in off-site surface waters at significant concentrations (e.g., chlorinated solvents).

3.2.5 Radionuclides

Effects of radionuclides on nonhuman biota are not analyzed in this assessment for three reasons. First, previous studies of radionuclide exposure and effects in White Oak Lake found no evidence of effects or of exposures sufficient to cause effects in controlled exposures (Blaylock and Trabalka 1978), and concentrations of radionuclides are much lower off-site than in White Oak Creek (see Hoffman et al. 1990). Second, the mode of action of radionuclides is the same in nonhuman organisms as in humans so the ranking of radionuclides produced by the human health assessment, which includes bioaccumulation by fish and ingestion of fish by humans, would be applicable to ecological effects. Third, a screening assessment of radionuclide effects on nonhuman populations would have no consequences because an extensive off-site radionuclide monitoring program will be conducted for human health assessment regardless of potential ecological effects. The results of those studies, including body burden data for fish, birds, and mammals, will be analyzed for evidence of ecological risks in future assessments.

3.3 AMBIENT CONCENTRATIONS

Data concerning chemical concentrations in water, sediment, and fish flesh were compiled from various sources including surveys conducted by the Tennessee Valley Authority, Oak Ridge National Laboratory, and individual investigators, plus water treatment plant records. The specific data sources and the procedures for compiling the data are

described by Hoffman et al. (1990). Maxima consist of the highest detected concentration or limit of detection for a medium and reach. Mean concentrations are means of both detected concentrations and the limits of detection when concentrations could not be determined. When means included limits of detection they are reported as "<x."

3.4 CALCULATIONS

Results are obtained by dividing the concentrations in water, sediment, or fish tissues by the criteria to obtain quotients. Quotients greater than 1 indicate that the criterion was exceeded.

4. RESULTS

The mean and maximum concentrations in water, sediment, and fish flesh, and the results of comparisons to toxicological screening criteria are presented in Appendix A, arranged by medium. The results are summarized in Table 2 and are discussed in this section. However, there are some generic observations. (1) The concentrations of metals in sediment are largely irrelevant because they are total concentrations in dry sediment. For example, a concentration of >10% aluminum clearly includes phases which are not available to organisms, including strongly sorbed aluminum and mineral aluminum. Except for mercury, there is no acceptable means to estimate available metal concentrations. All of the maximum metal concentrations in sediments are above the lower screening criteria, all but antimony in MHR are above the chronic NWQC, and most exceed the upper criterion. All that we can conclude concerning metals other than mercury in sediments is that effects in benthic organisms cannot be excluded. Therefore, individual metals in sediments other than mercury are not discussed. (2) Although both mean and maximum concentrations of chemicals are included in the analyses, mean water concentrations are not discussed because nearly all are "less-than" values. (3) The maximum concentrations in water of all metals are above the lower screening criteria. Therefore, the discussions of metals in water will only address the cases in which the upper or intermediate screening criteria (i.e., acute or chronic NWQC or equivalent) were exceeded. (4) Although the problem is not as great as for sediment, the appropriateness of the aqueous concentrations is uncertain because the forms of the chemicals in water and the methods of analysis are not specified in the data base. Aquatic toxicity data are obtained from relatively pure laboratory waters, so the concentrations are most relevant to ambient measurements of dissolved and disassociated chemicals. However, the factor-of-6 difference between maximum iron and maximum dissolved iron in WBR suggests that the reported concentrations may include considerable particle-associated material. Even well-filtered samples contain chemicals that are associated with dissolved humic material and have variable speciation. (5) The factor-of-100 conservatism

Table 2. Summary of results: Media in which maximum values or limits of detection exceeded criteria, media for which critical reaches were measured, and necessary and desired sensitivity of chemical analyses

Compound	Criteria exceeded[a]	Critical reaches[b]	Analytical sensitivity[c]			
			Water (μg/L)		Fish (mg/kg)	
	Water/ sediment/ fish (pisc.)/ fish (water)	Water/ sediment/ fish	Necessary	Desired	Necessary	Desired
Aluminum	Y/Y/ /	N/Y/N	87	0.87		
Antimony	N/N/y/y	N/N/Y	1600	16	300	5.5
Arsenic, pentavalent[d]	Y/Y/N/Y	Y/Y/Y	48	0.48	3000	31
Arsenic, trivalent			190	1.9		
Barium	N/Y/ /	N/N/N	5800	58		
Beryllium	N/Y/N/Y	N/N/Y	5.3	0.053	2500	500
Boron	Y/Y/ /	N/N/N	7850	78		
Cadmium	Y/Y/N/y	Y/Y/Y	1.1	0.011	250	1
Calcium	Y/ / /	N/N/N	116000	1160	n.a.	
Chromium, hexavalent[d]	Y/Y/N/y	Y/Y/Y	11	0.11	100	10
Chromium, trivalent			210	2.1	100	10
Cobalt	Y/Y/ /	N/N/N	10	0.1		
Copper	Y/Y/N/Y	Y/Y/Y	12	0.12	50000	100
Cyanide	Y/Y/ /	Y/Y/N	5.2	0.052		
Iron	Y/Y/ /	N/N/N	1000	10	n.a.	
Lead	Y/Y/N/Y	Y/Y/Y	3.2	0.032	15000	30
Lithium	Y/ / /	N/N/N	130	1.3		
Magnesium	N/ / /	N/N/N	82000	820	n.a.	
Manganese	Y/Y/ /	Y/N/N	41000	41		

Table 2 (continued)

Compound	Criteria exceeded[a]	Critical reaches[b]	Analytical sensitivity[c]			
			Water (μg/L)		Fish (mg/kg)	
	Water/ sediment/ fish (pisc.)/ fish (water)	Water/ sediment/ fish	Necessary	Desired	Necessary	Desired
Mercury, methyl[d]	Y/Y/Y/Y	Y/Y/Y	0.07	0.0007	0.1	0.01
Mercury, inorganic			0.26	0.0026	8	4
Molydenum	N/ / /	N/N/N	2350	23		
Nickel	Y/Y/N/y	Y/Y/Y	160	1.6	500	50
Niobium	?/ / /	N/N/N	?	?		
Phosphate	Y/ / /	N/N/N	25		n.a.	
Phosphorus, elemental[d]	Y/ / /	N/N/N	0.04	0.0004	n.a.	
Potassium	Y/ / /	N/N/N	53000	530	n.a.	
Selenium	Y/Y/Y/Y	N/Y/Y	35	0.35	5	1
Silicon	?	N/N/N	?	?	n.a.	
Silver	Y/Y/N/Y	N/Y/Y	0.12	0.0012	100	10
Sodium	Y/ / /	Y/N/N	68000	680	n.a.	
Strontium	N/Y/ /	N/N/N	42000	420		
Thallium	N/Y/y/N	N/N/Y	40	0.4	5	0.5
Thorium	N/Y/ /	N/N/N	565	5.6		
Tin	N/ / /	N/N/N	350	3.5		
Titanium	N/Y/ /	N/N/N	230	2.3		
Uranium	N/Y/ /	N/N/N	280	2.8		
Vanadium	Y/Y/ /	N/N/N	80	0.8		
Zinc	Y/Y/N/y	Y/Y/Y	110	1.1		
Zirconium	N/Y/ /	N/Y/N	140	1.4		
1,1,1 Trichloroethane	N/N/?/N	N/N/Y	9400	94	?	?
1,1,2,2-Tetrachloroethane	N/N/?/N	N/N/Y	2400	24	?	?
1,1,2-Trichloroethane	/N/?/N	N/N/Y	9400	94	?	?

Table 2 (continued)

Compound	Criteria exceeded[a]	Critical reaches[b])	Analytical sensitivity[c]			
			Water (μg/L)		Fish (mg/kg)	
	Water/ sediment/ fish (pisc.)/ fish (water)	Water/ sediment/ fish	Necessary	Desired	Necessary	Desired
1,1-Dichloroethane	N/N/?/N	N/N/Y	20000	200	?	?
1,1-Dichloroethylene	N/N/?/N	N/N/Y	11600	116	?	?
1,2,4-Trichlorobenzene	y/y/y/y	N/N/Y	50	0.5	1	0.3
1,2,5,6-Dibenzanthracene	/?/?/?	N/N/Y	?	?		3
1,2-Dichlorobenzene	y/N/Y/N	N/N/Y	763	7.6	1	0.3
1,2-Dichloroethane	N/N/?/N	N/N/Y	20000	200	?	?
1,2-Dichloropropane	N/N/?/N	N/N/Y	5700	57	?	?
1,2-Diphenylhydrazine	/?/?/?	N/N/Y	?	?	?	?
1,3-Dichlorobenzene	y/y/Y/N	N/N/Y	763	7.6	1	0.3
1,3-Dichloropropene	/ /?/	N/N/Y			?	?
1,4-Dichlorobenzene	y/y/Y/N	N/N/Y	763	7.6	1	0.3
2,4,6-Trichlorophenol	N/y/N/?	N/N/Y	970	9.7	3000	100
2,4-Dichlorophenol	y/y/N/?	N/N/Y	365	3.6	3000	100
2,4-Dimethylphenol	N/y/N/y	N/N/Y	2200	22	2700	90
2,4-Dinitrophenol	y/Y/y/?	N/N/Y	150	1.5	500	30
2,4-Dinitrotoluene	y/Y/Y/y	N/N/Y	230	2.3	1.5	0.05
2,6-Dinitrotoluene	y/Y/Y/y	N/N/Y	230	2.3	1.5	0.05
2-Chloroethyl vinyl ether	?/?/?/?	N/N/Y	?	?	?	?
2-Chloronaphthalene	y/?/Y/?	N/N/Y	440	4.4	1	0.3
2-Chlorophenol	N/y/N/?	N/N/Y	2000	20	3000	100
2-Nitrophenol	y/Y/N/?	N/N/Y	150	1.5	15000	240

Table 2 (continued)

Compound	Criteria exceeded[a]	Critical reaches[b]	Analytical sensitivity[c]			
			Water (μg/L)		Fish (mg/kg)	
	Water/ sediment/ fish (pisc.)/ fish (water)	Water/ sediment/ fish	Necessary	Desired	Necessary	Desired
3,3'-Dichlorobenzidine	?/?/Y/?	N/N/Y	?	?	1	0.3
4,6-Dinitro-ortho-cresol	y/?/Y/?	N/N/Y	150	1.5	63	4
4-Bromophenyl phenyl ether	y/N/?/?	N/N/Y	122	1.2	?	?
4-Chlorophenyl phenyl ether	y/y/Y/?	N/N/Y	122	1.2	1	0.3
4-Nitrophenol	y/Y/N/?	N/N/Y	150	1.5	1500	240
Acenaphthene	y/y/?/y	N/N/Y	520	5.2	?	3
Acenaphthalen	?	N/N/Y	?	?	?	?
Acrolein	/Y/?/N	N/N/Y	21	0.21	?	?
Acrylonitrile	/y/?/N	N/N/Y	2600	26	?	?
Aldrin	?	N/N/Y	?	?	?	?
Anthracene	?	N/N/Y	?	?	?	?
Benzene	N/N/?/N	N/N/Y	727	7.3	?	?
Benzidine	y/Y/N/Y	N/N/Y	25	0.25	430	30
Benzo(a)anthracene	?/?/?/?	N/N/Y	?	?	?	3
Benzo(b)fluoranthene	?	N/N/Y	?	?	?	3
Benzo(g,h,i)perylene	?	N/N/Y	?	?	?	3
Benzo(k)fluoranthene	?	N/N/Y	?	?	?	3
Benzo(a)pyrene	?/?/?/?	N/N/Y	?	?	?	3
Bis(2-chloroethoxy)methane	?/?/Y/?	N/N/Y	?	?	1	0.3
Bis(2-chloroethyl)ether	N/?/Y/?	N/N/Y	1900	19	1	0.3
Bis(2-chloroisopropyl)ether	N/?/Y/?	N/N/Y	1900	19	1	0.3
Bis(2-chloromethyl)ether		N/N/Y	1900	19	1	0.3
Bis(2-ethylhexyl)phthalate	Y/Y/N/Y	N/N/Y	3	0.03	2000	70
Bromoform	N/N/?/?	N/N/Y	4000	40	?	?

Table 2 (continued)

Compound	Criteria exceeded[a]	Critical reaches[b]	Analytical sensitivity[c]			
			Water (μg/L)		Fish (mg/kg)	
	Water/ sediment/ fish (pisc.)/ fish (water)	Water/ sediment/ fish	Necessary	Desired	Necessary	Desired
Carbon tetrachloride	N/N/?/N	N/N/Y	4000	40	?	?
Chlordane	/Y/?/y	N/N/Y	0.0043	0.000043	?	?
Chlorobenzene	y/y/N/N	N/N/Y	50	0.5	1	0.3
Chlorodibromomethane	/N/?/N	N/N/Y	4000	40	?	?
Chloroethane	N/N/?/N	N/N/Y	20000	20	?	?
Chloroform	N/N/?/N	N/N/Y	1240	12	?	?
Chrysene	?	N/N/Y	?	?	?	?
Dichlorobromomethane	N/N/?/N	N/N/Y	4000	40	?	?
Dichlorodifluoromethane	/N/?/N	N/N/Y	4000	40	?	?
Dieldrin	/Y/?/y	N/N/Y	0.0019	0.000019	?	?
Diethylphthalate	Y/Y/N/Y	N/N/Y	3	0.3	50000	2000
Dimethylphthalate	Y/Y/N/?	N/N/Y	3	0.3	50000	2000
Di-n-butylphthalate	Y/Y/N/Y	N/N/Y	3	0.3	50000	2000
Di-n-octylphthalate	Y/Y/N/y	N/N/Y	3	0.3	50000	2000
Endosulfan, alpha	/Y/?/?	N/N/Y	0.056	0.00056	?	?
Endosulfan, beta	/Y/?/?	N/N/Y	0.056	0.00056	?	?
Endosulfan, sulphate	/Y/?/?	N/N/Y	0.056	0.00056	?	?
Endrin	/Y/?/Y	N/N/Y	0.0023	0.000023	?	?
Endrin aldehyde	?	N/N/Y	?	?	?	?
Ethylbenzene	y/N/?/N	N/N/Y	440	4.4	?	?
Fluoranthene	Y/y/?/Y	N/N/Y	5	0.05	?	3
Fluorene	Y/Y/?/y	N/N/Y	6	0.06	?	3
Freon	?	N/N/N	?	?		
Heptachlor	/Y/?/y	N/N/Y	0.0038	0.000038	?	?

Table 2 (continued)

Compound	Criteria exceeded[a]	Critical reaches[b]	Analytical sensitivity[c]			
			Water (μg/L)		Fish (mg/kg)	
	Water/ sediment/ fish (pisc.)/ fish (water)	Water/ sediment/ fish	Necessary	Desired	Necessary	Desired
Heptachlor epoxide	?	N/N/Y	?	?	?	?
Hexachlorobenzene	y/y/Y/?	N/N/Y	38	0.38	1	0.3
Hexachlorobutadiene	u/y/Y/?	N/N/Y	9.3	0.093	1	0.3
Hexachlorocyclohexane, alpha	?	N/N/Y	?	?	1	0.3
Hexachlorocyclohexane, beta	?	N/N/Y	?	?	1	0.3
Hexachlorocyclohexane, delta	?	N/N/Y	?	?	1	0.3
Hexachlorocyclohexane, gamma	/Y/?/y	N/N/Y	2	0.02	1	0.3
Hexachlorocyclopentadiene	Y/y/Y/Y	N/N/Y	5.2	0.052	1	0.3
Hexachloroethane	y/y/Y/y	N/N/Y	540	5.4	1	0.3
Indeno (1,2,3-CD) pyrene	?	N/N/Y	?	?	?	3
Isophorone	N/y/N/y	N/N/Y	14000	140	3000	100
Methyl chloride	/N/?/?	N/N/Y	4000	40	?	?
Methyl bromide	/N/?/?	N/N/Y	4000	40	?	?
Methylene chloride	y/y/?/y	N/N/Y	4000	40	?	?
Naphthalene	y/y/?/y	N/N/Y	620	6.2	?	?
Nitrobenzene	N/y/y/?	N/N/Y	32000	320	50	2
n-Butylbenzyl phthalate	Y/Y/N/Y	N/N/Y	3	0.3	2000	70
n-Nitrosodimethylamine	y/Y/?/Y	N/N/Y	58	0.58	?	?
n-Nitrosodiphenylamine	y/Y/?/Y	N/N/Y	58	0.58	?	?
n-Nitrosodi-n-propylamine	y/Y/?/Y	N/N/Y	58	0.58	?	?
p,p'-DDD	/Y/Y/y	N/N/Y	0.001	0.00001	0.15	0.01
p,p'-DDE	/Y/Y/y	N/N/Y	0.001	0.00001	0.15	0.01
p,p'-DDT	/Y/Y/Y	N/N/Y	0.001	0.00001	0.15	0.01
Parachlorometa cresol	N/ /N/?	N/N/Y	2000	20	3000	100

Table 2 (continued)

Compound	Criteria exceeded[a]	Critical reaches[b]	Analytical sensitivity[c]			
			Water (μg/L)		Fish (mg/kg)	
	Water/ sediment/ fish (pisc.)/ fish (water)	Water/ sediment/ fish	Necessary	Desired	Necessary	Desired
PCBs	Y/Y/Y/N	N/N/Y	0.2	0.002	0.1	0.04
Pentachlorophenol	Y/y/y/y	N/N/Y	13	0.13	30	1
Phenanthrene	Y/Y/?/y	N/N/Y	3.7	0.037	?	3
Phenol(s)	N/Y/N/N	N/N/Y	2560	36	2700	90
Pyrene	?/?/?/?	N/N/Y			?	3
Tetrachloroethene	N/ / /	N/N/N	840	8.4		
Toluene	y/N/?/N	N/N/Y	230	2.3	?	?
Toxaphene	/Y/?/?	N/N/Y	0.0002	0.000002	?	?
trans-1,2-Dichloroethene	y/N/?/?	N/N/Y	2800	28	?	?
trans-1,2-Dichloropropene	N/ / /	N/N/N	240	2.4		
Trichloroethylene	N/ / /	N/N/N	21900	219		
Trichlorofluoromethane	/N/?/N	N/N/Y	4000	40	?	?
Vinyl chloride	?	N/N/N	?	?		

[a]Y indicates that the intermediate criterion for a medium is exceeded; y indicates that the lower criterion but not the intermediate criterion was exceeded; N indicates that no criteria were exceeded; ? indicates no toxicity data, bioaccumulation data, or K_{ow} data; and a blank indicates that the compound was not measured in the medium in any reach. Sediment maxima include all depths.

[b]Y indicates that the compound was measured in water or sediment in WOCC, PCE, and PCC, or in fish in WOCC and PCE. N indicates that not all of these critical reaches were measured.

[c]The necessary levels of sensitivity are the intermediate criteria and the desired levels of sensitivity are the lower criteria. A ? indicates no toxicity data, n.a. indicates chemicals with no significant dietary toxicity, and a blank indicates that the compound was not measured in that medium.

[d]The codes for criteria exceeded and reaches measured are based on total analyses, not the indicated chemical species.

of the lower criteria for water and sediments relative to the intermediate criteria (chronic NWQC) had little effect on the results. Very few chemical concentrations in water or sediments exceeded the lower criterion without also exceeding the intermediate criterion (Table 2). (6) In the following discussion the intermediate criteria for concentrations in water are referred to as "chronic NWQC" or "estimated chronic NWQC" and the upper criteria for concentrations in water are referred to as "acute NWQC" or "estimated acute NWQC" to emphasize the relationship of the reported concentrations to standard benchmarks. However, the reader should bear in mind that these results include water concentrations from nonstandard sampling and analysis methods and water concentrations estimated from sediment or fish tissue concentrations. Therefore, violations of standards are not implied by exceedances of these criteria.

4.1 RESULTS FOR METALS AND TOXIC INORGANIC CHEMICALS

Aluminum. Maximum concentrations of aluminum in WOCC and PCE water are above the upper criterion (proposed acute NWQC), and in WBR they are above the intermediate criterion (proposed chronic NWQC). Aluminum has not been measured in water in other reaches or in fish flesh in any reach.

Antimony. The detection limits for antimony in fish tissues are above the lower screening criterion for piscivores but below the intermediate criterion (the level that caused liver damage).

Arsenic. The maximum concentration of arsenic in WOCC water is above the acute NWQC, and in MHR it is above the chronic NWQC. Other analyzed reaches (PCE and PCC) have much lower maximum aqueous concentrations. However, analysis of fish tissues suggests that the fish in PCE and PCC have been exposed to potentially toxic concentrations of arsenic. These conclusions are based on the assumption that the arsenic is pentavalent. If it is trivalent, MHR and WOCC maximum water concentrations still exceed chronic NWQC, and the maximally contaminated fish in PCE were still apparently exposed to arsenic concentrations exceeding the chronic NWQC. Arsenic does not appear to pose a risk to piscivorous wildlife.

Boron. The maximum concentration of boron in PCE water exceeded the estimated chronic NWQC. It was not measured in water in other reaches or in fish tissues.

Calcium. The maximum aqueous calcium concentration in PCE, but not WBR, exceeded the estimated chronic NWQC. It was not measured in water in other reaches, and calcium concentrations are not pertinent to other media.

Cadmium. The maximum aqueous concentration of cadmium in PCE exceeded the acute NWQC. The chronic NWQC was exceeded by the maximum concentration in PCC, but not WOCC or PC. Detection limits exceeded cadmium criteria in MHR and WOCC. Fish tissue concentrations of cadmium suggest exposures that are considerably lower than the maximum measured aqueous concentrations in PCE and PCC and lower than chronic NWQC. Cadmium does not appear to pose a risk to off-site piscivorous wildlife. Cadmium appears to be slightly enriched in WOCC sediments relative to other reaches.

Chromium. The maximum concentration of chromium in MHR, WOCC, PCE, and PCC waters exceeded the acute NWQC, assuming that the chromium is hexavalent. All concentrations are below criteria for trivalent chromium. The maximum aqueous concentration in PC was below both criteria for both forms. Fish tissue concentrations of chromium suggest exposures that are considerably lower than the maximum measured aqueous concentrations in MHR, WOCC, PCE and PCC, and lower than chronic NWQC for both forms. However, the bioaccumulation factor for chromium is not well defined. Chromium does not appear to pose a risk to piscivorous wildlife. Chromium concentrations were elevated in WOCC and PCE relative to other reaches.

Cobalt. The detection limit for cobalt in PCE water exceeded the chronic NWQC, but the concentration in WOCC was below the chronic NWQC. Cobalt was not analyzed in sediment or fish flesh.

Copper. The maximum aqueous concentration of copper in MHR, WOCC, PCE, and PCC exceeded the acute NWQC. The chronic NWQC was exceeded in PC. The maximum concentration in WBR was below both criteria. Fish tissue concentrations of copper suggest exposures that are considerably lower than the maximum measured aqueous concentrations in MHR, WOCC, PCE and PCC, but still higher than the chronic NWQC in WOCC and PCE. Sediment

maximum and surface maximum (the highest concentration in a surface sample) concentrations of copper appear to be elevated in PCE.

Cyanide. The maximum aqueous concentration of cyanide in WOCC, PCE, PCC, and PC exceeded the chronic NWQC. Cyanide was not measured in any of the negative reference reaches or in fish tissues.

Iron. The maximum aqueous concentration of iron in WOCC, PCE, and WBR exceeded the chronic NWQC. The maximum iron concentration in MHR was less than one-tenth of that in WOCC and PCE, suggesting enrichment by sources on these creeks. Iron was not measured in any of the negative reference reaches or (for obvious reasons) in fish tissues.

Lead. The maximum concentration of lead in PCE water exceeded the acute NWQC. The chronic NWQC was exceeded in WOCC, PCC, and PC. The detection limit for lead in MHR was above the chronic NWQC, and lead was not measured in any negative reference reach. Concentrations in fish tissues suggest exposures much lower than the maximum measured aqueous concentrations, but the maximum concentration in MHR fish suggests an exposure concentration that exceeded the chronic NWQC. Except for the maximum concentration in PCE water, lead concentrations are similar among reaches for each medium.

Mercury. The maximum concentration of mercury in MHR water exceeded the acute NWQC. The intermediate criterion (estimated chronic NWQC) was exceeded in WOCC, PCE, PCC, and PC. Fish tissue concentrations suggest much lower exposure concentrations than the measured maximum water concentrations, but maximum tissue concentrations in PC, PCE, and PCC suggest exposure concentrations exceeding the intermediate criterion. The maximum tissue concentration in PCE exceeded the tissue concentration found in fathead minnows displaying toxic effects of chronic exposures to inorganic mercury (Snarski and Olson 1982). Pore-water concentrations estimated by applying the site-specific distribution coefficient to the maximum surface sediment concentrations exceed the intermediate criterion in WOCC, PCE, PCC, and WBR. Pore-water concentrations estimated from the maximum surface sediment concentrations in MHR and NR exceeded the lower screening criterion. Pore-water concentrations estimated from maximal and mean sediment concentrations over the sampled sediment columns exceed the intermediate criterion for all reaches except for the means in MHR and NR,

which exceed the lower screening criterion. Concentrations in MHR and NR sediments are less than one-tenth of the corresponding concentrations in other reaches. Mean mercury concentrations in fish are above the lower screening criterion for piscivorous wildlife in all reaches. Even without the correction for whole-fish concentrations, they exceed the concentration that reduces avian reproduction in PC, PCE, PCC, EF, and WOL. The maximum concentrations in fish from PCE and PCC exceed the dietary lethal concentration for mink.

Nickel. The maximum concentration of nickel in PCE water exceeded the acute NWQC. Neither NWQC was exceeded in other reaches.

Phosphorus. The maximum concentration of phosphorus in PCE water exceeded the acute WQC for elemental phosphorus. It is highly likely that the reported phosphorus appeared in other forms, which are much less toxic. Phosphorus was not measured in other reaches or media.

Phosphate. The maximum aqueous concentration of phosphate in PCE far exceeded the concentration of 25 μg/L that is sufficient to cause nuisance algal blooms.

Potassium. The maximum concentration of potassium in PCE water exceeded the estimated chronic NWQC. It was not measured in other reaches.

Selenium. The detection limit for selenium in PCE water exceeded the chronic NWQC. The maximum concentration in MHR was slightly below the chronic NWQC. Concentrations in fish tissues imply higher exposures (based on bioaccumulation factors) than the reported water concentrations, suggesting possible food-chain accumulation. Mean tissue concentrations in MHR, WOCC, PCE, PCC, and EF imply exposure concentrations in excess of chronic NWQC, and maximum tissue concentrations in PCC imply exposure in excess of acute NWQC. The maximum fish tissue concentrations in PCC and the maximum concentration in MHR exceed the intermediate criterion for piscivorous wildlife. Selenium concentrations in water appear to be elevated in WOCC, PCE, and PCC, relative to MHR and WBR.

Silver. The maximum concentration of silver in PCE water and the detection limit in WOCC exceeded the estimated acute NWQC. Concentrations in fish tissues imply higher exposures than the water concentrations, suggesting possible foodchain accumulation. Mean tissue concentrations

in MHR, WOCC, and PCE imply exposure concentrations in excess of the chronic NWQC, and maximum tissue concentrations in MHR imply exposure in excess of the acute NWQC. Sediment concentrations of silver appear to be elevated in WOCC and PCE.

Sodium. The maximum aqueous concentration of sodium in PCE exceeded the estimated chronic NWQC.

Thallium. The mean concentration of thallium in fish flesh from MHR exceeded the lower criterion for piscivores, and the limit of detection in other reaches exceeded that criterion.

Uranium. The maximum aqueous concentration of uranium in PCE exceeded the estimated chronic NWQC, and uranium concentrations are elevated in PCE relative to other reaches.

Vanadium. The detection limit for vanadium in PCE exceeded the estimated chronic NWQC.

Zinc. The maximum concentrations of zinc in WOCC, PCE, and PCC exceeded the acute NWQC. Maximum concentrations in MHR, WBR, and PC were below both criteria. The concentrations of zinc in fish tissues imply exposure concentrations that are somewhat lower than the maximum water concentrations, are quite consistent among reaches, and are below the chronic NWQC.

4.2 RESULTS FOR ORGANIC CHEMICALS

Acrolein. The detection limit for acrolein in sediment corresponds to an estimated pore-water concentration that exceeds the acute NWQC.

Benzidine. The detection limit for benzidine in sediment corresponds to an estimated pore-water concentration that exceeds the acute NWQC.

Chlordane. The limit of detection for chlordane in sediment corresponds to an estimated pore-water concentration that exceeds the acute NWQC.

Chlorinated aromatics. Several chlorinated aromatic compounds have detection limits in fish flesh that exceed the intermediate criterion for effects of the class on piscivorous wildlife.

DDT. *p,p'*DDT was detected in fish tissues in MHR and WOCC at maximum concentrations that imply aqueous exposures above the intermediate

criterion (chronic NWQC) and mean concentrations above the lower criterion. The body burdens are below concentrations that have been associated with overt toxic effects on fish (EPA 1980c), but in MHR they approximately equal the lower criterion. Because DDT is no longer legally used and because of its hydrophobic properties and its tendency to biomagnify, it is likely that these concentrations result from feeding on benthic organisms rather than bioconcentration. The maximum concentration in fish flesh from MHR exceeds the intermediate criterion for piscivores, and mean concentrations in MHR and WOCC barely exceed the lower criterion for piscivores.

Dieldrin. The limit of detection for dieldrin in sediment corresponds to an estimated pore-water concentration that is above the chronic NWQC.

Dinitrotoluene. The detection limits for the 2,4 and 2,6 isomers of dinitrotoluene in sediment correspond to estimated pore-water concentrations that exceed the chronic NWQC.

Endosulfan isomers. The limit of detection for endosulfan in sediment corresponds to an estimated pore-water concentration that exceeds the acute NWQC.

Endrin. The limit of detection for endrin in sediment corresponds to an estimated pore-water concentration that exceeds the acute NWQC. The detection limit in fish flesh corresponds to an estimated fish exposure concentration in excess of the chronic NWQC.

Heptachlor. The limit of detection for heptachlor in sediment corresponds to an estimated pore-water concentration that exceeds the chronic NWQC.

Hexachlorocyclopentadiene. The limit of detection for hexachlorocyclopentadiene in PCE water was above the acute NWQC. The detection limits in fish flesh correspond to an estimated fish exposure concentration in excess of the chronic NWQC.

Nitrophenol. The detection limit for 4-nitrophenol in sediment corresponds to an estimated pore-water concentration that exceeds the chronic NWQC.

Nitrosamines. The detection limits for nitrosamines in sediment correspond to estimated pore-water concentrations that exceed either the

acute NWQC or the intermediate criterion, depending on the particular nitrosamine.

Pentachlorophenol. The maximum concentration of pentachlorophenol in PCE water exceeded the acute NWQC.

Phenols. The maximum, surface maximum, and mean concentrations of phenols in MHR sediments correspond to estimated pore-water concentrations in excess of the acute NWQC for phenol.

Phthalate esters. The limits of detection for phthalate esters in PCE water were above the chronic NWQC. The limits of detection in sediments correspond to estimated pore-water concentrations that exceed acute NWQC. Phthalate esters that were detected appear to be elevated in sediments from PCE.

Polychlorinated biphenyls (PCBs). The detection limit for PCBs in WOCC and PCE waters exceeded the chronic NWQC. In sediment, only PCBs 1254 and 1260 exceeded detection limits, and the estimated pore-water concentrations for both exceeded the intermediate criterion (chronic NWQC) in the WOCC. In other reaches, sediment concentrations were below detection limits and above lower and intermediate criteria. Aqueous exposure concentrations for fish estimated from the maximum fish tissue concentrations suggest that fish exposures to PCBs have been below the lower criterion in MHR, WOCC, PCE, PCC, WBR, TR, and WOL. Maximum total PCB, PCB 1254, and PCB 1260 concentrations in fish exceeded the intermediate and lower screening criteria for piscivores in all measured reaches, and mean fish concentrations exceed both criteria in all but MHR and TR, where only the lower criterion was exceeded.

4.3 SUMMARY OF RESULTS

The reported maximum aqueous concentrations of aluminum, arsenic, boron, calcium, cadmium, chromium, copper, cyanide, lead, lithium, mercury, nickel, silver, sodium, uranium, and zinc exceeded acute or chronic NWQC or estimated equivalent values in off-site reaches that are influenced by DOE Oak Ridge facilities (WOCC, PCE, PCC). In addition, the maximum aqueous concentration of pentachlorophenol exceeded the acute NWQC, and PCB concentrations exceeded the chronic NWQC in WOCC and PCE. Application of bioaccumulation factors to concentrations of arsenic,

cadmium, copper, lead, selenium, and silver in fish tissues appears to confirm that exposures to high aqueous concentrations have occurred. However, concentrations of chromium, mercury, nickel, zinc, and PCBs in fish tissues suggest exposure concentrations that are lower than NWQC. These results suggest that toxic effects have occurred in these waters. The magnitude and extent of these effects cannot be estimated because the form of the chemicals and their temporal and spatial distributions are undefined. Because the measurements may include biologically unavailable forms of the chemicals, the effects may be much smaller than these results suggest.

As was discussed earlier, the available sediment concentrations for metals other than mercury are uninterpretable. Estimated pore-water concentrations of mercury exceed chronic NWQC, suggesting that benthic organisms are affected. Intermediate criteria were also exceeded by the maximum estimated pore-water concentrations of Bis(2-ethylhexyl)phthalate in PCE and of phenanthrene in PCE and PCC. The detection limits for many organic chemicals would result in pore-water concentrations that greatly exceed NWQC.

Fish tissue concentrations of mercury are sufficient to cause toxic effects in piscivorous wildlife in all measured reaches including TR, but particularly in PCE and PCC. Selenium in fish from PCC and thallium in fish from MHR may be toxic to wildlife. DDT in the most contaminated fish from MHR and WOCC is sufficient to cause eggshell thinning in piscivorous birds. Mean PCB concentrations in fish are sufficient to cause reproductive failure in mink in all reaches but MHR and TR, and mean fish concentrations in those reaches are barely below the observed-effects level. These results indicate that piscivorous wildlife along the Clinch River are at risk.

Although this screening assessment was intended primarily to eliminate chemicals from further consideration, it has eliminated relatively few. Metals in general cannot be eliminated because of the inability to interpret sediment concentrations and the high concentrations of several metals in water, sediment, and fish flesh, discussed above. Most of the organic chemicals measured in water were undetected and below screening criteria. However, only chloroform, bromodichloromethane,

phenols, and total PCBs were measured in any reach other than PCE, and they were measured only in WOCC. Therefore, organics in water can not be eliminated. Most priority organics were measured in sediments from MHR, WOCC, PCE, PCC, and NR. Most were undetected, and some can be eliminated because the quotients in Tables A-3 through A-5 have negative exponents (i.e., the estimated pore-water concentration is below the lower criterion), but many are not eliminated. Most priority organics were measured in fish flesh from MHR, WOCC, and PCE, but not from reference reaches. Most were undetected, and many can be eliminated because the quotients in Tables A-6 and A-7 all have negative exponents, but it is not possible to determine whether concentrations are elevated or what the sources are because of the absence of reference values. Finally, the occurrence of several chemicals in multiple media at potentially toxic concentrations raises the issue of combined toxic effects that are greater than those induced by any single chemical. Given these results, it is advisable to deemphasize the measurement of sources of exposure relative to the measurement of biological indicators of exposure and effects.

These results are compared to the results of screening for human health effects in Hoffman et al. (1990). Some chemicals are high priority for ecological effects but not human effects including aluminum, copper, lead, and manganese. Others such as mercury are of high priority in more reaches for ecological effects than for human effects. Several other chemicals are high priority for health effects but not ecological effects.

5. DATA NEEDS FOR ECOLOGICAL RISK ASSESSMENT

Although the off-site risk assessment is logically retrospective (i.e., it is concerned with the ongoing effects of past releases), this screening assessment is based on predictive risk assessment methods (i.e., it uses data concerning potential sources of exposure to predict the effects). The actual ecological risk assessment will use an epidemiological approach, in which sources, exposure, and possible effects are measured, and the results are used to determine (1) whether effects are occurring, (2) whether the effects are caused by particular sources, (3) what the actual magnitude and extent of effects are, and (4) what the consequences of remedial alternatives might be.

5.1 DATA NEEDS FOR SOURCE CHARACTERIZATION

The screening assessment is primarily useful in characterizing the sources (contaminated water, sediment, soil, and foodchain species). All of the sources are incompletely characterized, and some are not characterized in ways that are useful for ecological risk assessment. Problems with the source characterization include the following: (1) Whole-sediment concentrations are not directly useful for assessing ecological effects, and, in the case of metals, they are not even indirectly useful. Measurement of chemical concentrations in sediment pore water (or elutriate if pore-water sampling is not feasible) rather than digests of whole dry sediment would be directly applicable to estimating exposure and effects in benthic organisms. If pore water or elutriates cannot be analyzed in all samples, they must be analyzed in enough samples to establish site-specific distribution coefficients. (2) The form and species of chemicals in water are not characterized. At least, the metals that have separate NWQC for each species (chromium and arsenic) should be analyzed by species. Also, water analyses should be done for dissolved forms. (3) Fish body burdens as a source of exposure for piscivorous wildlife are not appropriately characterized. The analyses of "edible portions" for human consumption do not represent the exposure of piscivorous wildlife that consume the whole fish. Some whole-fish analyses should be performed to establish the ratios of whole fish

to edible portion concentrations. (4) Much of the data is not useful because it is reported as "undetected" or "<X." Although some of these results represent chemicals that were genuinely undetected, others represent cases in which the chemical was detected but could not be quantified accurately. Risk assessments would be greatly improved if the results of such analyses were reported as the best estimate of the concentration plus an estimate of observation error (Porter et al. 1988). (5) The analyses are quite inconsistent among reaches. The comparisons among reaches that are needed to identify the sources of contamination are not possible unless the chemicals of concern are all analyzed in all media and reaches. Also, the sampling intensity should be the same in all reaches or should be sufficient to completely characterize the reaches.

Ideally, the characterization of off-site sources of exposure would begin with a list of chemicals that have been emitted from point sources or deposited in leaky waste sites and would then proceed to reduce that list by analysis of ambient media. However, neither emissions nor wastes have been sufficiently characterized, so the ambient monitoring must address the entire priority pollutant list plus radionuclides. As discussed above, the priority pollutants have been irregularly monitored and measurement methods have not always been appropriate, so it is difficult to identify chemicals that can be shown to pose no environmental risk. In addition, the toxicity of many chemicals has not been sufficiently characterized. However, examination of Table 2 reveals some chemicals in some media that do not need to be analyzed for assessment of ecological risks. If a chemical was measured in the reaches that are most influenced by DOE emissions and did not exceed criteria, it can be eliminated. The critical reaches are judged to be WOCC, PCE, and PCC. Hence, chemicals can be eliminated that, for a particular medium, have an N(o) for criteria exceedance and a Y(es) for measurements in critical reaches. For example, 4-bromophenyl phenyl ether does not exceed criteria in sediments and was measured in sediments from the critical reaches, so new measurements in sediment are not needed.

5.2 DATA NEEDS TO CHARACTERIZE EXPOSURE

Exposure can be characterized by analysis of measured body burdens and biomarkers that are diagnostic of exposure to particular contaminants or classes of contaminants. Body burdens in fish can be used to estimate the degree of exposure of fish to chemicals. The analyses should be whole-body or, if target organs have been identified, organ-specific, not "edible portions." Also, as with the analyses of sources, the sampling and analysis need to be more consistent among reaches. Biomarkers of exposure may be analyzed in the off-site biological samples, but they have not been selected. Given the evidence that piscivorous wildlife are at risk, it would be desirable to also monitor them. This is difficult in general because they are not abundant. However, a great blue heron rookery near the ORGDP could be monitored for contamination of food and eggshells, and young birds that fall from the nests could be examined for signs of effects and chemically analyzed to estimate exposure.

5.3 DATA NEEDS TO CHARACTERIZE EFFECTS

Effects on assessment end points (e.g., reduction in fish populations and reduction in the reproductive output of bald eagles) can be estimated in three ways. The most direct and potentially the most reliable way is to measure the end point responses in the receiving environment (e.g., measure the abundance of fish populations), but these effects are difficult to measure because the natural variability in population-level characteristics tends to mask small effects and may even mask large effects. However, it is important to measure the end point responses because the measurements may reveal apparent effects, and, even if they do not, they can provide an upper bound on the magnitude of effects that could be occurring. The available information on the biota of the off-site receiving communities is sufficient to indicate that DOE's emissions have not had a catastrophic effect on those communities. However, that information is not sufficient to determine whether populations have been affected. The measures of effects on fish have not yet been chosen.

A less direct way of estimating effects on assessment end points is to infer those effects from measurements of effects on organismal and

suborganismal characteristics. Two sorts of indirect measures are useful. First, measures of toxic effects are needed that can be used to estimate the magnitude of effects on the end points. For example, measurements of growth rates of individual fish can contribute to the estimation of population productivity. Second, it is desirable to have diagnostic measures of effects to help identify the causes of observed overt effects. Indirect measures of effects will be obtained from fish and may be obtained from piscivorous wildlife.

6. APPROACHES FOR ECOLOGICAL RISK ASSESSMENT

Two approaches for ecological risk assessment will be employed for the later phases of the off-site assessment project. First, data concerning concentrations of chemicals in water, sediments, and fish will be used to refine the lists of chemicals of concern. The refinement will result from use of new data and from refinement of the assumptions used to develop the criteria. For those organisms such as piscivorous wildlife that are not currently included in the biological monitoring, this is the only basis for assessment.

Because indicators of effects will be measured in fish, it will be possible to employ an epidemiological approach to assess effects on fish. This approach will use the indicators of effects and supporting data to answer the following four questions:

(1) Are real toxicological effects occurring? That is, is there evidence that the fish exposed to DOE emissions are injured? Answering this question will require establishing that there are specific injuries or signs of debility in the fish that are not normal for the species and habitat type, or that species of fish that should occur in the habitat are not present or are present in very low numbers relative to their expected abundance. Thus, habitat analysis and establishing the "normal" state of health of the fish would be required.

(2) What is the cause of the effects? Establishing that the effects (if any) are caused by DOE effluents will require satisfying Koch's postulates, as modified for toxic effects (Suter, in press). First, a regular association must be established between the effects and the source. This requires that a particular effects syndrome be identified and that the syndrome be found regularly in fish exposed to the DOE effluents and not in reference reaches (i.e., those that are clean or at least are exposed to effluents that are not similar to the DOE effluents). Second, the fish that display the effects must also display evidence of exposure (i.e., body burdens or biomarkers of exposure). Third, the pollutants must be shown to induce effects in controlled exposures (i.e., toxicity tests). To establish the toxicity of existing water and sediment, the toxicity of these whole media can be tested in the

laboratory. If toxicity is demonstrated, then it is desirable to determine which components are responsible for the toxicity. This can be done by comparing the concentrations of chemicals in the media to existing toxicity data or by tests of spiked site water or sediment. Fourth, to establish the relevance of the controlled exposures to the observed effects in the field, it should be shown that the same effects occurred at similar levels of exposure in the laboratory and field. If there is good evidence that fish are being affected but this analysis indicates that the effects are not attributable to direct toxic effects, other causes should be considered. In particular, toxic effects on foodchain organisms should be investigated.

(3) What are the magnitude and extent of the effects? This question might be answered in a variety of ways depending on the nature of the effects and the data supporting the attribution of effects to pollution. If end point effects are measured in the field, then the problem is to describe the distribution of those effects in space and relative to concentrations of individual pollutants or indices of multiple pollutant exposure. If effects are shown to occur at the organismal or suborganismal levels, then the relationship between the lower-level effects and the population-level end points must be established before the distribution of effects can be described. It may be desirable to use results of water or sediment toxicity tests, rather than measurements of field-collected organisms, to establish the distribution of effects.

(4) What are the ultimate consequences of potential remedial actions? Ultimately, if significant ecological effects are shown to be occurring, it will be necessary to consider the consequences of alternative remedial actions on the magnitude and extent of effects. This will be done by using the models developed to describe the current effects (i.e., to answer question 3) to extrapolate into the future.

7. REFERENCES

Adams, W. J., P. S. Ziegenfuss, W. J. Renaudette, and R. G. Mosher. 1985. Comparison of laboratory and field methods for testing the toxicity of chemicals sorbed to sediments. pp. 494-513. IN T. M. Posten and P. E. Purdy (eds.), Aquatic Toxicology and Environmental Fate: Ninth Volume, ASTM STP 921. American Society for Testing and Materials, Philadelphia.

Anderson, D. W., J. R. Jehl Jr., R. W. Riesbrough, L. A. Wood Jr., L. R. Deweese, and W. G. Edgecomb. 1975. Brown pelicans: Improved reproduction off the Southern California coast. Science 190:806-808.

Barnthouse, L. W., G. W. Suter II, A. E. Rosen, and J. J. Beauchamp. 1987. Estimating responses of fish populations to toxic contaminants. Environ. Toxicol. Chem. 6:811-824.

Barnthouse, L. W., J. E. Breck, T. D. Jones, G. W. Suter, II, C. Easterly, L. R. Glass, B. A. Owen, and A. P. Watson. 1988. Relative toxicity estimates and bioaccumulation factors for the defense priority model. ORNL-6416. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Barnthouse, L. W., G. W. Suter II, and A. E. Rosen. 1990. Risks of toxic contaminants to exploited fish populations: Influence of life history, data uncertainty, and exploitation intensity. Environ. Toxicol. Chem. 9:297-311.

Bentley, R. E., J. W. Dean, T. A. Hollister, G. A. LeBlanc, S. Sauter, B. H. Sleight III, and W. G. Wilson. 1978. Laboratory evaluation of the toxicity of elemental phosphorus (P_4) to aquatic organisms. Defense Technical Information Center, Alexandria, Virginia.

Biesinger, K. E., and G. M. Christensen. 1972. Effects of various metals on survival, growth, reproduction, and metabolism of Daphnia magna. J. Fish. Res. Board Can. 29:1691-1700.

Blaylock, B. G., and J. R. Trabalka. 1978. Evaluating the effects of ionizing radiation on aquatic organisms. Adv. Radiat. Bio. 7:103-152.

Blaylock, B. G., M. L. Frank, C. R. Olsen, and R. R. Turner. Estimates of the concentration of mercury in bluegill (Lepomis macrochirus) in the lower end of Watts Bar Reservoir from 1946 to 1988 and potential health risks to humans. Oak Ridge National Laboratory, Oak Ridge, Tennessee (in review).

Bleavins, M. R., R. J. Aulerich, and R. K. Ringer. 1983. Hexachlorobenzene-induced effects on the lymphocyte blastogenic response to concanavalin A in the mink and European ferret. Environ. Toxicol. Chem. 2:411-418.

Brumbaugh, W. G., and D. A. Kane. 1985. Variability of aluminum concentrations in organs and whole bodies of smallmouth bass (Microprus dolomieui). Environ. Sci. Technol. 19:828-831.

Cairns, M. A., and A. V. Nebeker. 1982. Toxicity of acenaphthene and isophorone to early life stages of fathead minnows. Arch. Environm. Contam. Toxicol. 11:703-707.

Call, D. J., L. T. Brooke, N. Ahmad, and J. E. Richter. 1983. Toxicity and metabolism studies with EPA priority pollutants and related chemicals in freshwater organisms. EPA-600/3-83-095. National Technical Information Service, Springfield, Virginia.

Cushman, R. M., S. G. Hildebrand, R. H. Strand, and R. M. Anderson. 1977. The toxicity of 35 trace elements in coal to freshwater biota: A data base with automated retrieval capabilities. ORNL/TM-5793. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

DiToro, D. M. 1985. A particle interaction model of reversible organic chemical sorption. Chemosphee 14:1503-1538.

Eisler, R. 1985. Selenium hazards to fish, wildlife, and invertebrates: A synoptic review. U.S. Fish and Wildlife Service Biological Report 85/1.5. Laurel, Maryland.

Eisler, R. 1986. Chromium hazards to fish, wildlife, and invertebrates; A synoptic review. U.S. Fish and Wildlife Service Biological Report 85/1.6. Laurel, Maryland.

Eisler, R. 1987a. Mercury hazards to fish, wildlife, and invertebrates: A synoptic review. U.S. Fish and Wildlife Service Biological Report 85/1.10. Laurel, Maryland.

Eisler, R. 1987b. Polycyclic aromatic hydrocarbon hazards to fish, wildlife, and invertebrates: A synoptic review. U.S. Fish and Wildlife Service Biological Report 85/1.11. Laurel, Maryland.

Eisler, R. 1988. Lead hazards to fish, wildlife, and invertebrates; A synoptic review. U.S. Fish and Wildlife Service Biological Report 85/1.14. Laurel, Maryland.

Environmental Protection Agency (EPA). 1976. Quality criteria for water. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980a. Ambient water quality criteria for thallium. EPA 440/5-80-074. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980c. Ambient water quality criteria for DDT. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980d. Ambient water quality criteria for polychlorinated biphenyls. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980e. Ambient water quality criteria for benzidine. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980f. Ambient water quality criteria for nitrophenols. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980g. Ambient water quality criteria for polynuclear aromatic hydrocarbons. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980h. Ambient water quality criteria for naphthalene. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980i. Ambient water quality criteria for chlorinated benzenes. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980j. Ambient water quality criteria for phthalate esters. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980k. Ambient water quality criteria for nitrobenzene. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980l. Ambient water quality criteria for nitrosamines. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980m. Ambient water quality criteria for isophorone. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980n. Ambient water quality criteria for phenol. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980o. Ambient water quality criteria for 2-chlorophenol. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980p. Ambient water quality criteria for chlorinated phenols. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980q. Ambient water quality criteria for pentachlorophenol. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980r. Ambient water quality criteria for beryllium. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980s. Ambient water quality criteria for benzene. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980t. Ambient water quality criteria for chlorinated naphthalene. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980u. Ambient water quality criteria for chloroalkyl ethers. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980v. Ambient water quality criteria for dichloroethylenes. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980w. Ambient water quality criteria for ethylbenzene. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980x. Ambient water quality criteria for halomethanes. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1980y. Ambient water quality criteria for toluene. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1984a. Health effects assessment for lead. EPA 540/1-86-055. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1984b. Health effects assessment for chlorinated benzenes. EPA 600/8-84-015F. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1985. Ambient water quality criteria for arsenic—1094. EPA 440/5-84/033. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1986a. Quality criteria for water—1986. EPA 440/5-86-001. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1986b. Health effects assessment for arsenic. EPA 540/1-86-020. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1987. Health effects assessment for beryllium. EPA 660/8-84-026F. NTIS, Springfield, Virginia.

Environmental Protection Agency (EPA). 1988a. Aquatic information retrieval toxicity data base (ACQUIRE). Duluth, Minnesota.

Environmental Protection Agency (EPA). 1988b. Water quality criteria: Request for comments. Fed. Regist. 53:33177-33179.

Etnier, E. L. 1986. Water quality criteria for 2,4-dinitrotoluene and 2,6-dinitrotoluene. ORNL-6312. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Fuller, G. B., and W. C. Hobson. 1986. Effects of PCBs on reproduction in mammals. pp. 101-122. IN J. S. Waide (ed.), PCBs and the Environment, Vol. II. CRC Press, Boca Raton, Florida.

Hamilton, R. P., M. R. S. Fox, B. E. Fry, A. O. L. Jones, and R. M. Jacobs. 1979. Zinc interference with copper, iron, and manganese in young Japanese quail. J. Food Sci. 44:738.

Heinz, G. H., S. D. Hazeltine, and L. Sileo. 1983. Altered avoidance behavior of young black ducks fed cadmium. Environ. Toxicol. Chem. 2:319-421.

Hoffman, F. O., B. G. Blaylock, M. L. Frank, L. Hook, E. L. Etnier, and S. S. Talmage. 1990. Screening of contaminants in the off-site environment. ORNL/ER-9. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Holdway, D. A., and J. B. Sprague. 1979. Chronic toxicity of vanadium to flagfish. Water Res. 13:905-910.

International Joint Commission of the United States and Canada. 1988. Great Lakes Water Quality Agreement. Amended by protocol signed November 18, 1987. Ottawa, Canada.

Jones, C. G., L. E. McNeese, C. L. Baker, L. D. Bates, C. W. Snodgrass, and L. E. Stratton. 1990. Environmental restoration and waste management site-specific plan for the Oak Ridge Reservation. K/ESH-1. Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee.

Kenaga, E. E. 1973. Factors to be considered in the evaluation of the toxicity of pesticides to birds in the environment. Environ. Qual. Saf. 2:166-181.

Kroodsma, R. L. 1987. Resource management plan for the Oak Ridge Reservation: Volume 24: Threatened and endangered animal species. ORNL/ESH-1/V24. Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Lemly, A. D., and G. J. Smith. n.d. Aquatic cycling of selenium: Implications for fish and wildlife. Fish and Wildlife Leaflet 12:1-10.

Lincer, J. L. 1975. DOE-induced eggshell-thinning in the American kestrel: A comparison of the field situation and laboratory results. J. Appl. Ecol. 12:781-793.

Matsumura, F. 1985. Toxicology of Pesticides, 2nd ed. Plenum Press, New York.

McKim, J. M., G. F. Olson, G. W. Holcombe, and E. P. Hunt. 1976. Long-term effects of methylmercuric chloride on three generations of brook trout (Salvelinus fontinalis): Toxicity, accumulation, distribution, and elimination. J. Fish. Res. Board Can. 33:2726-2739.

National Institute of Occupational Safety and Health (NIOSH). 1988. Registry of Toxic Effects of Chemical Substances (RTECS). Washington, D.C.

National Research Council (NRC). 1977. Arsenic. National Academy Press, Washington, D.C.

National Research Council (NRC). 1980. Mineral Tolerance of Domestic Animals. National Academy Press, Washington, D.C.

Office of Water Regulations and Standards (OWRS). 1989. Briefing report to the EPA Science Advisory Board on the equilibrium partitioning approach to generating sediment quality criteria. EPA 440/5-89-002. Washington, D.C.

Ohlendorf, H. M., D. J. Hoffman, M. K. Saiki, and T. W. Aldrich. 1986. Embryonic mortality and abnormalities of aquatic birds: Apparent impacts of selenium from irrigation drainwater. Sci. Total Environ. 52:49-63.

Peakall, D. B. 1986. Accumulation and effects on birds. pp. 31-47. IN J. S. Waide (ed.), PCBs and the Environment, Vol. II, CRC Press, Boca Raton, Florida.

Porter, P. S., R. C. Ward, and H. F. Bell. 1988. The detection limit. Environ. Sci. Technol. 22:856-861.

Ringer, R. K. 1983. Toxicology of PCBs in mink and ferrets. pp. 227-240. IN F. M. Itri and M. A. Kamrin. PCBs: Human and Environmental Hazards. Butterworth Publishers, Boston.

Sheffy, T. B., and J. R. St. Amant. 1982. Mercury burdens in furbearers in Wisconsin. J. Wildl. Manage. 46:1117-1120.

Sigal, L. L., and G. W. Suter II. 1989. Potential effects of chemical agents on terrestrial resources. Environ. Prof. 11:376-384.

Snarski, V. M., and G. F. Olson. 1982. Chronic toxicity and bioaccumulation of mercuric chloride in the fathead minnow (Pimephales promelas). Aquatic Toxicol. 2:143-156.

Stephen, C. E., and J. R. Rogers. 1985. Advantages of using regression analysis to calculate results of chronic toxicity tests. pp. 328-339. IN R. C. Bahner and D. J. Hansen (eds.), Aquatic Toxicology and Hazard Assessment: Eighth Symposium, American Society for Testing and Materials, Philadelphia.

Stephan, C. E., D. I. Mount, D. J. Hanson, J. H. Gentile, G. A. Chapman, and W. A. Brungs. 1985. Guidelines for deriving numeric National Water Quality Criteria for the protection of aquatic organisms and their uses. PB85-227049. Environmental Protection Agency, Duluth, Minnesota.

Suter, G. W., II, D. S. Vaughan, and R. H. Gardner. 1983. Risk assessment by analysis of extrapolation error: A demonstration for effects of pollutants on fish. Environ. Toxicol. Chem. 2:369-378.

Suter, G. W., II, A. E. Rosen, E. Linder, and D. F. Parkhurst. 1987. End points for responses of fish to chronic toxic exposures. Environ. Toxicol. Chem. 6:793-809.

Suter, G. W., II. 1989. Ecological end points. pp. 1-2--2-28. IN W. Warren-Hicks, B. R. Parkhurst, and S. S. Baker, Jr. (eds.), Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference. EPA/600/3-89.013. Environmental Protection Agency, Corvallis, Oregon.

Suter, G. W., II. Use of biomarkers in ecological risk assessment. IN J. F. McCarthy and L. R. Shugart (eds.), Biomarkers of Environmental Contamination. Lewis Publishing, New York (in press).

Tucker, R. K., and J. S. Lietzke. 1979. Comparative toxicity of insecticides for vertebrate wildlife and fish. Pharmac. Ther. 6:167-220.

Venugopal, B., and T. D. Luckey. 1978. Metal Toxicity in Mammals-2. Plenum Press, New York.

Warren-Hicks, W., B. R. Parkhurst, and S. S. Baker Jr. (eds.). 1989. Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference. EPA/600/3-89-013. Environmental Protection Agency, Corvallis, Oregon.

Wren, C. D., D. B. Hunter, J. F. Leatherland, and P. M. Stokes. 1987. The effects of polychlorinated biphenyls and methylmercury, singly and in combination, on mink. I: Uptake and toxic responses. Arch. Environ. Contam. Toxicol. 16:441-447.

APPENDIX A.

CONCENTRATIONS IN AMBIENT MEDIA, SCREENING CRITERIA, AND QUOTIENTS

Table A-1. Maximum water concentrations by reach, criteria, and quotients for aquatic biota

Reach	Compound	Remarks[a]	Maximum conc. (mg/L)	Intermediate criteria (μg/L)	Intermed. quotient	Lower criteria (μg/L)	Lower quotient	Upper criteria μg/L	Upper quotient
2	Aluminum		17	87	1.95E+02	0.87	1.95E+04	750	2.27E+01
3	Aluminum		12	87	1.38E+02	0.87	1.38E+04	750	1.60E+01
5	Aluminum		0.23	87	2.64E+00	0.87	2.64E+02	750	3.07E-01
3	Antimony		0.27	1600	1.69E-01	16	1.69E+01	9000	3.00E-02
1	Arsenic		0.36	48	7.50E+00	0.48	7.50E+02	850	4.24E-01
2	Arsenic		0.9	48	1.88E+01	0.48	1.88E+03	850	1.06E+00
3	Arsenic		0.021	48	4.38E-01	0.48	4.38E+01	850	2.47E-02
4	Arsenic		0.0054	48	1.13E-01	0.48	1.13E+01	850	6.35E-03
13	Arsenic		0.014	48	2.92E-01	0.48	2.92E+01	850	1.65E-02
3	Barium	<	0.1	5800	1.72E-02	58	1.72E+00	130	7.69E-01
3	Beryllium		0.0024	5.3	4.53E-01	0.053	4.53E+01	130	1.85E-02
3	Boron		12	7850	1.53E+00	78.5	1.53E+02	130	9.23E+01
1	Cadmium	<	0.006	1.1	5.45E+00	0.011	5.45E+02	3.9	1.54E+00
2	Cadmium	<	0.002	1.1	1.82E+00	0.011	1.82E+02	3.9	5.13E-01
3	Cadmium		0.05	1.1	4.55E+01	0.011	4.55E+03	3.9	1.28E+01
4	Cadmium		0.003	1.1	2.73E+00	0.011	2.73E+02	3.9	7.69E-01
13	Cadmium	<	0.002	1.1	1.82E+00	0.011	1.82E+02	3.9	5.13E-01
3	Calcium		440	116000	3.79E+00	1160	3.79E+02		
5	Calcium		23	116000	1.98E-01	1160	1.98E+01		
1	Chromium		0.021	11	1.91E+00	0.11	1.91E+02	16	1.31E+00
2	Chromium		0.093	11	8.45E+00	0.11	8.45E+02	16	5.81E+00
3	Chromium		0.041	11	3.73E+00	0.11	3.73E+02	16	2.56E+00
4	Chromium		0.077	11	7.00E+00	0.11	7.00E+02	16	4.81E+00
13	Chromium	<	0.01	11	9.09E-01	0.11	9.09E+01	16	6.25E-01
3	Cobalt	<	0.1	10	1.00E+01	0.1	1.00E+03		
1	Copper		0.057	12	4.75E+00	0.12	4.75E+02	18	3.17E+00
2	Copper		0.13	12	1.08E+01	0.12	1.08E+03	18	7.22E+00
3	Copper		0.41	12	3.42E+01	0.12	3.42E+03	18	2.28E+01
4	Copper		0.03	12	2.50E+00	0.12	2.50E+02	18	1.67E+00
5	Copper	<	0.01	12	8.33E-01	0.12	8.33E+01	18	5.56E-01
13	Copper		0.015	12	1.25E+00	0.12	1.25E+02	18	8.33E-01
2	Cyanide		0.026	5.2	5.00E+00	0.052	5.00E+02	22	1.18E+00
3	Cyanide		0.198	5.2	3.81E+01	0.052	3.81E+03	22	9.00E+00
4	Cyanide		0.016	5.2	3.08E+00	0.052	3.08E+02	22	7.27E-01
13	Cyanide		0.03	5.2	5.77E+00	0.052	5.77E+02	22	1.36E+00
1	Iron		0.37	1000	3.70E-01	10	3.70E+01		
2	Iron		4.5	1000	4.50E+00	10	4.50E+02		
3	Iron		6.5	1000	6.50E+00	10	6.50E+02		
5	Iron		3	1000	3.00E+00	10	3.00E+02		
5	Iron, diss		0.5	1000	5.00E-01	10	5.00E+01		
1	Lead	<	0.02	3.2	6.25E+00	0.032	6.25E+02	82	2.44E-01
2	Lead		0.019	3.2	5.94E+00	0.032	5.94E+02	82	2.32E-01
3	Lead		0.21	3.2	6.56E+01	0.032	6.56E+03	82	2.56E+00
4	Lead		0.025	3.2	7.81E+00	0.032	7.81E+02	82	3.05E-01

Table A-1 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/L)	Intermediate criteria (μg/L)	Intermed. quotient	Lower criteria (μg/L)	Lower quotient	Upper criteria μg/L	Upper quotient
13	Lead		0.018	3.2	5.63E+00	0.032	5.63E+02	82	2.20E-01
1	Lithium		1.99	130	1.53E+01	1.3	1.53E+03		
3	Lithium		0.059	130	4.54E-01	1.3	4.54E+01		
3	Magnesium		35	82000	4.27E-01	820	4.27E+01		
5	Magnesium		6.8	82000	8.29E-02	820	8.29E+00		
2	Manganese		0.1	4100	2.44E-02	41	2.44E+00		
3	Manganese		0.53	4100	1.29E-01	41	1.29E+01		
4	Manganese		0.2	4100	4.88E-02	41	4.88E+00		
5	Manganese		5.8	4100	1.41E+00	41	1.41E+02		
13	Manganese		0.38	4100	9.27E-02	41	9.27E+00		
5	Manganese, diss		5.8	4100	1.41E+00	41	1.41E+02		
1	Mercury		0.0052	0.07	7.43E+01	0.007	7.43E+03	2.4	2.17E+00
2	Mercury		0.0004	0.07	5.71E+00	0.007	5.71E+02	2.4	1.67E-01
3	Mercury		0.001	0.07	1.43E+01	0.007	1.43E+03	2.4	4.17E-01
4	Mercury		0.006	0.07	8.57E+00	0.007	8.57E+02	2.4	2.50E-01
13	Mercury	<	0.002	0.07	2.86E+00	0.007	2.86E+02	2.4	8.33E-02
3	Molybdenum		0.04	2350	1.70E-02	23.5	1.70E+00		
1	Nickel		0.02	160	1.25E-01	1.6	1.25E+01	1400	1.43E-02
2	Nickel		0.077	160	4.81E-01	1.6	4.81E+01	1400	5.50E-02
3	Nickel		1.6	160	1.00E+01	1.6	1.00E+03	1400	1.14E+00
4	Nickel		0.074	160	4.63E-01	1.6	4.63E+01	1400	5.29E-02
13	Nickel		0.076	160	4.75E-01	1.6	4.75E+01	1400	5.43E-02
3	Niobium		0.03			0			
3	Phosphate		431	25	1.72E+04	0.25	1.72E+06		
3	Phosphorus		8.4	0.04	2.10E+05	0.0004	2.10E+07	6	1.40E+03
1	Potassium		2.6	53000	4.91E-02	530	4.91E+00		
3	Potassium		81	53000	1.53E+00	530	1.53E+02		
1	Selenium		0.032	35	9.14E-01	0.35	9.14E+01	260	1.23E-01
3	Selenium	<	0.05	35	1.43E+00	0.35	1.43E+02	260	1.92E-01
3	Silicon		16			0			
2	Silver	<	0.0001	0	8.33E+00	0.0012	8.33E+02	4.1	1.22E+00
3	Silver		0.026	0	2.17E+02	0.0012	2.17E+04	4.1	6.34E+00
1	Sodium		0.79	68000	1.16E-02	680	1.16E+00		
2	Sodium		7.9	68000	1.16E-01	680	1.16E+01		
3	Sodium		1300	68000	1.91E+01	680	1.91E+03		
4	Sodium		7.9	68000	1.16E-01	680	1.16E+01		
13	Sodium		7.3	68000	1.07E-01	680	1.07E+01		
3	Strontium		0.34	42000	8.10E-03	420	8.10E-01		
3	Thallium		0.01	40	2.50E-01	0.4	2.50E+01	1400	7.14E-03
3	Thorium	<	0.2	565	3.54E-01	5.65	3.54E+01		
3	Tin		0.03	350	8.57E-02	3.5	8.57E+00		
3	Titanium		0.054	230	2.35E-01	2.3	2.35E+01		

Table A-1 (continued

Reach	Compound	Remarks[a]	Maximum conc. (mg/L)	Intermediate criteria (µg/L)	Intermed. quotient	Lower criteria (µg/L)	Lower quotient	Upper criteria µg/L	Upper quotient
3	Uranium		4.94	280	1.76E+01	2.8	1.76E+03		
3	Vanadium	<	0.5	80	6.25E+00	0.8	6.25E+02		
1	Zinc		0.028	110	2.55E-01	1.1	2.55E+01	120	2.33E-011
2	Zinc		0.18	110	1.64E+00	1.1	1.64E+02	120	1.50E+002
3	Zinc		1	110	9.09E+00	1.1	9.09E+02	120	8.33E+002
4	Zinc		0.24	110	2.18E+00	1.1	2.18E+02	120	2.00E+002
5	Zinc	<	0.01	110	9.09E-02	1.1	9.09E+00	120	8.33E-020
13	Zinc		0.1	110	9.09E-01	1.1	9.09E+01	120	8.33E-011
1	Zirconium	<	0.002	140	1.43E-02	1.4	1.43E+00		
3	Zirconium		0.028	140	2.00E-01	1.4	2.00E+01		
3	1 1 1-Trichloroethane		0.09	9400	9.57E-03	94	9.57E-01		
3	1 1 2 2-Tetrachloroethane	<	0.005	2400	2.08E-03	24	2.08E-01		
3	1 1-Dichloroethane	<	0.005	20000	2.50E-04	200	2.50E-02		
3	1 1-Dichloroethene	<	0.005	2800	1.79E-03	28	1.79E-01		
3	1 2 4-Trichlorobenzene	<	0.008	50	1.60E-01	0.5	1.60E+01		
3	1 2-Dichlorobenzene	<	0.008	763	1.05E-02	7.63	1.05E+00		
3	1 2-Dichloroethane	<	0.005	20000	2.50E-04	200	2.50E-02		
3	1 2-Dichloropropane	<	0.005	5700	8.77E-04	57	8.77E-02		
3	1 3-Dichlorobenzene	<	0.008	763	1.05E-02	7.63	1.05E+00		
3	1 4-Dichlorobenzene	<	0.008	763	1.05E-02	7.63	1.05E+00		
3	2 4 6-Trichlorophenol	<	0.008	970	8.25E-03	9.7	8.25E-01		
3	2 4-Dichlorophenol	<	0.008	365	2.19E-02	3.65	2.19E+00		
3	2 4-Dimethylphenol	<	0.008	2200	3.64E-03	22	3.64E+01		
3	2 4-Dinitrophenol	<	0.029	150	1.93E-01	1.5	1.93E+01		
3	2 4-Dinitrotoluene	<	0.008	230	3.48E-02	2.3	3.48E+00		
3	2 6-Dinitrotoluene	<	0.008	230	3.48E-02	2.3	3.48E+00		
3	2-Chloroethylvinyl ether	<	0.01			0			
3	2-Chloronaphthalene	<	0.008	440	1.82E-02	4.4	1.82E+00		
3	2-Chlorophenol	<	0.008	2000	4.00E-03	20	4.00E-01		
3	2-Nitrophenol	<	0.008	150	5.33E-02	1.5	5.33E+00		
3	3 3'-Dichlorobenzidine	<	0.017			0			
3	3 3'-Dichlorobenzidine	<	0.012			0			
3	4 6-Dinitro-ortho-cresol	<	0.029	150	1.93E-01	1.5	1.93E+01		
3	4-Bromophenyl-phenylether	<	0.008	122	6.56E-02	1.22	6.56E+00		
3	4-Chlorophenyl-phenylether	<	0.025	122	2.05E-01	1.22	2.05E+01		
3	4-Nitrophenol		0.042	150	2.80E-01	1.5	2.80E+01		
3	Acenaphthene	<	0.008	520	1.54E-02	5.2	1.54E+00		
3	Acenaphthylene	<	0.008			0			
3	Anthracene	<	0.008			0			
3	Benzene	<	0.005	727	6.88E-03	7.27	6.88E-01		
3	Benzidine	<	0.008	25	3.20E-01	0.25	3.20E+01		
3	Benzo(a)anthracene	<	0.008			0			
3	Benzo(a)pyrene	<	0.008			0			

Table A-1 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/L)	Intermediate criteria (μg/L)	Intermed. quotient	Lower criteria (μg/L)	Lower quotient	Upper criteria μg/L	Upper quotient
3	Benzo(b)fluoranthene	<	0.008			0			
3	Benzo(g h i)perylene	<	0.008			0			
3	Benzo(k)fluoranthene	<	0.008			0			
3	Bis (2-ethylhexyl) phthalate		0.083	3	2.77E+01	0.03	2.77E+03	940	8.83E-02
3	Bis(2-chloroethoxy)methane	<	0.008			0			
3	Bis(2-chloroethyl)ether	<	0.008	19000	4.21E-04	190	4.21E-02		
3	Bis(2-chloroisopropyl)ether	<	0.008	19000	4.21E-04	190	4.21E-02		
2	Bromodichloromethane	<	0.005	4000	1.25E-03	40	1.25E+01		
3	Bromodichloromethane	<	0.005	4000	1.25E-03	40	1.25E-01		
3	Bromoform	<	0.005	4000	1.25E-03	40	1.25E-01		
3	Bromomethane	<	0.01	4000	2.50E-03	40	2.50E-01		
3	Butylbenzylphthalate	<	0.008	3	2.67E+00	0.03	2.67E+02	940	8.51E-03
3	Carbon tetrachloride		0.019	4000	4.75E-03	40	4.75E+01		
3	Chlorobenzene	<	0.005	50	1.00E-01	0.5	1.00E+01		
3	Chloroethane	<	0.01	20000	5.00E-04	200	5.00E+02		
2	Chloroform	<	0.005	1240	4.03E-03	12.4	4.03E+01		
3	Chloroform		0.51	1240	4.11E-02	12.4	4.11E+00		
3	Chloromethane	<	0.01	4000	2.50E-03	40	2.50E-01		
3	Chrysene	<	0.008			0			
3	cis-1 3-Dichloropropene	<	0.005	244	2.05E-02	2.44	2.05E+00		
3	Dibenz(a h)anthracene	<	0.008			0			
3	Dibromochloromethane	<	0.005	4000	1.25E-03	40	1.25E-01		
3	Diethylphthalate	<	0.008	3	2.67E+00	0.03	2.67E+02	940	8.51E-03
3	Dimethylphthalate	<	0.008	3	2.67E+00	0.03	2.67E+02	940	8.51E-03
3	Di-n-butylphthalate	<	0.008	3	2.67E+00	0.03	2.67E+02	940	8.51E-03
3	Di-n-octylphthalate	<	0.008	3	2.67E+00	0.03	2.67E+02	940	8.51E-03
3	Ethylbenzene	<	0.005	440	1.14E-02	4.4	1.14E+00		
3	Fluoranthene	<	0.008	16	5.00E-01	0.16	5.00E+01		
3	Fluorene	<	0.008	6	1.33E+00	0.06	1.33E+02		
3	Freon		0.015			0			
3	Freon 113		0.048			0			
3	Hexachlorobenzene	<	0.008	38	2.11E-01	0.38	2.11E+01		
3	Hexachlorobutadiene	<	0.008	9.5	8.60E-01	0.093	8.60E+01		
3	Hexachlorocyclopentadiene	<	0.008	5.2	1.54E+00	0.052	1.54E+02	7	1.14E+00
3	Hexachloroethane	<	0.008	540	1.48E-02	5.4	1.48E+00		
3	Indeno(1 2 3-cd)pyrene	<	0.008			0			
3	Isophorone	<	0.008	14000	5.71E-04	140	5.71E-02		
3	Methylene chloride		0.24	4000	6.00E-02	40	6.00E+00		
3	Naphthalene	<	0.008	620	1.29E-02	6.2	1.29E+00		
3	Nitrobenzene	<	0.008	32000	2.50E-04	320	2.50E+02		
3	N-nitrosodimethylamine	<	0.008	58	1.38E-01	0.58	1.38E+01		
3	N-nitrosodiphenylamine	<	0.008	58	1.38E-01	0.58	1.38E+01		
3	N-nitroso-di-n-propylamine	<	0.008	58	1.38E-01	0.58	1.38E+01		

Table A-1 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/L)	Intermediate criteria (μg/L)	Intermed. quotient	Lower criteria (μg/L)	Lower quotient	Upper criteria μg/L	Upper quotient
3	Parachlorometa cresol	<	0.008	2000	4.00E-03	20	4.00E-01		
2	PCB	<	0.0005	0.005	3.57E+01	0.00014	3.57E+03	2	2.50E-01
3	PCB-1016	<	0.005	0.005	3.57E+02	0.00014	3.57E+04		
3	PCB-1221	<	0.005	0.005	3.57E+02	0.00014	3.57E+04		
3	PCB-1232	<	0.005	0.005	3.57E+02	0.00014	3.57E+04		
3	PCB-1242	<	0.005	0.005	3.57E+02	0.00014	3.57E+04		
3	PCB-1248	<	0.005	0.005	3.57E+02	0.00014	3.57E+04		
3	PCB-1254		0.0204	0.005	1.46E+03	0.00014	1.46E+05		
3	PCB-1260	<	0.006	0.005	4.29E+02	0.00014	4.29E+04		
3	Pentachlorophenol		0.042	13	3.23E+00	0.13	3.23E+02	20	2.10E+00
3	Phenanthrene	<	0.008	3.7	2.16E+00	0.037	2.16E+02		
3	Phenol	<	0.008	2560	3.13E-03	25.6	3.13E-01	10200	7.84E-04
2	Phenols	<	0.001	2560	3.91E-04	25.6	3.91E-02	10200	9.80E-05
3	Pyrene	<	0.008						
3	Tetrachloroethene		0.096	840	1.14E-01	8.4	1.14E+01	5280	1.82E-02
3	Toluene	<	0.005	230	2.17E-02	2.3	2.17E+00	17500	2.86E-04
3	Total halomethanes		0.01	4000	2.50E-03	40	2.50E-01	11000	9.09E-04
3	Total toxic organics		0.06			0			
3	trans-1 2-Dichloroethene		0.12	2800	4.29E-02	28	4.29E+00	11600	1.03E-02
3	trans-1 3-Dichloropropene		0.017	240	7.08E-02	2.4	7.08E+00	6060	2.81E-03
3	Trichloroethene		0.51	21900	2.33E-02	219	2.33E+00	45000	1.13E-02
3	Vinyl chloride		0.012			0			

[a]"<" indicates that the chemical was not detected and the reported concentration is the highest reported limit of detection; and "A" indicates that the value reported is the mean of two or more determinations.

Table A-2. Mean water concentrations, criteria, and quotients for aquatic biota

Reach	Compound	Remarks[a]	Water conc. (mg/L)	Intermediate criteria (μg/L)	Intermediate quotient	Lower criterion (mg/l)	Lower quotient
2	Aluminum	<	0.545808	87	6.27E+00	0.00087	6.27E+02
3	Aluminum	<	0.369	87	4.13E+00	0.00087	4.13E+02
5	Aluminum		0.17	87	1.95E+00	0.00087	1.95E+02
3	Antimony	<	0.052	1600	3.25E-02	0.016	3.25E+00
1	Arsenic	<	0.206	48	4.29E+00	0.00048	4.29E+02
2	Arsenic	<	0.02027	48	4.22E-01	0.00048	4.22E+01
3	Arsenic	<	0.0084	48	1.75E-01	0.00048	1.75E+01
4	Arsenic	<	0.005	48	1.04E-01	0.0048	1.04E+01
13	Arsenic	<	0.055	48	1.15E-01	0.0048	1.15E+01
2	Barium		0.058727	5800	1.01E-02	0.058	1.01E+00
3	Barium	<	0.1	5800	1.72E-02	0.058	1.72E+00
3	Beryllium	<	0.001	5.3	1.89E-01	0.000053	1.89E+01
2	Beryllium		0.00092	5.3	1.74E-01	0.000053	1.74E+01
3	Boron	<	0.194	7850	2.47E-02	0.0758	2.47E+00
1	Cadmium	<	0.004	1.1	3.64E+00	0.000011	3.64E+02
2	Cadmium	<	0.00223	1.1	2.03E+00	0.000011	2.03E+02
3	Cadmium	<	0.002890	1.1	2.63E+00	0.000011	2.63E+02
4	Cadmium	<	0.002	1.1	1.82E+00	0.000011	1.82E+02
13	Cadmium	<	0.002	1.1	1.82E+00	0.000011	1.82E+02
1	Chromium	<	0.006	11	5.45E-01	0.00011	5.45E+01
2	Chromium	<	0.01499	11	1.36E+00	0.00011	1.36E+02
3	Chromium	<	0.011831	11	1.08E+00	0.00011	1.08E+02
4	Chromium	<	0.01	11	9.09E-01	0.00011	9.09E+01
13	Chromium	<	0.01	11	9.09E-01	0.00011	9.09E+01
2	Cobalt	<	0.003636	10	3.64E-01	0.0001	3.64E+01
3	Cobalt	<	0.1	10	1.00E+01	0.0001	1.00E+03
1	Copper	<	0.003	12	2.50E-01	0.00012	2.50E+01
2	Copper	<	0.02067	12	1.72E+00	0.00012	1.72E+02

Table A-2 (continued)

Reach	Compound	Remarks[a]	Water conc. (mg/L)	Intermediate criteria µg/L	Intermediate quotient	Lower criterion (mg/l)	Lower quotient
3	Copper	<	0.009964	12	8.30E-01	0.00012	8.30E+01
4	Copper	<	0.015863	12	1.32E+00	0.00012	1.32E+02
5	Copper	<	0.01	12	8.33E-01	0.00012	8.33E+01
13	Copper	<	0.003	12	2.50E-01	0.00012	2.50E+01
2	Cyanide	<	0.0055	5.2	1.06E+00	0.000052	1.06E+02
3	Cyanide	<	0.017583	5.2	3.38E+00	0.000052	3.38E+02
4	Cyanide	<	0.00425	5.2	8.17E-01	0.000052	8.17E+01
13	Cyanide	<	0.0055	5.2	1.06E+00	0.000052	1.06E+02
1	Lead	<	0.02	3.2	6.25E+00	0.000032	6.25E+02
2	Lead	<	0.008076	3.2	2.52E+00	0.000032	2.52E+02
3	Lead	<	0.012276	3.2	3.84E+00	0.000032	3.84E+02
4	Lead	<	0.00497	3.2	1.55E+00	0.000032	1.55E+02
13	Lead	<	0.006	3.2	1.88E+00	0.000032	1.88E+02
1	Lithium		0.317	130	2.44E+00	0.0013	2.44E+02
2	Lithium		0.0075	130	5.77E-02	0.0013	5.77E+00
2	Manganese		0.053500	4100	1.30E-02	0.041	1.30E+00
3	Manganese	<	0.088347	4100	2.15E-02	0.041	2.15E+00
4	Manganese	<	0.042	4100	1.02E-02	0.041	1.02E+00
5	Manganese		1.0341	4100	2.52E-01	0.041	2.52E+01
13	Manganese	<	0.151	4100	3.68E-02	0.041	3.68E+00
1	Mercury	<	0	0.07	0.00E+00	0.000000	0.00E+00
2	Mercury	<	0.00015	0.07	2.14E+00	0.000000	2.14E+02
3	Mercury	<	0.000008	0.07	1.26E-01	0.000000	1.26E+01
4	Mercury	<	0.0002	0.07	2.86E+00	0.000000	2.86E+02
13	Mercury	k	0.0002	0.07	2.86E+00	0.000000	2.86E+02
2	Molybdenum	<	0.01	2350	4.26E-03	0.0235	4.26E-01
3	Molybdenum	<	0.011	2350	4.68E-03	0.0235	4.68E-01
1	Nickel	<	0.008	160	5.00E-02	0.0016	5.00E+00

Table A-2 (continued)

Reach	Compound	Remarks[a]	Water conc. (mg/L)	Intermediate criteria µg/L	Intermediate quotient	Lower criterion (mg/l)	Lower quotient
2	Nickel	<	0.028063	160	1.75E-01	0.0016	1.75E+01
3	Nickel	<	0.095869	160	5.99E-01	0.0016	5.99E+01
4	Nickel	<	0.0505	160	3.16E-01	0.0016	3.16E+01
13	Nickel	<	0.050	160	3.13E-01	0.00160	3.13E+01
3	Niobium	<	0.008			0	
1	Selenium	<	0.02	35	5.71E-01	0.00035	5.71E+01
2	Selenium	<	0.001	35	2.86E-02	0.00035	2.86E+00
3	Selenium	<	0.01	35	2.86E-01	0.00035	2.86E+01
2	Silver	<	0.001	0.12	8.33E+00	0.000001	8.33E+02
3	Silver	<	0.01	0.12	8.33E+01	0.000001	8.33E+03
13	Sodium		5.2	68000	7.65E-02	0.68	7.65E+00
2	Strontium		0.0994	42000	2.37E-03	0.42	2.37E-01
3	Strontium		0.2	42000	4.76E-03	0.42	4.76E-01
3	Thallium	<	0.0109	40	2.50E-01	0.0004	2.50E+01
3	Thorium	<	0.04066	565	7.20E-02	0.00565	7.20E+00
3	Tin	<	0.01093	350	3.12E-02	0.00350	3.12E+00
3	Titanium	<	0.23665	230	1.03E+00	0.0023	1.03E+02
2	Uranium	<	0.00196	280	7.00E-03	0.0028	7.00E-01
3	Uranium	<	0.23665	280	8.45E-01	0.0028	8.45E+01
4	Uranium	<	0.00236	280	8.43E-03	0.0028	8.43E-01
13	Uranium	<	0.0057	280	2.04E-02	0.0028	2.04E+00
2	Vanadium	<	0.006	80	7.50E-02	0.0008	7.50E+00
3	Vanadium	<	0.05	80	6.25E+00	0.0008	6.25E+02
1	Zinc	<	0.004	110	3.64E-02	0.0011	3.64E+00
2	Zinc	<	0.032004	110	2.91E-01	0.0011	2.91E+01
3	Zinc	<	0.036881	110	3.35E-01	0.0011	3.35E+01
4	Zinc	<	0.03075	110	2.80E-01	0.0011	2.80E+01
5	Zinc	<	0.01	110	9.09E-02	0.0011	9.09E+00

Table A-2 (continued)

Reach	Compound	Remarks[a]	Water conc. (mg/L)	Intermediate criteria µg/L	Intermediate quotient	Lower criterion (mg/l)	Lower quotient
13	Zinc	<	0.0265	110	2.41E-01	0.0011	2.41E+01
1	Zirconium	<	0.002	140	1.43E-02	0.0014	1.43E+00
3	Zirconium	<	0.0047	140	3.36E-02	0.0014	3.36E+00
3	1,1,1-trichloroethane	<	0.005113	9400	5.44E-04	0.094	5.44E-02
3	1,1,2,2-tetrachloroethane	<	0.005	2400	2.08E-03	0.024	2.08E-01
3	1,1-dichloroethane	<	0.005	20000	2.50E-04	0.2	2.50E-02
3	1,1-dichloroethylene	<	0.005	2800	1.79E-03	0.028	1.79E-01
3	1,2,4-trichlorobenzene	<	0.005231	50	1.05E-01	0.0005	1.05E+01
3	1,2,5,6-dibenzanthracene	<	0.005231			0	
3	1,2-dichlorobenzene	<	0.005231	763	6.86E-03	0.00763	6.86E-01
3	1,2-dichloroethane	<	0.005	20000	2.50E-04	0.2	2.50E-02
3	1,2-dichloropropane	<	0.005	5700	8.77E-04	0.057	8.77E-02
3	1,3-dichlorobenzene	<	0.005231	763	6.86E-03	0.00763	6.86E-01
3	1,3-dichloropropene	<	0.005			0	
3	1,4-dichlorobenzene	<	0.005231	763	6.86E-03	0.00763	6.86E-01
3	2,4,6-trichlorophenol	<	0.005231	970	5.39E-03	0.0097	5.39E-01
3	2,4-dichlorophenol	<	0.005231	365	1.43E-02	0.00365	1.43E+00
3	2,4-dimethylphenol	<	0.005231	2200	2.38E-03	0.022	2.38E-01
3	2,4-dinitrophenol	<	0.007008	150	4.67E-02	0.0015	4.67E+00
3	2,4-dinitrotoluene	<	0.005231	230	2.27E-02	0.0023	2.27E+00
3	2,6-dinitrotoluene	<	0.005231	230	2.27E-02	0.0023	2.27E+00
3	2-chloroethyl vinyl ether	<	0.01			0	
3	2-chloronaphthalene	<	0.005231	440	1.19E-02	0.0044	1.19E+00
3	2-chlorophenol	<	0.005231	2000	2.62E-03	0.02	2.62E-01
3	2-nitrophenol	<	0.005231	150	3.49E-02	0.0015	3.49E+00
3	3,3'-dichlorobenzidine	<	0.0107			0	
3	4,6-dinitro-ortho-cresol	<	0.026985	150	1.80E-01	0.0015	1.80E+01
3	4-bromophenyl phenyl ether	<	0.005231	122	4.29E-02	0.00122	4.29E+00

Table A-2 (continued)

Reach	Compound	Remarks[a]	Water conc. (mg/L)	Intermediate criteria µg/L	Intermediate quotient	Lower criterion (mg/l)	Lower quotient
3	4-chlorophenyl phenyl ether	<	0.005231	122	4.29E-02	0.00122	4.29E+00
3	4-nitrophenol	<	0.026185	150	1.75E-01	0.0015	1.75E+01
3	Acenaphthene	<	0.005231	520	1.01E-02	0.0052	1.01E+00
3	Acenaphthylene	<	0.00231			0	
3	Anthracene	<	0.005231			0	
3	Benzene	<	0.005	727	6.88E-03	0.00727	6.88E-01
3	Benzidine	<	0.005231	25	2.09E-01	0.00025	2.09E+01
3	Benzo(a)anthracene	<	0.005231			0	
3	Benzo(b)fluoranthene	<	0.005231			0	
3	Benzo(ghi)perylene	<	0.005231			0	
3	Benzo(k)flouranthene	<	0.005231			0	
3	Benzo-a-pyrene	<	0.005231			0	
3	Bis(2-chloroethoxy)methane	<	0.005231			0	
3	Bis(2-chloroethyl)ether	<	0.005231	19000	2.75E-04	0.19	2.75E-02
3	Bis(2-chloroisopropyl)ether	<	0.005231	1900	2.75E-03	0.019	2.75E-01
3	Bis(2-ethylhexyl)phthalate	<	0.0067	3	2.23E+00	0.00003	2.23E+02
3	Bromoform	<	0.0050	4000	1.25E-03	0.04	1.25E-01
3	Butylbenzylphthalate	<	0.005231	3	1.74E+00	0.00003	1.74E+02
3	Carbon tetrachloride	<	0.005163	4000	1.29E-03	0.04	1.29E-01
3	Chlorobenzene	<	0.005	50	1.00E-01	0.0005	1.00E+01
3	Chlorodibromomethane	<	0.005174	4000	1.29E-03	0.04	1.29E-01
3	Chloroethane	<	0.01	20000	5.00E-04	0.2	5.00E-02
2	Chloroform	<	0.004148	1240	3.35E-03	0.0124	3.35E-01
3	Chloroform	<	0.005198	1240	4.19E-03	0.0124	4.19E-01
3	Chrysene	<	0.005231			0	
2	Dichlorobromomethane	<	0.005	4000	1.25E-03	0.04	1.25E-01
3	Dichlorobromomethane	<	0.004861	4000	1.22E-03	0.04	1.22E-01
3	Diethyl phthalate	<	0.005231	3	1.74E+00	0.00003	1.74E+02

Table A-2 (continued)

Reach	Compound	Remarks[a]	Water conc. (mg/L)	Intermediate criteria µg/L	Intermediate quotient	Lower criterion (mg/l)	Lower quotient
3	Dimethyl phthalate	<	0.005231	3	1.74E+00	0.00003	1.74E+02
3	Di-n-butyl phthalate	<	0.005231	3	1.74E+00	0.00003	1.74E+02
3	Di-n-octyl phthalate	<	0.005231	3	1.74E+00	0.00003	1.74E+02
3	Ethylbenzene	<	0.005	440	1.14E-02	0.0044	1.14E+00
3	Fluoranthene	<	0.005231	16	3.27E-01	0.00016	3.27E+01
3	Fluorene	<	0.005231	6	8.72E-01	0.00006	8.72E+01
3	Freon		0.0047			0	
3	Freon 113	<	0.0108			0	
3	Hexachlorobenzene	<	0.005231	38	1.38E-01	0.00038	1.38E+01
3	Hexachlorobutadiene	<	0.005231	9.3	5.62E-01	0.000093	5.62E+01
3	Hexachlorocyclopentadiene	<	0.005231	5.2	1.01E+00	0.000052	1.01E+02
3	Hexachloroethane	<	0.005231	540	9.69E-03	0.0054	9.69E-01
3	Indeno (1,2,3-cd) pyrene	<	0.005231			0	
3	Isophorone	<	0.005231	14000	3.74E-04	0.14	3.74E-02
3	Methyl bromide	<	0.01	4000	2.50E-03	0.04	2.50E-01
3	Methyl chloride	<	0.01	4000	2.50E-03	0.04	2.50E-01
3	Methylene chloride	<	0.005314	4000	1.33E-03	0.04	1.33E-01
3	Naphthalene	<	0.005064	620	8.17E-03	0.0062	8.17E-01
3	Nitrobenzene	<	0.005231	32000	1.63E-04	0.32	1.63E-02
3	N-nitrosodimethylamine	<	0.005064	58	8.73E-02	0.00058	8.73E+00
3	N-nitrosodiphenylamine	<	0.005064	58	8.73E-02	0.00058	8.73E+00
3	N-nitrosodi-n-propylamine	<	0.005064	58	8.73E-02	0.00058	8.73E+00
3	Parachlorometa cresol	<	0.005231			0	
2	PCBs	<	0.00050	0.2	2.50E+00	0.000002	2.50E+02
3	PCB-1016	<	0.000749	0.2	3.75E+00	0.000002	3.75E+02
3	PCB-1221	<	0.000749	0.2	3.75E+00	0.000002	3.75E+02
3	PCB-1232	<	0.000749	0.2	3.75E+00	0.000002	3.75E+02

Table A-2 (continued)

Reach	Compound	Remarks[a]	Water conc. (mg/L)	Intermediate criteria µg/L	Intermediate quotient	Lower criterion (mg/l)	Lower quotient
3	PCB-1242	<	0.000749	0.2	3.75E+00	0.000002	3.75E+02
3	PCB-1248	<	0.000749	0.2	3.75E+00	0.000002	3.75E+02
3	PCB-1254	<	0.001417	0.2	7.09E+00	0.000002	7.09E+02
3	PCB-1260	<	0.001498	0.2	7.49E+00	0.000002	7.49E+02
3	Pentachlorophenol	<	0.026138	13	2.01E+00	0.00013	2.01E+02
3	Phenanthrene	<	0.005231	3.7	1.41E+00	0.000037	1.41E+02
3	Phenol	<	0.005231	2560	2.04E-03	0.0256	2.04E-01
2	Phenols	<	0.001	2560	3.91E-04	0.0256	3.91E-02
3	Pyrene	<	0.005215				
3	Tetrachloroethylene	<	0.005071	840	6.04E-03	0.0084	6.04E-01
3	Toluene	<	0.005	230	2.17E-02	0.0023	2.17E+00
3	trans-1,2-dichloroethene	<	0.013488	2800	4.82E-03	0.028	4.82E-01
3	trans-1 3-dichloropropene	<	0.005058	244	2.07E-02	0.00244	2.07E+00
3	Trichloroethylene	<	0.005025	21900	1.14E-03	0.219	1.14E-01
3	Vinyl chloride	<	0.006023			0	

[a]"<" indicates that the chemical was not detected and the reported concentration is the highest reported limit of detection; and "A" indicates that the value reported is the mean of two or more determinations.

Table A-3. Maximum sediment concentrations, criteria, and quotients

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{OW})$	Intermediate criteria µg/L	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
2	Aluminum		10000		87	8.70E-04		1.15E+07
3	Aluminum		140000		87	8.70E-04		1.61E+08
4	Aluminum		81500		87	8.70E-04		9.37E+07
1	Antimony		0.3		1600	1.60E-02		1.88E+01
1	Arsenic		17		48	4.80E-04		3.54E+04
2	Arsenic		12		48	4.80E-04		2.50E+04
3	Arsenic		68		48	4.80E-04		1.42E+05
4	Arsenic		11		48	4.80E-04		2.29E+04
5	Arsenic		16		48	4.80E-04		3.33E+04
10	Arsenic		24		48	4.80E-04		5.00E+04
4	Barium		471		5800	5.80E-02		8.12E+03
1	Berylium		1.6		5.3	5.30E-05		3.02E+04
4	Berylium		2.68		5.3	5.30E-05		5.06E+04
5	Berylium		1.6		5.2	5.20E-05		3.08E+04
4	Boron		310		7850	7.85E-02		3.95E+03
1	Cadmium	<	1		1.1	1.10E-05		9.09E+04
2	Cadmium		4.2		1.1	1.10E-05		3.82E+05
3	Cadmium		3.5		1.1	1.10E-05		3.18E+05
4	Cadmium		1.6		1.1	1.10E-05		1.45E+05
5	Cadmium	<	1		1.1	1.10E-05		9.09E+04
10	Cadmium	<	0.5		1.1	1.10E-05		4.55E+04
1	Chromium		27		11	1.10E-04		2.45E+05
2	Chromium		290		11	1.10E-04		2.64E+06
3	Chromium		270		11	1.10E-04		2.45E+06
4	Chromium		90.4		11	1.10E-04		8.22E+05
5	Chromium		54		11	1.10E-04		4.91E+05
10	Chromium		23		11	1.10E-04		2.09E+05

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{OW})$	Intermediate criteria µg/L	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
4	Cobalt		20.4		12	1.00E-04		2.04E+05
1	Copper		54		12	1.20E-04		4.50E+05
2	Copper		17		12	1.20E-04		1.42E+05
3	Copper		260		12	1.20E-04		2.17E+06
4	Copper		65.7		12	1.20E-04		5.48E+05
5	Copper		40		12	1.20E-04		3.33E+05
1	Cyanide	<	1.6		5.2	5.20E-05		3.08E+04
2	Cyanide	<	1		5.2	5.20E-05		1.92E+04
3	Cyanide	<	1.1		5.2	5.20E-05		2.12E+04
4	Cyanide	<	0.8		5.2	5.20E-05		1.54E+04
10	Cyanide	<	0.9		5.2	5.20E-05		1.73E+04
5	Iron		40000		1000	1.00E-02		4.00E+06
1	Lead		46		3.2	3.20E-05		1.44E+06
2	Lead		51		3.2	3.20E-05		1.59E+06
3	Lead		94		3.2	3.20E-05		2.94E+06
4	Lead		130		3.2	3.20E-05		4.06E+06
5	Lead		53		3.2	3.20E-05		1.66E+06
10	Lead		67		3.2	3.20E-05		2.09E+06
2	Manganese		2000		4100	4.10E-02		4.88E+04
4	Manganese		3490		4100	4.10E-02		8.51E+04
5	Manganese		3600		4100	4.10E-02		8.78E+04
1	Mercury, total	<	0.105		0.07	7.00E-07		1.43E+05
2	Mercury, total	<	6		0.07	7.00E-07		8.57E+06
3	Mercury, total		5.9		0.07	7.00E-07		8.43E+06
4	Mercury, total		47		0.07	7.00E-07		6.71E+07
5	Mercury, total		24.4		0.07	7.00E-07		3.49E+07
10	Mercury, total		0.1		0.07	7.00E-07		1.43E+05

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{OW})$	Intermediate criteria µg/L	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
1	Nickel		36		160	1.60E-03		2.25E+04
2	Nickel		30		160	1.60E-03		1.88E+04
3	Nickel		1300		160	1.60E-03		8.13E+05
4	Nickel		58		160	1.60E-03		3.63E+04
5	Nickel		24		160	1.60E-03		1.50E+04
10	Nickel		27		160	1.60E-03		1.69E+04
1	Selenium		2		35	3.50E-04		5.71E+03
2	Selenium		110		35	3.50E-04		3.14E+05
3	Selenium		160		35	3.50E-04		4.57E+05
4	Selenium		190		35	3.50E-04		5.43E+05
5	Selenium		0.8		35	3.50E-04		2.29E+03
1	Silver	<	1		0.12	1.20E-06		8.33E+05
2	Silver		10		0.12	1.20E-06		8.33E+06
3	Silver		2		0.12	1.20E-06		1.67E+06
4	Silver		3.7		0.12	1.20E-06		3.08E+06
5	Silver	<	1		0.12	1.20E-06		8.33E+05
10	Silver	<	1		0.12	1.20E-06		8.33E+05
4	Strontium		124		42000	4.20E-01		2.95E+02
1	Thallium	<	5		40	4.00E-04		1.25E+04
1	Thorium	<	20		565	5.65E-03		3.54E+03
2	Thorium	<	20		565	5.65E-03		3.54E+03
3	Thorium	<	20		565	5.65E-03		3.54E+03
4	Titanium		4080		230	2.30E-03		1.77E+06
1	Uranium		5.9		280	2.80E-03		2.11E+03
2	Uranium		18		280	2.80E-03		6.54E+03
3	Uranium		179		280	2.80E-03		6.39E+04
4	Uranium		7.82		280	2.80E-03		2.79E+03

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{OW})$	Intermediate criteria µg/L	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
10	Uranium		4.3		280	2.80E-03		1.54E+03
4	Vanadium		99		80	8.00E-04		1.24E+05
1	Zinc		150		110	1.10E-03		1.36E+05
2	Zinc		92		110	1.10E-03		8.36E+04
3	Zinc		370		110	1.10E-03		3.36E+05
4	Zinc		168		110	1.10E-03		1.53E+05
5	Zinc		220		110	1.10E-03		2.00E+05
1	Zirconium		230		140	1.40E-03		1.64E+05
2	Zirconium		890		140	1.40E-03		6.36E+05
3	Zirconium		470		140	1.40E-03		3.36E+05
4	Zirconium		610		140	1.40E-03		4.36E+05
10	Zirconium		210		140	1.40E-03		1.50E+05
1	1,1,1-Trichloroethane	<	0.008	2.48	9400	9.40E-02	2.65E-03	2.82E-02
1	1,1,2,2-Tetrachloroethane	<	0.008	2.39	2400	2.40E-02	3.26E-03	1.36E-01
1	1,1,2-Trichloroethane	<	0.008	2.48	9400	9.40E-02	2.65E-03	2.82E-02
1	1,1-Dichloroethane	<	0.008	1.79	20000	2.00E-01	1.30E-02	6.49E-02
1	1,1-Dichloroethylene	<	0.008	1.48	11600	1.16E-01	2.65E-02	2.28E-01
1	1,2,4-Trichlorobenzene	<	2	4.23	50	5.00E-04	1.18E-02	2.36E+01
2	1,2,4-Trichlorobenzene	<	1.4	4.23	50	5.00E-04	8.24E-03	1.65E+01
3	1,2,4-Trichlorobenzene	<	1.7	4.23	50	5.00E-04	1.00E-02	2.00E+01
4	1,2,4-Trichlorobenzene	<	1.8	4.23	50	5.00E-04	1.06E-02	2.12E+01
10	1,2,4-Trichlorobenzene	<	1.5	4.23	50	5.00E-04	8.83E-03	1.77E+01
1	1,2,5,6-Dibenzanthracene	<	2	6.5		0.00E+00	6.32E-05	
2	1,2,5,6-Dibenzanthracene	<	1.4	6.5		0.00E+00	4.43E-05	
3	1,2,5,6-Dibenzanthracene	<	1.7	6.5		0.00E+00	5.28E-05	
4	1,2,5,6-Dibenzanthracene	<	1.8	6.5		0.00E+00	5.69E-05	
10	1,2,5,6-Dibenzanthracene	<	1.5	6.5		0.00E+00	4.74E-05	

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{ow})$	Intermediate criteria µg/L	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
1	1,2-Dichlorobenzene	<	2	3.39	763	7.63E-03	8.15E-02	1.07E+01
2	1,2-Dichlorobenzene	<	1.4	3.39	763	7.63E-03	5.70E-02	7.47E+00
3	1,2-Dichlorobenzene	<	1.7	3.39	763	7.63E-03	6.93E-02	9.08E+00
4	1,2-Dichlorobenzene	<	1.8	3.39	763	7.63E-03	7.33E-02	9.61E+00
10	1,2-Dichlorobenzene	<	1.5	3.39	763	7.63E-03	6.11E-02	8.01E+00
1	1,2-Dichloroethane	<	0.008	1.47	20000	2.00E-01	2.71E-02	1.36E-01
1	1,2-Dichloropropane	<	0.008	2.28	5700	5.70E-02	4.20E-03	7.37E-02
1	1,2-Diphenylhydrazine	<	2	2.94		0.00E+00	2.30E-01	
2	1,2-Diphenylhydrazine	<	1.4	2.94		0.00E+00	1.61E-01	
3	1,2-Diphenylhydrazine	<	1.7	2.94		0.00E+00	1.95E-01	
4	1,2-Diphenylhydrazine	<	1.8	2.94		0.00E+00	2.07E-01	
10	1,2-Diphenylhydrazine	<	1.5	2.94		0.00E+00	1.72E-01	
1	1,3-Dichlorobenzene	<	2	3.41	763	7.63E-03	7.78E-02	1.02E+01
2	1,3-Dichlorobenzene	<	1.4	3.41	763	7.63E-03	5.45E-02	7.14E+00
3	1,3-Dichlorobenzene	<	1.7	3.41	763	7.63E-03	6.61E-02	8.67E+00
4	1,3-Dichlorobenzene	<	1.8	3.41	763	7.63E-03	7.00E-02	9.18E+00
10	1,3-Dichlorobenzene	<	1.5	3.41	763	7.63E-03	5.84E-02	7.65E+00
1	1,3-Dichloropropene	<	0.008	1.36	244	2.44E-03	3.49E-02	1.43E+01
1	1,4-Dichlorobenzene	<	2	3.38	763	7.63E-03	8.34E-02	1.09E+01
2	1,4-Dichlorobenzene	<	1.4	3.38	763	7.63E-03	5.84E-02	7.65E+00
3	1,4-Dichlorobenzene	<	1.7	3.38	763	7.63E-03	7.09E-02	9.29E+00
4	1,4-Dichlorobenzene	<	1.8	3.38	763	7.63E-03	7.50E-02	9.83E+00
10	1,4-Dichlorobenzene	<	1.5	3.38	763	7.63E-03	6.25E-02	8.20E+00
1	2,4,6-Trichlorophenol	<	0.5	3.69	970	9.70E-03	1.02E-02	1.05E+00
1	2,4-Dichlorophenol	<	0.5	3.06	365	3.65E-03	4.35E-02	1.19E+01
1	2,4-Dimethylphenol	<	0.5	2.36	2200	2.20E-02	2.18E-01	9.92E+00
1	2,4-Dinitrophenol	<	5	1.54	150	1.50E-03	1.44E+01	9.61E+03

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{ow})$	Intermediate criteria µg/L	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
1	2,4-Dinitrotoluene	<	2	1.98	230	2.30E-03	2.09E+00	9.11E+02
2	2,4-Dinitrotoluene	<	1.4	1.98	230	2.30E-03	1.47E+00	6.37E+02
3	2,4-Dinitrotoluene	<	1.7	1.98	230	2.30E-03	1.78E+00	7.74E+02
4	2,4-Dinitrotoluene	<	1.8	1.98	230	2.30E-03	1.88E+00	8.19E+02
10	2,4-Dinitrotoluene	<	1.5	1.98	230	2.30E-03	1.57E+00	6.83E+02
1	2,6-Dinitrotoluene	<	2	1.98	230	2.30E-03	2.09E+00	9.11E+02
2	2,6-Dinitrotoluene	<	1.4	1.98	230	2.30E-03	1.47E+00	6.37E+02
3	2,6-Dinitrotoluene	<	1.7	1.98	230	2.30E-03	1.78E+00	7.74E+02
4	2,6-Dinitrotoluene	<	1.8	1.98	230	2.30E-03	1.88E+00	8.19E+02
10	2,6-Dinitrotoluene	<	1.5	1.98	230	2.30E-03	1.57E+00	6.83E+02
1	2-Chloroethyl vinyl ether	<	0.008	0.99		0.00E+00	8.19E-02	
1	2-Chloronaphthalene	<	2		440	4.40E-03		
2	2-Chloronaphthalene	<	1.4		440	4.40E-03		
3	2-Chloronaphthalene	<	1.7		440	4.40E-03		
4	2-Chloronaphthalene	<	1.8		440	4.40E-03		
10	2-Chloronaphthalene	<	1.5		440	4.40E-03		
1	2-Chlorophenol	<	0.5	2.15	2000	2.00E-02	3.54E-01	1.77E+01
1	2-Nitrophenol	<	0.5	1.79	150	1.50E-03	8.11E-01	5.41E+02
1	3,3'-Dichlorobenzidine	<	5	3.02		0.00E+00	4.77E-01	
2	3,3'-Dichlorobenzidine	<	3.5	3.02		0.00E+00	3.34E-01	
3	3,3'-Dichlorobenzidine	<	4	3.02		0.00E+00	3.82E-01	
4	3,3'-Dichlorobenzidine	<	4	3.02		0.00E+00	3.82E-01	
10	3,3'-Dichlorobenzidine	<	3.8	3.02		0.00E+00	3.63E-01	
1	4,6-Dinitro-ortho-cresol	<	2.5	3.5	150	1.50E-03	7.91E-02	5.27E+01
1	4-Bromophenyl phenyl ether	<	2	5.24	122	1.22E-03	1.15E-03	9.43E-01

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	log(K_{OW})	Intermediate criteria (μg/L)	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
2	4-Bromophenyl phenyl ether	<	1.4	5.24	122	1.22E-03	8.06E-04	6.60E-01
3	4-Bromophenyl phenyl ether	<		5.24	122	1.22E-03	9.78E-04	8.02E-01
4	4-Bromophenyl phenyl ether	<	1.8	5.24	122	1.22E-03	1.04E-03	8.49E-01
10	4-Bromophenyl phenyl ether	<	1.5	5.24	122	1.22E-03	8.63E-04	7.08E-01
1	4-Chlorophenyl phenyl ether	<	2	4.08	122	1.22E-03	1.66E-02	1.36E+01
2	4-Chlorophenyl phenyl ether	<	1.4	4.08	122	1.22E-03	1.16E-02	9.54E+00
3	4-Chlorophenyl phenyl ether	<	1.7	4.08	122	1.22E-03	1.41E-02	1.16E+01
4	4-Chlorophenyl phenyl ether	<	1.8	4.08	122	1.22E-03	1.50E-02	1.23E+01
10	4-Chlorophenyl phenyl ether	<	1.5	4.08	122	1.22E-03	1.25E-02	1.02E+01
1	4-Nitrophenol	<	0.5	1.91	150	1.50E-03	6.15E-01	4.10E+02
1	Acenaphthene	<	2	3.92	520	5.20E-03	2.40E-02	4.62E+00
2	Acenaphthene	<	1.4	3.92	520	5.20E-03	1.68E-02	3.24E+00
3	Acenaphthene	<	1.7	3.92	520	5.20E-03	2.04E-02	3.93E+00
4	Acenaphthene	<	1.8	3.92	520	5.20E-03	2.16E-02	4.16E+00
10	Acenaphthene	<	1.5	3.92	520	5.20E-03	1.80E-02	3.47E+00
1	Acenaphthylene	<	2	4.07		0.00E+00	1.70E-02	
2	Acenaphthylene	<	1.4	4.07		0.00E+00	1.19E-02	
3	Acenaphthylene	<	1.7	4.07		0.00E+00	1.45E-02	
4	Acenaphthylene	<	1.8	4.07		0.00E+00	1.53E-02	
10	Acenaphthylene	<	1.5	4.07		0.00E+00	1.28E-02	
1	Acrolein	<	0.08	0.9	21	2.10E-04	1.01E+00	4.80E+03
1	Acrylonitrile	<	0.08	1.2	2600	2.60E-02	5.05E-01	1.94E+01
1	Aldrin	<	0.5	5.52		0.00E+00	1.51E-04	
1	Anthracene	<	2	4.45		0.00E+00	7.10E-03	
2	Anthracene	<	1.4	4.45		0.00E+00	4.97E-03	
3	Anthracene		0.5	4.45		0.00E+00	1.77E-03	

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	log(K_{ow})	Intermediate criteria (μg/L)	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
4	Anthracene		5.6	4.45		0.00E+00	1.99E-02	
10	Anthracene	<	1.5	4.45		0.00E+00	5.32E-03	
1	Benzene	<	0.008	2.15	727	7.27E-03	5.66E-03	7.79E-01
1	Benzidine	<	10	1.35	74	7.40E-04	4.47E+01	6.04E+04
2	Benzidine	<	7	1.35	74	7.40E-04	3.13E+01	4.23E+04
3	Benzidine	<	8	1.35	74	7.40E-04	3.57E+01	4.83E+04
4	Benzidine	<	9	1.35	74	7.40E-04	4.02E+01	5.43E+04
10	Benzidine	<	7.5	1.35	74	7.40E-04	3.35E+01	4.53E+04
1	Benzo(a)anthracene	<	2	5.91		0.00E+00	2.46E-04	
2	Benzo(a)anthracene	<	1.4	5.91		0.00E+00	1.72E-04	
3	Benzo(a)anthracene		0.5	5.91		0.00E+00	6.15E-05	
4	Benzo(a)anthracene		3.8	5.91		0.00E+00	4.68E-04	
10	Benzo(a)anthracene	<	1.5	5.91		0.00E+00	1.85E-04	
1	Benzo(b)fluoranthene	<	2	6.12		0.00E+00	1.52E-04	
2	Benzo(b)fluoranthene	<	1.4	6.12		0.00E+00	1.06E-04	
3	Benzo(b)fluoranthene	<	1.7	6.12		0.00E+00	1.29E-04	
4	Benzo(b)fluoranthene	<	1.8	6.12		0.00E+00	1.37E-04	
10	Benzo(b)fluoranthene	<	1.5	6.12		0.00E+00	1.14E-04	
1	Benzo(ghi)perylene	<	2	6.58		0.00E+00	5.26E-05	
2	Benzo(ghi)perylene	<	1.4	6.58		0.00E+00	3.68E-05	
3	Benzo(ghi)perylene	<	1.7	6.58		0.00E+00	4.47E-05	
4	Benzo(ghi)perylene	<	1.8	6.58		0.00E+00	4.73E-05	
10	Benzo(ghi)perylene	<	1.5	6.58		0.00E+00	3.95E-05	
1	Benzo(k)flouranthene	<	2	6.84		0.00E+00	2.89E-05	
2	Benzo(k)flouranthene	<	1.4	6.84		0.00E+00	2.02E-05	
3	Benzo(k)flouranthene	<	1.7	6.84		0.00E+00	2.46E-05	

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	log(K_{ow})	Intermediate criteria (μg/L)	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
4	Benzo(k)flouranthene	<	1.8	6.84		0.00E+00	2.60E-05	
10	Benzo(k)flouranthene	<	1.5	6.84		0.00E+00	2.17E-05	
1	Benzo-a-pyrene	<	2	6.19		0.00E+00	1.29E-04	
2	Benzo-a-pyrene	<	1.4	6.19		0.00E+00	9.04E-05	
3	Benzo-a-pyrene	<	1.7	6.19		0.00E+00	1.10E-04	
4	Benzo-a-pyrene	<	1.8	6.19		0.00E+00	1.16E-04	
10	Benzo-a-pyrene	<	1.5	6.19		0.00E+00	9.68E-05	
1	Bis(2-chloroethoxy)methane	<	2	0.75		0.00E+00	3.56E+01	
2	Bis(2-chloroethoxy)methane	<	1.4	0.75		0.00E+00	2.49E+01	
3	Bis(2-chloroethoxy)methane	<	1.7	0.75		0.00E+00	3.02E+01	
4	Bis(2-chloroethoxy)methane	<	1.8	0.75		0.00E+00	3.20E+01	
10	Bis(2-chloroethoxy)methane	<	1.5	0.75		0.00E+00	2.67E+01	
1	Bis(2-chloroethyl)ether	<	2	1.12	19000	1.90E-01	1.52E+01	7.99E+01
2	Bis(2-chloroethyl)ether	<	1.4	1.12	19000	1.90E-01	1.06E+01	5.59E+01
3	Bis(2-chloroethyl)ether	<	1.7	1.12	19000	1.90E-01	1.29E+01	6.79E+01
4	Bis(2-chloroethyl)ether	<	1.8	1.12	19000	1.90E-01	1.37E+01	7.19E+01
10	Bis(2-chloroethyl)ether	<	1.5	1.12	19000	1.90E-01	1.14E+01	5.99E+01
1	Bis(2-chloroisopropyl)ether	<	2		19000	1.90E-01		
2	Bis(2-chloroisopropyl)ether	<	1.4		19000	1.90E-01		
3	Bis(2-chloroisopropyl)ether	<	1.7		19000	1.90E-01		
4	Bis(2-chloroisopropyl)ether	<	1.8		19000	1.90E-01		
10	Bis(2-chloroisopropyl)ether	<	1.5		19000	1.90E-01		
1	Bis(chloromethyl)ether	<	0.008	-0.38		0.00E+00	1.92E+00	
1	Bis(2-ethylhexyl)phthalate		2.2	4.89	3	3.00E-05	2.83E-03	9.45E+01
2	Bis(2-ethylhexyl)phthalate		1.9	4.89	3	3.00E-05	2.45E-03	8.16E+01
3	Bis(2-ethylhexyl)phthalate		96.7	4.89	3	3.00E-05	1.25E-01	4.15E+03

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{ow})$	Intermediate criteria (μg/L)	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
4	Bis(2-ethylhexyl)phthalate		0.2	4.89	3	3.00E-05	2.58E-04	8.59E+00
10	Bis(2-ethylhexyl)phthalate	<	1.5	4.89	3	3.00E-05	1.93E-03	6.44E+01
1	Bromoform	<	0.008	2.38	4000	4.00E-02	3.33E-03	8.34E-02
1	Carbon tetrachloride	<	0.008	2.72	4000	4.00E-02	1.52E-03	3.81E-02
1	Chlordane	<	2.5	2.78	0.0043	4.30E-08	4.15E-01	9.65E+06
1	Chlorobenzene	<	0.008	2.65	50	5.00E-04	1.79E-03	3.58E+00
1	Chlorodibromomethane	<	0.008	2.09	4000	4.00E-02	6.50E-03	1.63E-01
1	Chloroethane	<	0.008	1.43	20000	2.00E-01	2.97E-02	1.49E-01
1	Chloroform	<	0.008	1.94	1240	1.24E-02	9.19E-03	7.41E-01
1	Chrysene	<	2	5.91		0.00E+00	2.46E-04	
2	Chrysene	<	1.4	5.91		0.00E+00	1.72E-04	
3	Chrysene		0.7	5.91		0.00E+00	8.61E-05	
4	Chrysene		0.4	5.91		0.00E+00	6.64E-04	
10	Chrysene	<	1.5	5.91		0.00E+00	1.85E-04	
1	Dichlorobromomethane	<	0.008	1.88	4000	4.00E-02	1.05E-02	2.64E-01
1	Dichlorodifluoromethane	<	0.008	2.16	4000	4.00E-02	5.53E-03	1.38E-01
1	Dieldrin	<	0.5	5.16	0.0019	1.90E-08	3.46E-04	1.82E+04
1	Diethyl phthalate	<	2.5	1.4	3	3.00E-05	9.95E+00	3.32E+05
2	Diethyl phthalate	<	1.4	1.4	3	3.00E-05	5.57E+00	1.86E+05
3	Diethyl phthalate	<	1.7	1.4	3	3.00E-05	6.77E+00	2.26E+05
4	Diethyl phthalate	<	1.8	1.4	3	3.00E-05	7.17E+00	2.39E+05
10	Diethyl phthalate	<	1.5	1.4	3	3.00E-05	5.97E+00	1.99E+05
1	Dimethyl phthalate	<	2	2.12	3	3.00E-05	1.52E+00	5.06E+04
2	Dimethyl phthalate	<	1.4	2.12	3	3.00E-05	1.06E+00	3.54E+04
3	Dimethyl phthalate	<	1.7	2.12	3	3.00E-05	1.29E+00	4.30E+04
4	Dimethyl phthalate	<	1.8	2.12	3	3.00E-05	1.37E+00	4.55E+04

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{ow})$	Intermediate criteria (μg/L)	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
10	Dimethyl phthalate	<	1.5	2.12	3	3.00E-05	1.14E+00	3.79E+04
1	Di-n-butyl phthalate	<	2	5.2	3	3.00E-05	1.26E-03	4.21E+01
2	Di-n-butyl phthalate	<	1.4	5.2	3	3.00E-05	8.83E-04	2.94E+01
3	Di-n-butyl phthalate		0.3	5.2	3	3.00E-05	1.89E-04	6.31E+00
4	Di-n-butyl phthalate	<	1.8	5.2	3	3.00E-05	1.14E-03	3.79E+01
10	Di-n-butyl phthalate	<	1.5	5.2	3	3.00E-05	9.46E-04	3.15E+01
1	Di-n-octyl phthalate	<	2	5.55	3	3.00E-05	5.64E-04	1.88E+01
2	Di-n-octyl phthalate	<	1.4	5.55	3	3.00E-05	3.95E-04	1.32E+01
3	Di-n-octyl phthalate	<	1.7	5.55	3	3.00E-05	4.79E-04	1.60E+01
4	Di-n-octyl phthalate	<	1.8	5.55	3	3.00E-05	5.07E-04	1.69E+01
10	Di-n-octyl phthalate	<	1.5	5.55	3	3.00E-05	4.23E-04	1.41E+01
1	Endosulfan, alpha	<	0.5	3.83	0.056	5.60E-07	7.40E-03	1.32E+04
1	Endosulfan, beta	<	0.5	3.62	0.056	5.60E-07	1.20E-02	2.14E+04
1	Endosulfan sulfate	<	0.5	3.66	0.056	5.60E-07	1.09E-02	1.95E+04
1	Endrin	<	0.5	5.38	0.0023	2.30E-08	2.08E-04	9.06E+03
1	Endrin aldehyde	<	0.5	5.6		0.00E+00	1.26E-04	
1	Ethylbenzene	<	0.008	3.15	440	4.40E-03	5.66E-04	1.29E-01
1	Fluoranthene	<	2	5.22	16	1.60E-04	1.21E-03	7.56E+00
2	Fluoranthene	<	1.4	5.22	16	1.60E-04	8.44E-04	5.28E+00
3	Fluoranthene		3.8	5.22	16	1.60E-04	2.29E-03	1.43E+01
4	Fluoranthene	<	1.8	5.22	16	1.60E-04	1.08E-03	6.75E+00
10	Fluoranthene	<	1.5	5.22	16	1.60E-04	9.04E-04	5.63E+00
1	Fluorene	<	2	4.18	6	6.00E-05	1.32E-02	2.20E+02
2	Fluorene	<	1.4	4.18	6	6.00E-05	9.25E-03	1.54E+02
3	Fluorene	<	1.7	4.18	6	6.00E-05	1.12E-02	1.87E+02
4	Fluorene	<	1.8	4.18	6	6.00E-05	1.19E-02	1.98E+02

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{OW})$	Intermediate criteria (μg/L)	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
10	Fluorene	<	1.5	4.18	6	6.00E-05	9.91E-03	1.65E+02
1	Heptachlor	<	0.5	5.44	0.0038	3.80E-08	1.82E-04	4.78E+03
1	Heptachlor epoxide	<	0.5	5.4		0.00E+00	1.99E-04	
1	Hexachlorobenzene	<	2	5.31	38	3.80E-04	9.80E-04	2.58E+00
2	Hexachlorobenzene	<	1.4	5.31	38	3.80E-04	6.86E-04	1.80E+00
3	Hexachlorobenzene	<	1.7	5.31	38	3.80E-04	8.33E-04	2.19E+00
4	Hexachlorobenzene	<	1.8	5.31	38	3.80E-04	8.82E-04	2.32E+00
10	Hexachlorobenzene	<	1.5	5.31	38	3.80E-04	7.35E-04	1.93E+00
1	Hexachlorobutadiene	<	2	4.9	9.3	9.30E-05	2.52E-03	2.71E+01
2	Hexachlorobutadiene	<	1.4	4.9	9.3	9.30E-05	1.76E-03	1.90E+01
3	Hexachlorobutadiene	<	1.7	4.9	9.3	9.30E-05	2.14E-03	2.30E+01
4	Hexachlorobutadiene	<	1.8	4.9	9.3	9.30E-05	2.27E-03	2.44E+01
10	Hexachlorobutadiene	<	1.5	4.9	9.3	9.30E-05	1.89E-03	2.03E+01
1	Hexachlorocyclohexane, alpha	<	0.5	3.81		0.00E+00	7.74E-03	
1	Hexachlorocyclohexane, beta	<	0.5	3.96		0.00E+00	5.48E-03	
1	Hexachlorocyclohexane, delta	<	0.5	4.14		0.00E+00	3.62E-03	
1	Hexachlorocyclohexane, gama	<	0.5	3.66	2	2.00E-05	1.09E-02	5.47E+02
1	Hexachlorocyclopentadiene	<	2	5.51	5.2	5.20E-05	6.18E-04	1.19E+01
2	Hexachlorocyclopentadiene	<	1.4	5.51	5.2	5.20E-05	4.33E-04	8.32E+00
3	Hexachlorocyclopentadiene	<	1.7	5.51	5.2	5.20E-05	5.25E-04	1.01E+01
4	Hexachlorocyclopentadiene	<	1.8	5.51	5.2	5.20E-05	5.56E-04	1.07E+01
10	Hexachlorocyclopentadiene	<		5.51	5.2	5.20E-05	4.64E-04	8.91E+00
1	Hexachloroethane	<	2	3.93	540	5.40E-03	2.35E-02	4.35E+00
2	Hexachloroethane	<	1.4	3.93	540	5.40E-03	1.64E-02	3.05E+00
3	Hexachloroethane	<	1.7	3.93	540	5.40E-03	2.00E-02	3.70E+00
4	Hexachloroethane	<	1.8	3.93	540	5.40E-03	2.11E-02	3.92E+00

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{ow})$	Intermediate criteria (μg/L)	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
10	Hexachloroethane	<	1.5	3.93	540	5.40E-03	1.76E-02	3.26E+00
1	Indeno (1,2,3-cd) pyrene	<	2	6.58		0.00E+00	5.26E-05	
2	Indeno (1,2,3-cd) pyrene	<	1.4	6.58		0.00E+00	3.68E-05	
3	Indeno (1,2,3-cd) pyrene	<	1.7	6.58		0.00E+00	4.47E-05	
4	Indeno (1,2,3-cd) pyrene	<	1.8	6.58		0.00E+00	4.73E-05	
10	Indeno (1,2,3-cd) pyrene	<	1.5	6.58		0.00E+00	3.95E-05	
1	Isophorone	<	2	1.67	14000	1.40E-01	4.28E+00	3.05E+01
2	Isophorone	<	1.4	1.67	14000	1.40E-01	2.99E+00	2.14E+01
3	Isophorone	<	1.7	1.67	14000	1.40E-01	3.63E+00	2.60E+01
4	Isophorone	<	1.8	1.67	14000	1.40E-01	3.85E+00	2.75E+01
10	Isophorone	<	1.5	1.67	14000	1.40E-01	3.21E+00	2.29E+01
1	Methyl bromide	<	0.008	1.19	4000	4.00E-02	5.17E-02	1.29E+00
1	Methyl chloride	<	0.008	0.91	4000	4.00E-02	9.84E-02	2.46E+00
1	Methylene chloride		0.1	1.25	4000	4.00E-02	5.62E-01	1.41E+01
1	Naphthalene	<	2	3.33	620	6.20E-03	9.35E-02	1.51E+01
2	Naphthalene	<	1.4	3.33	620	6.20E-03	6.55E-02	1.06E+01
3	Naphthalene	<	1.7	3.33	620	6.20E-03	7.95E-02	1.28E+01
4	Naphthalene	<	1.8	3.33	620	6.20E-03	8.42E-02	1.36E+01
10	Naphthalene	<	1.5	3.33	620	6.20E-03	7.02E-02	1.13E+01
1	Nitrobenzene	<	2	1.85	32000	3.20E-01	2.83E+00	8.83E+00
2	Nitrobenzene	<	1.4	1.85	32000	3.20E-01	1.98E+00	6.18E+00
3	Nitrobenzene	<	1.7	1.85	32000	3.20E-01	2.40E+00	7.50E+00
4	Nitrobenzene	<	1.8	1.85	32000	3.20E-01	2.54E+00	7.95E+00
10	Nitrobenzene	<	1.5	1.85	32000	3.20E-01	2.12E+00	6.62E+00
1	N-butyl benzyl phthalate	<	2	4.05	3	3.00E-05	1.78E-02	5.94E+02
2	N-butyl benzyl phthalate	<	1.4	4.05	3	3.00E-05	1.25E-02	4.16E+02

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{ow})$	Intermediate criteria (μg/L)	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
3	N-butyl benzyl phthalate	<	1.7	4.05	3	3.00E-05	1.52E-02	5.05E+02
4	N-butyl benzyl phthalate	<	1.8	4.05	3	3.00E-05	1.60E-02	5.35E+02
10	N-butyl benzyl phthalate	<	1.5	4.05	3	3.00E-05	1.34E-02	4.46E+02
1	N-nitrosodimethylamine	<	2	-0.57	58	5.80E-04	7.43E+02	1.28E+06
2	N-nitrosodimethylamine	<	1.4	-0.57	58	5.80E-04	5.20E+02	8.97E+05
3	N-nitrosodimethylamine	<	1.7	-0.57	58	5.80E-04	6.32E+02	1.09E+06
4	N-nitrosodimethylamine	<	1.8	-0.57	58	5.80E-04	6.69E+02	1.15E+06
10	N-nitrosodimethylamine	<	1.5	-0.57	58	5.80E-04	5.57E+02	9.61E+05
1	N-nitrosodiphenylamine	<	2	2.57	58	5.80E-04	5.38E-01	9.28E+02
2	N-nitrosodiphenylamine	<	1.4	2.57	58	5.80E-04	3.77E-01	6.50E+02
3	N-nitrosodiphenylamine	<	1.7	2.57	58	5.80E-04	4.58E-01	7.89E+02
4	N-nitrosodiphenylamine	<	1.8	2.57	58	5.80E-04	4.84E-01	8.35E+02
10	N-nitrosodiphenylamine	<	1.5	2.57	58	5.80E-04	4.04E-01	6.96E+02
1	N-nitrosodi-n-propylamine	<	2	1.36	58	5.80E-04	8.73E+00	1.51E+04
2	N-nitrosodi-n-propylamine	<	1.4	1.36	58	5.80E-04	6.11E+00	1.05E+04
3	N-nitrosodi-n-propylamine	<	1.7	1.36	58	5.80E-04	7.42E+00	1.28E+04
4	N-nitrosodi-n-propylamine	<	1.8	1.36	58	5.80E-04	7.86E+00	1.35E+04
10	N-nitrosodi-n-propylamine	<		1.36	58	5.80E-04	6.55E+00	1.13E+04
1	p,p'-DDD	<	0.5	6.02	0.001	1.00E-08	4.77E-05	4.77E+03
1	p,p'-DDE	<	0.5	5.83	0.001	1.00E-08	7.40E-05	7.40E+03
1	p,p'-DDT	<	0.5	5.69	0.001	1.00E-08	1.02E-04	1.02E+04
1	Parachlorometa cresol	<	0.5	3.1	2000	2.00E-02	3.97E-02	1.99E+00
1	PCB-1016	<	5	6	0.2	2.00E-06	5.00E-04	2.50E+02
2	PCB-1016	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
3	PCB-1016	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{OW})$	Intermediate criteria (μg/L)	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
4	PCB-1016	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
5	PCB-1016	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
10.	PCB-1016	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
1	PCB-1221	<	5	6	0.2	2.00E-06	5.00E-04	2.50E+02
2	PCB-1221	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
3	PCB-1221	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
4	PCB-1221	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
5	PCB-1221	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
10	PCB-1221	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
1	PCB-1232	<	5	6	0.2	2.00E-06	5.00E-04	2.50E+02
2	PCB-1232	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
3	PCB-1232	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
4	PCB-1232	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
5	PCB-1232	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
10	PCB-1232	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
1	PCB-1242	<	5	6	0.2	2.00E-06	5.00E-04	2.50E+02
2	PCB-1242	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
3	PCB-1242	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
4	PCB-1242	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
5	PCB-1242	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
10	PCB-1242	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
1	PCB-1248	<	5	6	0.2	2.00E-06	5.00E-04	2.50E+02
2	PCB-1248	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
3	PCB-1248	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
4	PCB-1248	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
5	PCB-1248	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
10	PCB-1248	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{ow})$	Intermediate criteria (μg/L)	Lower screening criterion mg/l	Pore water mg/l	Lower quotient
1	PCB-1254	<	5	6	0.2	2.00E-06	5.00E-04	2.50E+02
2	PCB-1254		1.2	6	0.2	2.00E-06	1.20E-04	6.00E+01
3	PCB-1254	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
4	PCB-1254	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
5	PCB-1254	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
10	PCB-1254	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
1	PCB-1260	<	5	6	0.2	2.00E-06	5.00E-04	2.50E+02
2	PCB-1260		1.6	6	0.2	2.00E-06	1.60E-04	8.00E+01
3	PCB-1260	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
4	PCB-1260	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
5	PCB-1260	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
10	PCB-1260	<	0.1	6	0.2	2.00E-06	1.00E-05	5.00E+00
1	Pentachlorophenol	<	0.5	5.12	13	1.30E-04	3.79E-04	2.92E+00
1	Phenanthrene	<	2	4.57	3.7	3.70E-05	5.38E-03	1.45E+02
2	Phenanthrene	<	1.4	4.57	3.7	3.70E-05	3.77E-03	1.02E+02
3	Phenanthrene		2.7	4.57	3.7	3.70E-05	7.27E-03	1.96E+02
4	Phenanthrene		5.4	4.57	3.7	3.70E-05	1.45E-02	3.93E+02
10	Phenanthrene	<	1.5	4.57	3.7	3.70E-05	4.04E-03	1.09E+02
1	Phenol	<	0.5	1.48	2560	2.56E-02	1.66E+00	6.47E+01
1	Phenols		300	1.48	2560	2.56E-02	9.93E+02	3.88E+04
2	Phenols		0.6	1.48	2560	2.56E-02	1.99E+00	7.76E+01
3	Phenols	<	0.4	1.48	2560	2.56E-02	1.32E+00	5.17E+01
4	Phenols		0.6	1.48	2560	2.56E-02	1.99E+00	7.76E+01
10	Phenols		0.5	1.48	2560	2.56E-02	1.66E+00	6.47E+01
1	Pyrene	<	2	5.18		0.00E+00	1.32E-03	
2	Pyrene	<	1.4	5.18		0.00E+00	9.25E-04	

Table A-3 (continued)

Reach	Compound	Remarks[a]	Maximum concentration (mg/kg)	$\log(K_{ow})$	Intermediate criteria (μg/L)	Lower screening criterion (mg/L)	Pore water (mg/L)	Lower quotient
3	Pyrene		4.8	5.18		0.00E+00	3.17E-03	
4	Pyrene		12	5.18		0.00E+00	7.93E-03	
10.	Pyrene	<	1.5	5.18		0.00E+00	9.91E-04	
1	Toluene	<	0.008	2.58	230	2.30E-03	2.10E-03	9.15E-01
1	Toxaphene	<	5	3.3	0.0002	2.00E-09	2.51E-01	1.25E+08
1	trans-1,2-Dichloroethene	<	0.008	2.09	2800	2.80E-02	6.50E-03	2.32E-01
1	Trichlorofluoromethane	<	0.008	2.53	4000	4.00E-02	2.36E-03	5.90E-02
1	Vinyl chloride	<	0.008	1.48		0.00E+00	2.65E-02	

[a]"<" indicates that the chemical was not detected and the reported concentration is the highest reported limit of detection; and "A" indicates that the value reported is the mean of two or more determinations.

Table A-4. Mean sediment concentrations, criteria, and quotients for benthic biota

Reach	Compound	Mean conc. (mg/kg)	Remarks[a]	log K_{OW}	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
2	Aluminum	7150			87	8.70E-01		8.22E+06
3	Aluminum	20421.67			87	8.70E-01		2.35E+07
4	Aluminum	3700			87	8.70E-01		4.25E+06
1	Antimony	0.3			1600	1.60E+01		1.88E+01
1	Arsenic	15			48	4.80E-01		3.13E+04
2	Arsenic	8.217			48	4.80E-01		1.71E+04
3	Arsenic	8.64426			48	4.80E-01		1.80E+04
4	Arsenic	6.2097			48	4.80E-01		1.29E+04
5	Arsenic	16			48	4.80E-01		3.33E+04
10	Arsenic	20			48	4.80E-01		4.17E+04
1	Berylium	1.6			5.3	5.30E-02		3.02E+04
5	Berylium	1.6			5.3	5.30E-02		3.02E+04
1	Cadmium	0.833333	<		1.1	1.10E-02		7.58E+04
2	Cadmium	1.9			1.1	1.10E-02		1.73E+05
3	Cadmium	0.817122			1.1	1.10E-02		7.43E+04
4	Cadmium	0.5189			1.1	1.10E-02		4.12E+04
5	Cadmium	1	<		1.1	1.10E-02		9.09E+04
10	Cadmium	0.5	<		1.1	1.10E-02		4.55E+04
1	Chromium	23.33333			11	1.10E-01		2.12E+05
2	Chromium	71.33317			11	1.10E-01		6.48E+05
3	Chromium	54.22886			11	1.10E-01		4.93E+05
4	Chromium	26.869			11	1.10E-01		2.44E+05
5	Chromium	35.17995			11	1.10E-01		3.20E+05
10	Chromium	22			11	1.10E-01		2.00E+05
1	Copper	44			12	1.20E-01		3.67E+05
2	Copper	12.73333			12	1.20E-01		1.06E+05
3	Copper	58.5979			12	1.20E-01		4.88E+05
4	Copper	22.82475			12	1.20E-01		1.90E+05
5	Copper	40			12	1.20E-01		3.33E+05
1	Cyanide	1	<		5.2	5.20E-02		1.92E+04
2	Cyanide	0.933	<		5.2	5.20E-02		1.79E+04
3	Cyanide	0.967	<		5.2	5.20E-02		1.86E+04
4	Cyanide	0.75	<		5.2	5.20E-02		1.44E+04
10	Cyanide	0.9	<		5.2	5.20E-02		1.73E+04
1	Lead	44.66667			3.2	3.20E-02		1.40E+06
2	Lead	26.74983			3.2	3.20E-02		8.36E+05
3	Lead	30.26123			3.2	3.20E-02		9.46E+05
4	Lead	22.76267			3.2	3.20E-02		7.11E+05
5	Lead	53			3.2	3.20E-02		1.66E+06
10	Lead	62.5			3.2	3.20E-02		1.95E+06
1	Manganese	3500			4100	4.10E+01		8.54E+04

Table A-4 (continued)

Reach	Compound	Mean conc. (mg/kg)	Remarks[a]	log K_{ow}	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
2	Manganese	1415			4100	4.10E+01		3.45E+04
3	Manganese	550.42			4100	4.10E+01		1.34E+04
4	Manganese	415			4100	4.10E+01		1.01E+04
5	Manganese	3600			4100	4.10E+01		8.78E+04
1	Mercury	0.1	<		0.07	7.00E-04		1.43E+05
2	Mercury	1.9125			0.07	7.00E-04		2.73E+06
3	Mercury	10.24547			0.07	7.00E-04		1.46E+07
4	Mercury	7.751			0.07	7.00E-04		1.11E+07
5	Mercury	1.786155			0.07	7.00E-04		2.55E+06
10	Mercury	0.1			0.07	7.00E-04		1.43E+05
1	Nickel	23.33333			160	1.60E+00		1.46E+04
2	Nickel	18.65017			160	1.60E+00		1.17E+04
3	Nickel	97.18768			160	1.60E+00		6.07E+04
4	Nickel	30.10762			160	1.60E+00		1.88E+04
5	Nickel	24			160	1.60E+00		1.50E+04
10	Nickel	25.5			160	1.60E+00		1.59E+04
1	Selenium	1.1			35	3.50E-01		3.14E+03
2	Selenium	74.5			35	3.50E-01		2.13E+05
3	Selenium	80.57436			35	3.50E-01		2.30E+05
4	Selenium	52.8003			35	3.50E-01		1.51E+05
5	Selenium	0.8			35	3.50E-01		2.29E+03
1	Silver	1	<		0.12	1.20E-03		8.33E+05
2	Silver	3.6125			0.12	1.20E-03		3.01E+06
3	Silver	14.89978			0.12	1.20E-03		1.24E+07
4	Silver	0.9097			0.12	1.20E-03		7.58E+05
5	Silver	1	<		0.12	1.20E-03		8.33E+05
10	Silver	1	<		0.12	1.20E-03		8.33E+05
1	Thallium	5	<		40	4.00E-01		1.25E+04
2	Thorium	20	<		565	5.65E+00		3.54E+03
3	Thorium	20	<		565	5.65E+00		3.54E+03
4	Thorium	20	<		565	5.65E+00		3.54E+03
1	Uranium	5.9			280	2.80E+00		2.11E+03
2	Uranium	3.999			280	2.80E+00		1.43E+03
3	Uranium	17.50621			280	2.80E+00		6.25E+03
4	Uranium	2.975			280	2.80E+00		1.06E+03
10	Uranium	4.25			280	2.80E+00		1.52E+03
1	Zinc	135			110	1.10E+00		1.23E+05
2	Zinc	52.66667			110	1.10E+00		4.79E+04
3	Zinc	139.0981			110	1.10E+00		1.26E+05
4	Zinc	89.36384			110	1.10E+00		8.12E+04
5	Zinc	220			110	1.10E+00		2.00E+05

Table A-4 (continued)

Reach	Compound	Mean conc. (mg/kg)	Remarks[a]	log K_{OW}	Intermediate criteria (µg/L)	Lower criteria (µg/L)	Pore water (mg/L)	Lower quotient
2	Manganese	1415			4100	4.10E+01		1.64E+05
2	Zirconium	500			140	1.40E+00		3.57E+05
3	Zirconium	343.333			140	1.40E+00		2.45E+05
4	Zirconium	505			140	1.40E+00		3.61E+05
10	Zirconium	195			140	1.40E+00		1.39E+05
1	1,1,1-Trichloroethane	0.008	<	2.48	9400	9.40E+01	2.65E-03	2.82E+08
1	1,1,2,2-Tetrachloroethane	0.008	<	2.39	2400	2.40E+01	3.26E-03	1.36E+06
1	1,1,2-Trichloroethane	0.008	<	2.48	9400	9.40E+01	2.65E-03	2.82E+08
1	1,1-Dichloroethane	0.008	<	1.79	20000	2.00E+02	1.30E-02	6.49E+08
1	1,1-Dichloroethylene	0.008	<	1.48	11600	1.16E+02	2.65E-02	2.28E-01
1	1,2,4-Trichlorobenzene	1.25	<	4.23	50	5.00E-01	7.36E-03	1.47E+01
2	1,2,4-Trichlorobenzene	0.937	<	4.23	50	5.00E-01	5.52E-03	1.10E+01
3	1,2,4-Trichlorobenzene	1.4	<	4.23	50	5.00E-01	8.24E-03	1.65E+01
4	1,2,4-Trichlorobenzene	1.5	<	4.23	50	5.00E-01	8.83E-03	1.77E+01
10	1,2,4-Trichlorobenzene	1.45	<	4.23	50	5.00E-01	8.54E-03	1.71E+01
1	1,2,5,6-Dibenzanthracene	1.25	<	6.5		0.00E+00	3.95E-05	
2	1,2,5,6-Dibenzanthracene	0.937	<	6.5		0.00E+00	2.96E-05	
3	1,2,5,6-Dibenzanthracene	1.4	<	6.5		0.00E+00	4.43E-05	
4	1,2,5,6-Dibenzanthracene	1.5	<	6.5		0.00E+00	4.74E-05	
10	1,2,5,6-Dibenzanthracene	1.45	<	6.5		0.00E+00	4.59E-05	
1	1,2-Dichlorobenzene	1.25	<	3.39	763	7.63E+00	5.09E-02	6.67E+00
2	1,2-Dichlorobenzene	0.937	<	3.39	763	7.63E+00	3.82E-02	5.00E+00
3	1,2-Dichlorobenzene	1.4	<	3.39	763	7.63E+00	5.70E-02	7.47E+00
4	1,2-Dichlorobenzene	1.5	<	3.39	763	7.63E+00	6.11E-02	8.01E+00
10	1,2-Dichlorobenzene	1.45	<	3.39	763	7.63E+00	5.91E-02	7.74E+00
1	1,2-Dichloroethane	0.008	<	1.47	20000	2.00E+02	2.71E-02	1.36E-01
1	1,2-Dichloropropane	0.008	<	2.28	5700	5.70E+01	4.20E-03	7.37E-02
1	1,2-Diphenylhydrazine	1.25	<	2.94		0.00E+00	1.44E-01	
2	1,2-Diphenylhydrazine	0.937	<	2.94		0.00E+00	1.08E-01	
3	1,2-Diphenylhydrazine	1.4	<	2.94		0.00E+00	1.61E-01	
4	1,2-Diphenylhydrazine	1.5	<	2.94		0.00E+00	1.72E-01	
10	1,2-Diphenylhydrazine	1.45	<	2.94		0.00E+00	1.66E-01	
1	1,3-Dichlorobenzene	1.25	<	3.41	763	7.63E+00	4.86E-02	6.37E+00
2	1,3-Dichlorobenzene	0.937	<	3.41	763	7.63E+00	3.65E-02	4.78E+00
3	1,3-Dichlorobenzene	1.4	<	3.41	763	7.63E+00	5.45E-02	7.14E+00
4	1,3-Dichlorobenzene	1.5	<	3.41	763	7.63E+00	5.84E-02	7.65E+00
10	1,3-Dichlorobenzene	1.45	<	3.41	763	7.63E+00	5.64E-02	7.39E+00
1	1,3-Dichloropropene	0.008	<	1.4	244	2.44E+00	3.18E-02	1.31E+01
1	1,4-Dichlorobenzene	1.25	<	3.38	763	7.63E+00	5.21E-02	6.83E+00
2	1,4-Dichlorobenzene	0.937	<	3.38	763	7.63E+00	3.91E-02	5.12E+00
3	1,4-Dichlorobenzene	1.4	<	3.38	763	7.63E+00	5.84E-02	7.65E+00

Table A-4 (continued)

Reach	Compound	Mean conc. (mg/kg)	Remarks[a]	log K_{ow}	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
4	1,4-Dichlorobenzene	1.5	<	3.38	763	7.63E+00	6.25E-02	8.20E+00
10	1,4-Dichlorobenzene	1.45	<	3.38	763	7.63E+00	6.04E-02	7.92E+00
1	2,4,6-Trichlorophenol	0.5	<	3.69	970	9.70E+00	1.02E-02	1.05E+00
1	2,4-Dichlorophenol	0.5	<	3.06	365	3.65E+00	4.35E-02	1.19E+01
1	2,4-Dimethylphenol	0.5	<	2.36	2200	2.20E+01	2.18E-01	9.92E+00
1	2,4-Dinitrophenol	5	<	1.5	150	1.50E+00	1.58E+01	1.05E+04
1	2,4-Dinitrotoluene	1.25	<	1.98	230	2.30E+00	1.31E+00	5.69E+02
2	2,4-Dinitrotoluene	0.937	<	1.98	230	2.30E+00	9.81E-01	4.27E+02
3	2,4-Dinitrotoluene	1.4	<	1.98	230	2.30E+00	1.47E+00	6.37E+02
4	2,4-Dinitrotoluene	1.5	<	1.98	230	2.30E+00	1.57E+00	6.83E+02
10	2,4-Dinitrotoluene	1.45	<	1.98	230	2.30E+00	1.52E+00	6.60E+02
1	2,6-Dinitrotoluene	1.25	<	1.98	230	2.30E+00	1.31E+00	5.69E+02
2	2,6-Dinitrotoluene	0.937	<	1.98	230	2.30E+00	9.81E-01	4.27E+02
3	2,6-Dinitrotoluene	1.4	<	1.98	230	2.30E+00	1.47E+00	6.37E+02
4	2,6-Dinitrotoluene	1.5	<	1.98	230	2.30E+00	1.57E+00	6.83E+02
10	2,6-Dinitrotoluene	1.45	<	1.98	230	2.30E+00	1.52E+00	6.60E+02
1	2-Chloroethyl vinyl ether	0.008	<	0.99		0.00E+00	8.19E-02	
1	2-Chloronaphthalene	1.25	<		440	4.40E+00	1.25E+02	2.84E+03
2	2-Chloronaphthalene	0.937	<		440	4.40E+00	9.37E+01	2.13E+03
3	2-Chloronaphthalene	1.4	<		440	4.40E+00	1.40E+02	3.18E+03
4	2-Chloronaphthalene	1.5	<		440	4.40E+00	1.50E+02	3.41E+03
10	2-Chloronaphthalene	1.45	<		440	4.40E+00	1.45E+02	3.30E+03
1	2-Chlorophenol	0.5	<	2.15	2000	2.00E+01	3.54E-01	1.77E+01
1	2-Nitrophenol	0.5	<	1.79	150	1.50E+00	8.11E-01	5.41E+02
1	3,3′-Dichlorobenzidine	3.5	<	3.02		0.00E+00	3.34E-01	
2	3,3′-Dichlorobenzidine	2.367	<	3.02		0.00E+00	2.26E-01	
3	3,3′-Dichlorobenzidine	3.233	<	3.02		0.00E+00	3.09E-01	
4	3,3′-Dichlorobenzidine	3.5	<	3.02		0.00E+00	3.34E-01	
10	3,3′-Dichlorobenzidine	3.65	<	3.02		0.00E+00	3.49E-01	
1	4,6-Dinitro-ortho-cresol	2.5	<	3.5	150	1.50E+00	7.91E-02	5.27E+01
1	4-Bromophenyl phenyl ether	1.25	<	5.24	122	1.22E+00	7.19E-04	5.90E-01
2	4-Bromophenyl phenyl ether	0.937	<	5.24	122	1.22E+00	5.39E-04	4.42E-01
3	4-Bromophenyl phenyl ether	1.4	<	5.24	122	1.22E+00	8.06E-04	6.60E-01
4	4-Bromophenyl phenyl ether	1.5	<	5.24	122	1.22E+00	8.63E-04	7.08E-01
10	4-Bromophenyl phenyl ether	1.45	<	5.24	122	1.22E+00	8.34E-04	6.84E-01
1	4-Chlorophenyl phenyl ether	1.25	<	4.08	122	1.22E+00	1.04E-02	8.52E+00
2	4-Chlorophenyl phenyl ether	0.937	<	4.08	122	1.22E+00	7.79E-03	6.39E+00
3	4-Chlorophenyl phenyl ether	1.4	<	4.08	122	1.22E+00	1.16E-02	9.54E+00
4	4-Chlorophenyl phenyl ether	1.5	<	4.08	122	1.22E+00	1.25E-02	1.02E+01
10	4-Chlorophenyl phenyl ether	1.45	<	4.08	122	1.22E+00	1.21E-02	9.89E+00
1	4-Nitrophenol	0.5	<	1.91	150	1.50E+00	6.15E-01	4.10E+02

Table A-4 (continued)

Reach	Compound	Mean conc. (mg/kg)	Remarks[a]	log K_{OW}	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
1	Acenaphthene	1.25	<	3.92	520	5.20E+00	1.50E-02	2.89E+00
2	Acenaphthene	0.937	<	3.92	520	5.20E+00	1.13E-02	2.17E+00
3	Acenaphthene	1.4	<	3.92	520	5.20E+00	1.68E-02	3.24E+00
4	Acenaphthene	0.752	<	3.92	520	5.20E+00	9.04E-03	1.74E+00
10	Acenaphthene	1.45	<	3.92	520	5.20E+00	1.74E-02	3.35E+00
1	Acenaphthylene	1.25	<	4.07		0.00E+00	1.06E-02	
2	Acenaphthylene	0.803714	<	4.07		0.00E+00	6.84E-03	
3	Acenaphthylene	0.2832	<	4.07		0.00E+00	2.41E-03	
4	Acenaphthylene	1.5	<	4.07		0.00E+00	1.28E-02	
10	Acenaphthylene	1.45	<	4.07		0.00E+00	1.23E-02	
1	Acrolein	0.08	<	0.9	21	2.10E-01	1.01E+00	4.80E+03
1	Acrylonitrile	0.08	<	1.2	2600	2.60E+01	5.05E-01	1.94E+01
1	Aldrin	0.5	<	5.52		0.00E+00	1.51E-04	
1	Anthracene	1.25	<	4.45		0.00E+00	4.44E-03	
2	Anthracene	0.803429		4.45		0.00E+00	2.85E-03	
3	Anthracene	0.159	<	4.45		0.00E+00	5.09E-04	
4	Anthracene	0.307		4.45		0.00E+00	1.36E-03	
10	Anthracene	1.45	<	4.45		0.00E+00	5.14E-03	
1	Benzene	0.008	<	2.15	727	7.27E+00	5.66E-03	7.79E-01
1	Benzidine	7.5	<	1.35	74	7.40E-01	3.35E+01	4.53E+04
2	Benzidine	4.7	<	1.35	74	7.40E-01	2.10E+01	2.84E+04
3	Benzidine	7	<	1.35	74	7.40E-01	3.13E+01	4.23E+04
4	Benzidine	7.5	<	1.35	74	7.40E-01	3.35E+01	4.53E+04
10	Benzidine	7.25	<	1.35	74	7.40E-01	3.24E+01	4.38E+04
1	Benzo(a)anthracene	1.25	<	5.91		0.00E+00	1.54E-04	
2	Benzo(a)anthracene	0.804286	<	5.91		0.00E+00	9.89E-05	
3	Benzo(a)anthracene	0.0273		5.91		0.00E+00	1.51E-05	
4	Benzo(a)anthracene	0.208		5.91		0.00E+00	3.73E-05	
10	Benzo(a)anthracene	1.45	<	5.91		0.00E+00	1.78E-04	
1	Benzo(b)fluoranthene	1.25	<	6.12		0.00E+00	9.48E-05	
2	Benzo(b)fluoranthene	0.937	<	6.12		0.00E+00	7.11E-05	
3	Benzo(b)fluoranthene	1.4	<	6.12		0.00E+00	1.06E-04	
4	Benzo(b)fluoranthene	1.5	<	6.12		0.00E+00	1.14E-04	
10	Benzo(b)fluoranthene	1.45	<	6.12		0.00E+00	1.10E-04	
1	Benzo(ghi)perylene	1.25	<	6.58		0.00E+00	3.29E-05	
2	Benzo(ghi)perylene	0.937	<	6.58		0.00E+00	2.46E-05	
3	Benzo(ghi)perylene	1.4	<	6.58		0.00E+00	3.68E-05	
4	Benzo(ghi)perylene	1.5	<	6.58		0.00E+00	3.95E-05	
10	Benzo(ghi)perylene	1.45	<	6.58		0.00E+00	3.81E-05	
1	Benzo(k)flouranthene	1.25	<	6.84		0.00E+00	1.81E-05	
2	Benzo(k)flouranthene	0.937	<	6.84		0.00E+00	1.35E-05	

Table A-4 (continued)

Reach	Compound	Mean conc. (mg/kg)	Remarks[a]	log K_{OW}	Intermediate criteria (µg/L)	Lower criteria (µg/L)	Pore water (mg/L)	Lower quotient
3	Benzo(k)flouranthene	1.4	<	6.84		0.00E+00	2.02E-05	
4	Benzo(k)flouranthene	1.5	<	6.84		0.00E+00	2.17E-05	
10	Benzo(k)flouranthene	1.45	<	6.84		0.00E+00	2.10E-05	
1	Benzo-a-pyrene	1.25	<	6.19		0.00E+00	8.07E-05	
2	Benzo-a-pyrene	0.937	<	6.19		0.00E+00	6.05E-05	
3	Benzo-a-pyrene	1.4	<	6.19		0.00E+00	9.04E-05	
4	Benzo-a-pyrene	1.5	<	6.19		0.00E+00	9.68E-05	
10	Benzo-a-pyrene	1.45	<	6.19		0.00E+00	9.36E-05	
1	Bis(2-chloroethoxy)methane	1.25	<	0.75		0.00E+00	2.22E+01	
2	Bis(2-chloroethoxy)methane	0.937	<	0.75		0.00E+00	1.67E+01	
3	Bis(2-chloroethoxy)methane	1.4	<	0.75		0.00E+00	2.49E+01	
4	Bis(2-chloroethoxy)methane	1.5	<	0.75		0.00E+00	2.67E+01	
10	Bis(2-chloroethoxy)methane	1.45	<	0.75		0.00E+00	2.58E+01	
1	Bis(2-chloroethyl)ether	1.25	<	1.12	19000	1.90E+02	9.48E+00	4.99E+01
2	Bis(2-chloroethyl)ether	0.937	<	1.12	19000	1.90E+02	7.11E+00	3.74E+01
3	Bis(2-chloroethyl)ether	1.4	<	1.12	19000	1.90E+02	1.06E+01	5.59E+01
4	Bis(2-chloroethyl)ether	1.5	<	1.12	19000	1.90E+02	1.14E+01	5.99E+01
10	Bis(2-chloroethyl)ether	1.45	<	1.12	19000	1.90E+02	1.10E+01	5.79E+01
1	Bis(2-chloroisopropyl)ether	1.25	<		19000	1.90E+02	1.25E+02	6.58E+02
2	Bis(2-chloroisopropyl)ether	0.937	<		19000	1.90E+02	9.37E+01	4.93E+02
3	Bis(2-chloroisopropyl)ether	1.4	<		19000	1.90E+02	1.40E+02	7.37E+02
4	Bis(2-chloroisopropyl)ether	1.5	<		19000	1.90E+02	1.50E+02	7.89E+02
10	Bis(2-chloroisopropyl)ether	1.45	<		19000	1.90E+02	1.45E+02	7.63E+02
1	Bis(chloromethyl)ether	0.008	<	-0.38		0.00E+00	1.92E+00	
1	Bis(2-ethylhexyl) phthalate	2.15		4.2	3	3.00E-02	1.36E-02	4.52E+02
2	Bis(2-ethylhexyl) phthalate	1.186		4.2	3	3.00E-02	7.48E-03	2.49E+02
3	Bis(2-ethylhexyl) phthalate	3.471		4.2	3	3.00E-02	2.10E-02	7.00E+02
4	Bis(2-ethylhexyl) phthalate	0.024		4.2	3	3.00E-02	9.50E-04	3.17E+01
10	Bis(2-ethylhexyl) phthalate	1.45	<	4.2	3	3.00E-02	9.15E-03	3.05E+02
1	Bromoform	0.008	<	2.38	4000	4.00E+01	3.33E-03	8.34E-02
1	Carbon tetrachloride	0.008	<	2.72	4000	4.00E+01	1.52E-03	3.81E-02
1	Chlordane	2.5	<	6	0.0043	4.30E-05	2.50E-04	5.81E+03
1	Chlorobenzene	0.008	<	2.65	50	5.00E-01	1.79E-03	3.58E+00
1	Chlorodibromomethane	0.008	<	2.09	4000	4.00E+01	6.50E-03	1.63E-01
1	Chloroethane	0.008	<	1.43	20000	2.00E+02	2.97E-02	1.49E-01
1	Chloroform	0.008	<	1.94	1240	1.24E+01	9.19E-03	7.41E-01
1	Chrysene	1.25	<	5.91		0.00E+00	1.54E-04	
2	Chrysene	0.803571	<	5.91		0.00E+00	9.89E-05	
3	Chrysene	0.033		5.91		0.00E+00	1.58E-05	
4	Chrysene	0.287		5.91		0.00E+00	4.52E-05	
10	Chrysene	1.45	<	5.91		0.00E+00	1.78E-04	

Table A-4 (continued)

Reach	Compound	Mean conc. (mg/kg)	Remarks[a]	log K_{OW}	Intermediate criteria (µg/L)	Lower criteria (µg/L)	Pore water (mg/L)	Lower quotient
1	Dichlorobromomethane	0.008	<	1.88	4000	4.00E+01	1.05E-02	2.64E-01
1	Dichlorodifluoromethane	0.008	<	2.16	4000	4.00E+01	5.53E-03	1.38E-01
1	Dieldrin	0.5	<	5.16	0.0019	1.90E-05	3.46E-04	1.82E+04
1	Diethyl phthalate	2.25	<	1.4	3	3.00E-02	8.96E+00	2.99E+05
2	Diethyl phthalate	0.937	<	1.4	3	3.00E-02	3.73E+00	1.24E+05
3	Diethyl phthalate	1.4	<	1.4	3	3.00E-02	5.57E+00	1.86E+05
4	Diethyl phthalate	1.5	<	1.4	3	3.00E-02	5.97E+00	1.99E+05
10	Diethyl phthalate	1.45	<	1.4	3	3.00E-02	5.77E+00	1.92E+05
1	Dimethyl phthalate	1.25	<	2.12	3	3.00E-02	9.48E-01	3.16E+04
2	Dimethyl phthalate	0.937	<	2.12	3	3.00E-02	7.11E-01	2.37E+04
3	Dimethyl phthalate	1.4	<	2.12	3	3.00E-02	1.06E+00	3.54E+04
4	Dimethyl phthalate	1.5	<	2.12	3	3.00E-02	1.14E+00	3.79E+04
10	Dimethyl phthalate	1.45	<	2.12	3	3.00E-02	1.10E+00	3.67E+04
1	Di-n-butyl phthalate	1.25	<	5.2	3	3.00E-02	7.89E-04	2.63E+01
2	Di-n-butyl phthalate	0.803571	<	5.2	3	3.00E-02	5.07E-04	1.69E+01
3	Di-n-butyl phthalate	0.0592		5.2	3	3.00E-02	9.64E-05	3.21E+00
4	Di-n-butyl phthalate	0.029		5.2	3	3.00E-02	9.76E-05	3.25E+00
10	Di-n-butyl phthalate	1.45	<	5.2	3	3.00E-02	9.15E-04	3.05E+01
1	Di-n-octyl phthalate	1.25	<	5.55	3	3.00E-02	3.52E-04	1.17E+01
2	Di-n-octyl phthalate	0.937	<	5.55	3	3.00E-02	2.64E-04	8.80E+00
3	Di-n-octyl phthalate	1.4	<	5.55	3	3.00E-02	3.95E-04	1.32E+01
4	Di-n-octyl phthalate	1.5	<	5.55	3	3.00E-02	4.23E-04	1.41E+01
10	Di-n-octyl phthalate	1.45	<	5.55	3	3.00E-02	4.09E-04	1.36E+01
1	Endosulfan, alpha	0.5	<	3.83	0.56	5.60E-03	7.40E-03	1.32E+03
1	Endosulfan, beta	0.5	<	3.62	0.56	5.60E-03	1.20E-02	2.14E+03
1	Endosulfan sulfate	0.5	<	3.66	0.56	5.60E-03	1.09E-02	1.95E+03
1	Endrin	0.5	<	5.38	0.0023	2.30E-05	2.08E-04	9.06E+03
1	Endrin aldehyde	0.5	<	5.6		0.00E+00	1.26E-04	
1	Ethylbenzene	0.008	<	3.15	440	4.40E+00	5.66E-04	1.29E-01
1	Fluoranthene	1.295	<	5.22	16	1.60E-01	7.80E-04	4.88E+00
2	Fluoranthene	0.803429	<	5.22	16	1.60E-01	4.84E-04	3.03E+00
3	Fluoranthene	0.4385		5.22	16	1.60E-01	3.05E-04	1.91E+00
4	Fluoranthene	0.0033		5.22	16	1.60E-01	9.51E-05	5.94E-01
10	Fluoranthene	1.45	<	5.22	16	1.60E-01	8.74E-04	5.46E+00
1	Fluorene	1.25	<	4.18	6	6.00E-02	8.26E-03	1.38E+02
2	Fluorene	0.937	<	4.18	6	6.00E-02	6.19E-03	1.03E+02
3	Fluorene	1.4	<	4.18	6	6.00E-02	9.25E-03	1.54E+02
4	Fluorene	1.5	<	4.18	6	6.00E-02	9.91E-03	1.65E+02
10	Fluorene	1.45	<	4.18	6	6.00E-02	9.58E-03	1.60E+02
1	Heptachlor	0.5	<	5.44	0.0038	3.80E-05	1.82E-04	4.78E+03
1	Heptachlor epoxide	0.5	<	4.6		0.00E+00	1.26E-03	

Table A-4 (continued)

Reach	Compound	Mean conc. (mg/kg)	Remarks[a]	log K_{ow}	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
1	Hexachlorobenzene	1.25	<	5.31	38	3.80E-01	6.12E-04	1.61E+00
2	Hexachlorobenzene	0.937	<	5.31	38	3.80E-01	4.59E-04	1.21E+00
3	Hexachlorobenzene	1.4	<	5.31	38	3.80E-01	6.86E-04	1.80E+00
4	Hexachlorobenzene	1.5	<	5.31	38	3.80E-01	7.35E-04	1.93E+00
10	Hexachlorobenzene	1.45	<	5.31	38	3.80E-01	7.10E-04	1.87E+00
1	Hexachlorobutadiene	1.25	<	4.9	9.3	9.30E-02	1.57E-03	1.69E+01
2	Hexachlorobutadiene	0.937	<	4.9	9.3	9.30E-02	1.18E-03	1.27E+01
3	Hexachlorobutadiene	1.4	<	4.9	9.3	9.30E-02	1.76E-03	1.90E+01
4	Hexachlorobutadiene	1.5	<	4.9	9.3	9.30E-02	1.89E-03	2.03E+01
10	Hexachlorobutadiene	1.45	<	4.9	9.3	9.30E-02	1.83E-03	1.96E+01
1	Hexachlorocyclohexane, alpha	0.5	<	3.81		0.00E+00	7.74E-03	
1	Hexachlorocyclohexane, beta	0.5	<	3.96		0.00E+00	5.48E-03	
1	Hexachlorocyclohexane, delta	0.5	<	4.14		0.00E+00	3.62E-03	
1	Hexachlorocyclohexane, gama	0.5	<	3.66	2	2.00E-02	1.09E-02	5.47E+02
1	Hexachlorocyclopentadiene	1.25	<	5.51	5.2	5.20E-02	3.86E-04	7.43E+00
2	Hexachlorocyclopentadiene	0.937	<	5.51	5.2	5.20E-02	2.90E-04	5.57E+00
3	Hexachlorocyclopentadiene	1.4	<	5.51	5.2	5.20E-02	4.33E-04	8.32E+00
4	Hexachlorocyclopentadiene	1.5	<	5.51	5.2	5.20E-02	4.64E-04	8.91E+00
10	Hexachlorocyclopentadiene	1.45	<	5.51	5.2	5.20E-02	4.48E-04	8.62E+00
1	Hexachloroethane	1.25	<	3.93	540	5.40E+00	1.47E-02	2.72E+00
2	Hexachloroethane	0.937	<	3.93	540	5.40E+00	1.10E-02	2.04E+00
3	Hexachloroethane	1.4	<	3.93	540	5.40E+00	1.64E-02	3.05E+00
4	Hexachloroethane	1.5	<	3.93	540	5.40E+00	1.76E-02	3.26E+00
10	Hexachloroethane	1.45	<	3.93	540	5.40E+00	1.70E-02	3.15E+00
1	Indeno (1,2,3-cd) pyrene	1.25	<	6.58		0.00E+00	3.29E-05	
2	Indeno (1,2,3-cd) pyrene	0.937	<	6.58		0.00E+00	2.46E-05	
3	Indeno (1,2,3-cd) pyrene	1.4	<	6.58		0.00E+00	3.68E-05	
4	Indeno (1,2,3-cd) pyrene	1.5	<	6.58		0.00E+00	3.95E-05	
10	Indeno (1,2,3-cd) pyrene	1.45	<	6.58		0.00E+00	3.81E-05	
1	Isophorone	1.25	<	1.67	14000	1.40E+02	2.67E+00	1.91E+01
2	Isophorone	0.937	<	1.67	14000	1.40E+02	2.00E+00	1.43E+01
3	Isophorone	1.4	<	1.67	14000	1.40E+02	2.99E+00	2.14E+01
4	Isophorone	1.5	<	1.67	14000	1.40E+02	3.21E+00	2.29E+01
10	Isophorone	1.45	<	1.67	14000	1.40E+02	3.10E+00	2.21E+01
1	Methyl bromide	0.008	<	1.19	4000	4.00E+01	5.17E-02	1.29E+00
1	Methyl chloride	0.008	<	0.91	4000	4.00E+01	9.84E-02	2.46E+00
1	Methylene chloride	0.1		1.25	4000	4.00E+01	5.62E-01	1.41E+01
1	Naphthalene	1.25	<	3.33	620	6.20E+00	5.85E-02	9.43E+00
2	Naphthalene	0.937	<	3.33	620	6.20E+00	4.38E-02	7.07E+00
3	Naphthalene	1.4	<	3.33	620	6.20E+00	6.55E-02	1.06E+01
4	Naphthalene	1.5	<	3.33	620	6.20E+00	7.02E-02	1.13E+01

Table A-4 (continued)

Reach	Compound	Mean conc. (mg/kg)	Remarks[a]	log K_{ow}	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
10	Naphthalene	1.45	<	3.33	620	6.20E+00	6.78E-02	1.09E+01
1	Nitrobenzene	1.25	<	1.85	3200	3.20E+01	1.77E+00	5.52E+01
2	Nitrobenzene	0.937	<	1.85	3200	3.20E+01	1.32E+00	4.14E+01
3	Nitrobenzene	1.4	<	1.85	3200	3.20E+01	1.98E+00	6.18E+01
4	Nitrobenzene	1.5	<	1.85	3200	3.20E+01	2.12E+00	6.62E+01
10	Nitrobenzene	1.45	<	1.85	3200	3.20E+01	2.05E+00	6.40E+01
1	N-butyl benzyl phthalate	1.25	<	4.05	3	3.00E-02	1.11E-02	3.71E+02
2	N-butyl benzyl phthalate	0.937	<	4.05	3	3.00E-02	8.35E-03	2.78E+02
3	N-butyl benzyl phthalate	1.4	<	4.05	3	3.00E-02	1.25E-02	4.16E+02
4	N-butyl benzyl phthalate	1.5	<	4.05	3	3.00E-02	1.34E-02	4.46E+02
10	N-butyl benzyl phthalate	1.45	<	4.05	3	3.00E-02	1.29E-02	4.31E+02
1	N-nitrosodimethylamine	1.25	<	-0.57	358	3.58E+00	4.64E+02	1.30E+05
2	N-nitrosodimethylamine	0.937	<	-0.57	58	5.80E-01	3.48E+02	6.00E+05
3	N-nitrosodimethylamine	1.4	<	-0.57	58	5.80E-01	5.20E+02	8.97E+05
4	N-nitrosodimethylamine	1.5	<	-0.57	58	5.80E-01	5.57E+02	9.61E+05
10	N-nitrosodimethylamine	1.45	<	-0.57	58	5.80E-01	5.39E+02	9.29E+05
1	N-nitrosodiphenylamine	1.25	<	2.57	58	5.80E-01	3.36E-01	5.80E+02
2	N-nitrosodiphenylamine	0.937	<	2.57	58	5.80E-01	2.52E-01	4.35E+02
3	N-nitrosodiphenylamine	1.4	<	2.57	58	5.80E-01	3.77E-01	6.50E+02
4	N-nitrosodiphenylamine	1.5	<	2.57	58	5.80E-01	4.04E-01	6.96E+02
10	N-nitrosodiphenylamine	1.45	<	2.57	58	5.80E-01	3.90E-01	6.73E+02
1	N-nitrosodi-n-propylamine	1.25	<	1.36	58	5.80E-01	5.46E+00	9.41E+03
2	N-nitrosodi-n-propylamine	0.937	<	1.36	58	5.80E-01	4.09E+00	7.05E+03
3	N-nitrosodi-n-propylamine	1.4	<	1.36	58	5.80E-01	6.11E+00	1.05E+04
4	N-nitrosodi-n-propylamine	1.5	<	1.36	58	5.80E-01	6.55E+00	1.13E+04
10	N-nitrosodi-n-propylamine	1.45	<	1.36	58	5.80E-01	6.33E+00	1.09E+04
1	p,p'-DDD	0.5	<	6.02	0.001	1.00E-05	4.77E-05	4.77E+03
1	p,p'-DDE	0.5	<	5.83	0.001	1.00E-05	7.40E-05	7.40E+03
1	p,p'-DDT	0.5	<	5.69	0.001	1.00E-05	1.02E-04	1.02E+04
1	Parachlorometa cresol	0.5	<	3.1	2000	2.00E+01	3.97E-02	1.99E+00
1	PCB-1016	2.55	<	6	0.2	2.00E-03	2.55E-04	1.28E+02
2	PCB-1016	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
3	PCB-1016	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1016	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1016	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1016	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	PCB-1221	2.55	<	6	0.2	2.00E-03	2.55E-04	1.28E+02
2	PCB-1221	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
3	PCB-1221	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1221	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1221	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00

Table A-4 (continued)

Reach	Compound	Mean conc. (mg/kg)	Remarks[a]	log K_{ow}	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
10	PCB-1221	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	PCB-1232	2.55	<	6	0.2	2.00E-03	2.55E-04	1.28E+02
2	PCB-1232	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
3	PCB-1232	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1232	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1232	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1232	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	PCB-1242	2.55	<	6	0.2	2.00E-03	2.55E-04	1.28E+02
2	PCB-1242	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
3	PCB-1242	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1242	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1242	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1242	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	PCB-1248	2.55	<	6	0.2	2.00E-03	2.55E-04	1.28E+02
2	PCB-1248	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
3	PCB-1248	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1248	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1248	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1248	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	PCB-1254	2.55	<	6	0.2	2.00E-03	2.55E-04	1.28E+02
2	PCB-1254	0.283		6	0.2	2.00E-03	3.85E-05	1.93E+01
3	PCB-1254	0.937209	<	6	0.2	2.00E-03	9.37E-05	4.69E+01
4	PCB-1254	0.921739	<	6	0.2	2.00E-03	9.22E-05	4.61E+01
5	PCB-1254	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1254	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	PCB-1260	2.55	<	6	0.2	2.00E-03	2.55E-04	1.28E+02
2	PCB-1260	0.35		6	0.2	2.00E-03	4.43E-05	2.21E+01
3	PCB-1260	0.937209	<	6	0.2	2.00E-03	9.37E-05	4.69E+01
4	PCB-1260	0.921739	<	6	0.2	2.00E-03	9.22E-05	4.61E+01
5	PCB-1260	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1260	0.1	<	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	Pentachlorophenol	0.5	<	5.12		0.00E+00	3.79E-04	
1	Phenanthrene	1.25	<	4.57	3.7	3.70E-02	3.36E-03	9.09E+01
2	Phenanthrene	0.803857	<	4.57	3.7	3.70E-02	2.16E-03	5.85E+01
3	Phenanthrene	0.2649		4.57	3.7	3.70E-02	9.26E-04	2.50E+01
4	Phenanthrene	0.314		4.57	3.7	3.70E-02	1.05E-03	2.84E+01
10	Phenanthrene	1.45	<	4.57	3.7	3.70E-02	3.90E-03	1.05E+02
1	Phenol	0.5	<	1.48	2560	2.56E+01	1.66E+00	6.47E+01
1	Phenols	150.25		1.48	2560	2.56E+01	4.98E+02	1.94E+04
2	Phenols	0.433		1.48	2560	2.56E+01	1.43E+00	5.60E+01
3	Phenols	0.4	<	1.48	2560	2.56E+01	1.32E+00	5.17E+01

Table A-4 (continued)

Reach	Compound	Mean conc. (mg/kg)	Remarks[a]	log K_{OW}	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
4	Phenols	0.5		1.48	2560	2.56E+01	1.66E+00	6.47E+01
10	Phenols	0.45		1.48	2560	2.56E+01	1.49E+00	5.82E+01
1	Pyrene	1.25	<	5.18		0.00E+00	8.26E-04	
2	Pyrene	0.803429	<	5.18		0.00E+00	5.31E-04	
3	Pyrene	0.4908		5.18		0.00E+00	3.66E-04	
4	Pyrene	0.728		5.18		0.00E+00	4.84E-04	
10	Pyrene	1.45	<	5.18		0.00E+00	9.58E-04	
1	Toluene	0.008	<	2.58	230	2.30E+00	2.10E-03	9.15E-01
1	Toxaphene	5	<	3.3	0.0002	2.00E-06	2.51E-01	1.25E+08
1	trans-1,2-Dichloroethene	0.008	<	1.4	2800	2.80E+01	3.18E-02	1.14E+00
1	Trichlorofluoromethane	0.008	<	2.53	4000	4.00E+01	2.36E-03	5.90E-02
1	Vinyl chloride	0.008	<	1.48		0.00E+00	2.65E-02	

[a]"<" indicates that the chemical was not detected and the reported concentration is the highest reported limit of detection; and "A" indicates that the value reported is the mean of two or more determinations.

Table A-5. Maximum concentrations in surface sediment by reach, criteria, and quotients for benthic biota

Reach	Compound	Remarks[a]	Surface conc. (mg/kg)	$\log(K_{OW})$	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
2	Aluminum		10000		87	8.70E-01		1.15E+07
3	Aluminum		14000		87	8.70E-01		1.61E+07
4	Aluminum		74600		87	8.70E-01		8.57E+07
1	Antimony		0.3		1600	1.60E+01		1.88E-01
1	Arsenic		17		48	4.80E-01		3.13E+04
2	Arsenic		12		48	4.80E-01		2.50E+04
3	Arsenic		68		48	4.80E-01		1.42E+05
4	Arsenic		11		48	4.80E-01		2.29E+04
5	Arsenic		16		48	4.80E-01		3.33E+04
10	Arsenic		24		48	4.80E-01		5.00E+04
4	Barium		436		5800	5.80E+01		7.52E+03
1	Beryllium		1.6		5.3	5.30E-02		3.02E+04
4	Beryllium		2.41		5.3	5.30E-02		4.55E+04
5	Beryllium		1.6		5.3	5.30E-02		3.08E+04
4	Boron		141		7850	7.85E+01		1.80E+03
1	Cadmium	<	1		1.1	1.10E-02		9.09E+04
2	Cadmium		4.2		1.1	1.10E-02		3.82E+05
3	Cadmium		3.5		1.1	1.10E-02		3.18E+05
4	Cadmium		1.3		1.1	1.10E-02		1.18E+05
5	Cadmium	<	1		1.1	1.10E-02		9.09E+04
10	Cadmium	<	0.5		1.1	1.10E-02		4.55E+04
1	Chromium		27		11	1.10E-01		2.45E+05
2	Chromium		290		11	1.10E-01		2.64E+06
3	Chromium		260		11	1.10E-01		2.36E+06
4	Chromium		61.8		11	1.10E-01		5.62E+05
5	Chromium		42		11	1.10E-01		3.82E+05
10	Chromium		23		11	1.10E-01		2.09E+05
4	Cobalt		20		10	1.00E-01		2.00E+05
1	Copper		54		12	1.20E-01		4.50E+05
2	Copper		17		12	1.20E-01		1.42E+05
3	Copper		260		12	1.20E-01		2.17E+06
4	Copper		52.6		12	1.20E-01		4.38E+05
5	Copper		40		12	1.20E-01		3.33E+05
1	Cyanide		0.4		5.2	5.20E-02		7.69E+03

Table A-5 (continued)

Reach	Compound	Remarks[a]	Surface conc. (mg/kg)	log(K_{OW})	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
2	Cyanide	<	1		5.2	5.20E-02		1.92E+04
3	Cyanide	<	1.1		5.2	5.20E-02		2.12E+04
4	Cyanide	<	0.8		5.2	5.20E-02		1.54E+04
10	Cyanide	<	0.9		5.2	5.20E-02		1.73E+04
5	Iron		40000		1000	1.00E+01		4.00E+05
1	Lead		60		3.2	3.20E-02		1.88E+05
2	Lead		51		3.2	3.20E-02		1.59E+05
3	Lead		94		3.2	3.20E-02		2.94E+05
4	Lead		47		3.2	3.20E-02		1.47E+05
5	Lead		53		3.2	3.20E-02		1.66E+05
10	Lead		67		3.2	3.20E-02		2.09E+05
4	Lithium		116		130	1.30E+00		8.92E+04
1	Manganese		3500		4100	4.10E+01		8.54E+04
2	Manganese		2000		4100	4.10E+01		4.88E+04
3	Manganese		920		4100	4.10E+01		2.24E+04
4	Manganese		2840		4100	4.10E+01		6.93E+04
5	Manganese		3600		4100	4.10E+01		8.78E+04
1	Mercury		0.11		0.07	7.00E-04		1.57E+05
2	Mercury		6		0.07	7.00E-04		9.29E+06
3	Mercury		88.1		0.07	7.00E-04		1.26E+07
4	Mercury		5.3		0.07	7.00E-04		7.57E+06
5	Mercury		1.3		0.07	7.00E-04		1.86E+06
10	Mercury		0.1		0.07	7.00E-04		1.43E+05
1	Nickel		36		160	1.60E+00		1.44E+04
2	Nickel		30		160	1.60E+00		1.88E+04
3	Nickel		1300		160	1.60E+00		8.13E+05
4	Nickel		43.4		160	1.60E+00		2.71E+04
5	Nickel		24		160	1.60E+00		1.50E+04
10	Nickel		27		160	1.60E+00		1.69E+04
1	Selenium		2		35	3.50E-01		5.71E+03
2	Selenium		110		35	3.50E-01		3.14E+05
3	Selenium		160		35	3.50E-01		4.57E+05
4	Selenium		130		35	3.50E-01		3.71E+05
5	Selenium		0.8		35	3.50E-01		2.29E+03
1	Silver	<	1		0.12	1.20E-03		8.33E+05
2	Silver		10		0.12	1.20E-03		8.33E+06
3	Silver		44		0.12	1.20E-03		3.67E+07
4	Silver		3.7		0.12	1.20E-03		3.08E+06
5	Silver	<	1		0.12	1.20E-03		8.33E+05
10	Silver	<	1		0.12	1.20E-03		8.33E+05
4	Strontium		77.8		42000	4.20E+02		1.85E+02

Table A-5 (continued)

Reach	Compound	Remarks[a]	Surface conc. (mg/kg)	log(K_{OW})	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
1	Thallium	<	5		40	4.00E-01		1.25E+05
2	Thorium	<	20		565	5.65E+00		3.54E+03
3	Thorium	<	20		565	5.65E+00		3.54E+03
4	Thorium	<	20		565	5.65E+00		3.54E+00
4	Titanium		3910		230	2.30E+00		1.70E+05
1	Uranium		5.9		280	2.80E+00		2.11E+03
2	Uranium		6		280	2.80E+00		2.14E+03
3	Uranium		179		280	2.80E+00		6.39E+04
4	Uranium		7		280	2.80E+00		2.50E+03
10	Uranium		4.3		280	2.80E+00		1.54E+03
4	Vanadium		92.1		80	8.00E-01		1.15E+05
1	Zinc		150		110	1.10E+00		1.36E+05
2	Zinc		92		110	1.10E+00		8.36E+04
3	Zinc		370		110	1.10E+00		3.36E+05
4	Zinc		168		110	1.10E+00		1.53E+05
5	Zinc		220		110	1.10E+00		2.00E+05
1	Zirconium		230		140	1.40E+00		1.64E+05
2	Zirconium		890		140	1.40E+00		6.36E+05
3	Zirconium		470		140	1.40E+00		3.36E+05
4	Zirconium		610		140	1.40E+00		4.36E+05
10	Zirconium		210		140	1.40E+00		1.50E+05
1	1,1,1-Trichloroethane	<	0.008	2.48	9400	9.40E+01	2.65E-03	2.82E-02
1	1,1,2,2-Tetrachloroethane	<	0.008	2.39	2400	2.40E+01	3.26E-03	1.36E-01
1	1,1,2-Trichloroethane	<	0.008	2.48	9400	9.40E+01	2.65E-03	2.82E-02
1	1,1-Dichloroethane	<	0.008	1.79	20000	2.00E+02	1.30E-02	6.49E-02
1	1,1-Dichloroethylene	<	0.008	1.48	11600	1.16E+02	2.65E-02	2.28E-01
1	1,2,4-Trichlorobenzene	<	0.5	4.23	50	5.00E-01	2.94E-03	5.89E+00
2	1,2,4-Trichlorobenzene	<	1.4	4.23	50	5.00E-01	8.24E-03	1.65E+01
3	1,2,4-Trichlorobenzene	<	1.7	4.23	50	5.00E-01	1.00E-02	2.00E+01
4	1,2,4-Trichlorobenzene	<	1.8	4.23	50	5.00E-01	1.06E-02	2.12E+01
10	1,2,4-Trichlorobenzene	<	1.5	4.23	50	5.00E-01	8.83E-03	1.77E+01
1	1,2,5,6-Dibenzanthracene	<	0.5	6.5		0.00E+00	1.58E-05	
2	1,2,5,6-Dibenzanthracene	<	1.4	6.5		0.00E+00	4.43E-05	
3	1,2,5,6-Dibenzanthracene	<	1.7	6.5		0.00E+00	5.38E-05	
4	1,2,5,6-Dibenzanthracene	<	1.8	6.5		0.00E+00	5.69E-05	
10	1,2,5,6-Dibenzanthracene	<	1.5	6.5		0.00E+00	4.74E-05	
1	1,2-Dichlorobenzene	<	0.5	3.39	763	7.63E+00	2.04E-02	2.67E+00
2	1,2-Dichlorobenzene	<	1.4	3.39	763	7.63E+00	5.70E-02	7.47E+00
3	1,2-Dichlorobenzene	<	1.7	3.39	763	7.63E+00	6.93E-02	9.08E+00
4	1,2-Dichlorobenzene	<	1.8	3.39	763	7.63E+00	7.33E-02	9.61E+00
10	1,2-Dichlorobenzene	<	1.5	3.39	763	7.63E+00	6.11E-02	8.01E+00

Table A-5 (continued)

Reach	Compound	Remarks[a]	Surface conc. (mg/kg)	log(K_{OW})	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
1	1,2-Dichloroethane	<	0.008	1.47	20000	2.00E+02	2.71E-02	1.36E-01
1	1,2-Dichloropropane	<	0.008	2.28	5700	5.70E+01	4.20E-03	7.37E-02
1	1,2-Diphenylhydrazine	<	0.5	2.94		0.00E+00	5.74E-02	
2	1,2-Diphenylhydrazine	<	1.4	2.94		0.00E+00	1.61E-01	
3	1,2-Diphenylhydrazine	<	1.7	2.94		0.00E+00	1.95E-01	
4	1,2-Diphenylhydrazine	<	1.8	2.94		0.00E+00	2.07E-01	
10	1,2-Diphenylhydrazine	<	1.5	2.94		0.00E+00	1.72E-01	
1	1,3-Dichlorobenzene	<	0.5	3.41	763	7.63E+00	1.95E-02	2.55E+00
2	1,3-Dichlorobenzene	<	1.4	3.41	763	7.63E+00	5.45E-02	7.14E+00
3	1,3-Dichlorobenzene	<	1.7	3.41	763	7.63E+00	6.61E-02	8.67E+00
4	1,3-Dichlorobenzene	<	1.8	3.41	763	7.63E+00	7.00E-02	9.18E+00
10	1,3-Dichlorobenzene	<	1.5	3.41	763	7.63E+00	5.84E-02	7.65E+00
1	1,3-Dichloropropene	<	0.008	1.4	244	2.44E+00	3.18E-02	1.31E+01
1	1,4-Dichlorobenzene	<	0.5	3.38	763	7.63E+00	2.08E-02	2.73E+00
2	1,4-Dichlorobenzene	<	1.4	3.38	763	7.63E+00	5.84E-02	7.65E+00
3	1,4-Dichlorobenzene	<	1.7	3.38	763	7.63E+00	7.09E-02	9.29E+00
4	1,4-Dichlorobenzene	<	1.8	3.38	763	7.63E+00	7.50E-02	9.83E+00
10	1,4-Dichlorobenzene	<	1.5	3.38	763	7.63E+00	6.25E-02	8.20E+00
1	2,4,6-Trichlorophenol	<	0.5	3.69	970	9.70E+00	1.02E-02	1.05E+00
1	2,4-Dichlorophenol	<	0.5	3.06	365	3.65E+00	4.35E-02	1.19E+01
1	2,4-Dimethylphenol	<	0.5	2.36	2200	2.20E+01	2.18E-01	9.92E+00
1	2,4-Dinitrophenol	<	5	1.5	150	1.50E+00	1.58E+01	1.05E+01
1	2,4-Dinitrotoluene	<	0.5	1.98	230	2.30E+00	5.24E-01	2.28E+02
2	2,4-Dinitrotoluene	<	1.4	1.98	230	2.30E+00	1.47E+00	6.37E+02
3	2,4-Dinitrotoluene	<	1.7	1.98	230	2.30E+00	1.78E+00	7.74E+02
4	2,4-Dinitrotoluene	<	1.8	1.98	230	2.30E+00	1.88E+00	8.19E+02
10	2,4-Dinitrotoluene	<	1.5	1.98	230	2.30E+00	1.57E+00	6.83E+02
1	2,6-Dinitrotoluene	<	0.5	1.98	230	2.30E+00	5.24E-01	2.28E+02
2	2,6-Dinitrotoluene	<	1.4	1.98	230	2.30E+00	1.47E+00	6.37E+02
3	2,6-Dinitrotoluene	<	1.7	1.98	230	2.30E+00	1.78E+00	7.74E+02
4	2,6-Dinitrotoluene	<	1.8	1.98	230	2.30E+00	1.88E+00	8.19E+02
10	2,6-Dinitrotoluene	<	1.5	1.98	230	2.30E+00	1.57E+00	6.83E+02
1	2-Chloroethyl vinyl ether	<	0.008	0.99		0.00E+00	8.19E-02	
1	2-Chloronaphthalene	<	0.5		440	4.40E+00	5.00E+01	1.14E+04
2	2-Chloronaphthalene	<	1.4		440	4.40E+00	1.40E+02	3.18E+04
3	2-Chloronaphthalene	<	1.7		440	4.40E+00	1.70E+02	3.86E+04
4	2-Chloronaphthalene	<	1.8		440	4.40E+00	1.80E+02	4.09E+04
10	2-Chloronaphthalene	<	1.5		440	4.40E+00	1.50E+02	3.41E+04
1	2-Chlorophenol	<	0.5	2.15	2000	2.00E+01	3.54E-01	1.77E+01
1	2-Nitrophenol	<	0.5	1.79	150	1.50E+00	8.11E-01	5.41E+02
1	3,3'-Dichlorobenzidine	<	2	3.02		0.00E+00	1.91E-01	

Table A-5 (continued)

Reach	Compound	Remarks[a]	Surface conc. (mg/kg)	log(K_{OW})	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
2	3,3'-Dichlorobenzidine	<	3.5	3.02		0.00E+00	3.34E-01	
3	3,3'-Dichlorobenzidine	<	4	3.02		0.00E+00	3.82E-01	
4	3,3'-Dichlorobenzidine	<	4	3.02		0.00E+00	3.82E-01	
10	3,3'-Dichlorobenzidine	<	3.8	3.02		0.00E+00	3.63E-01	
1	4,6-Dinitro-ortho-cresol	<	2.5	3.5	150	1.50E+00	7.91E-02	5.27E+01
1	4-Bromophenyl phenyl ether	<	0.5	5.24	122	1.22E+00	2.88E-04	2.36E-04
2	4-Bromophenyl phenyl ether	<	1.4	5.24	122	1.22E+00	8.06E-04	6.60E-04
3	4-Bromophenyl phenyl ether	<	1.7	5.24	122	1.22E+00	9.78E-04	8.02E-04
4	4-Bromophenyl phenyl ether	<	1.8	5.24	122	1.22E+00	1.04E-03	8.49E-04
10	4-Bromophenyl phenyl ether	<	1.5	5.24	122	1.22E+00	8.63E-04	7.08E-04
1	4-Chlorophenyl phenyl ether	<	0.5	4.08	122	1.22E+00	4.16E-03	3.41E+00
2	4-Chlorophenyl phenyl ether	<	1.4	4.08	122	1.22E+00	1.16E-02	9.54E+00
3	4-Chlorophenyl phenyl ether	<	1.7	4.08	122	1.22E+00	1.41E-02	1.16E+01
4	4-Chlorophenyl phenyl ether	<	1.8	4.08	122	1.22E+00	1.50E-02	1.23E+01
10	4-Chlorophenyl phenyl ether	<	1.5	4.08	122	1.22E+00	1.25E-02	1.02E+01
1	4-Nitrophenol	<	0.5	1.91	150	1.50E+00	6.15E-01	4.10E+02
1	Acenaphthene	<	0.5	3.92	520	5.20E+00	6.01E-03	1.16E+00
2	Acenaphthene	<	1.4	3.92	520	5.20E+00	1.68E-02	3.24E+00
3	Acenaphthene	<	1.7	3.92	520	5.20E+00	2.04E-02	3.93E+00
4	Acenaphthene	<	1.8	3.92	520	5.20E+00	2.16E-02	4.16E+00
10	Acenaphthene	<	1.5	3.92	520	5.20E+00	1.80E-02	3.47E+00
1	Acenaphthylene	<	0.5	4.07		0.00E+00	4.26E-03	
2	Acenaphthylene	<	1.4	4.07		0.00E+00	1.19E-02	
3	Acenaphthylene	<	1.7	4.07		0.00E+00	1.45E-02	
4	Acenaphthylene	<	1.8	4.07		0.00E+00	1.53E-02	
10	Acenaphthylene	<	1.5	4.07		0.00E+00	1.28E-02	
1	Acrolein	<	0.08	0.9	21	2.10E-01	1.01E+00	4.80E+03
1	Acrylonitrile	<	0.08	1.2	2600	2.60E+01	5.05E-01	1.94E+01
1	Aldrin	<	0.5	5.52		0.00E+00	1.51E-04	
1	Anthracene	<	0.5	4.45		0.00E+00	1.77E-03	
2	Anthracene	<	1.4	4.45		0.00E+00	4.97E-03	
3	Anthracene		0.5	4.45		0.00E+00	1.77E-03	
4	Anthracene	<	1.8	4.45		0.00E+00	6.39E-03	
10	Anthracene	<	1.5	4.45		0.00E+00	5.32E-03	
1	Benzene	<	0.008	2.15	727	7.27E+00	5.66E-03	7.79E-01
1	Benzidine	<	5	1.35	74	7.40E-01	2.23E+01	3.02E+04
2	Benzidine	<	7	1.35	74	7.40E-01	3.13E+01	4.23E+04
3	Benzidine	<	8	1.35	74	7.40E-01	3.57E+01	4.83E+04
4	Benzidine	<	9	1.35	74	7.40E-01	4.02E+01	5.43E+04
10	Benzidine	<	7.5	1.35	74	7.40E-01	3.35E+01	4.53E+04
1	Benzo(a)anthracene	<	0.5	5.91		0.00E+00	6.15E-05	

Table A-5 (continued)

Reach	Compound	Remarks[a]	Surface conc. (mg/kg)	log(K_{OW})	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
2	Benzo(a)anthracene	<	1.4	5.91		0.00E+00	1.72E-04	
3	Benzo(a)anthracene		0.5	5.91		0.00E+00	6.15E-05	
4	Benzo(a)anthracene	<	1.8	5.91		0.00E+00	2.21E-04	
10	Benzo(a)anthracene	<	1.5	5.91		0.00E+00	1.85E-04	
1	Benzo(b)fluoranthene	<	0.5	6.12		0.00E+00	3.79E-05	
2	Benzo(b)fluoranthene	<	1.4	6.12		0.00E+00	1.06E-04	
3	Benzo(b)fluoranthene	<	1.7	6.12		0.00E+00	1.29E-04	
4	Benzo(b)fluoranthene	<	1.8	6.12		0.00E+00	1.37E-04	
10	Benzo(b)fluoranthene	<	1.5	6.12		0.00E+00	1.14E-04	
1	Benzo(ghi)perylene	<	0.5	6.58		0.00E+00	1.32E-05	
2	Benzo(ghi)perylene	<	1.4	6.58		0.00E+00	3.68E-05	
3	Benzo(ghi)perylene	<	1.7	6.58		0.00E+00	4.47E-05	
4	Benzo(ghi)perylene	<	1.8	6.58		0.00E+00	4.73E-05	
10	Benzo(ghi)perylene	<	1.5	6.58		0.00E+00	3.95E-05	
1	Benzo(k)flouranthene	<	0.5	6.84		0.00E+00	7.23E-06	
2	Benzo(k)flouranthene	<	1.4	6.84		0.00E+00	2.02E-05	
3	Benzo(k)flouranthene	<	1.7	6.84		0.00E+00	2.46E-05	
4	Benzo(k)flouranthene	<	1.8	6.84		0.00E+00	2.60E-05	
10	Benzo(k)flouranthene	<	1.5	6.84		0.00E+00	2.17E-05	
1	Benzo-a-pyrene	<	0.5	6.19		0.00E+00	3.23E-05	
2	Benzo-a-pyrene	<	1.4	6.19		0.00E+00	9.04E-05	
3	Benzo-a-pyrene	<	1.7	6.19		0.00E+00	1.10E-04	
4	Benzo-a-pyrene	<	1.8	6.19		0.00E+00	1.16E-04	
10	Benzo-a-pyrene	<	1.5	6.19		0.00E+00	9.68E-05	
1	Bis(2-chloroethoxy)methane	<	0.5	0.75		0.00E+00	8.89E+00	
2	Bis(2-chloroethoxy)methane	<	1.4	0.75		0.00E+00	2.49E+01	
3	Bis(2-chloroethoxy)methane	<	1.7	0.75		0.00E+00	3.02E+01	
4	Bis(2-chloroethoxy)methane	<	1.8	0.75		0.00E+00	3.20E+01	
10	Bis(2-chloroethoxy)methane	<	1.5	0.75		0.00E+00	2.67E+01	
1	Bis(2-chloroethyl)ether	<	0.5	1.12	19000	1.90E+02	3.79E+00	2.00E+01
2	Bis(2-chloroethyl)ether	<	1.4	1.12	19000	1.90E+02	1.06E+01	5.59E+01
3	Bis(2-chloroethyl)ether	<	1.7	1.12	19000	1.90E+02	1.29E+01	6.79E+01
4	Bis(2-chloroethyl)ether	<	1.8	1.12	19000	1.90E+02	1.37E+01	7.19E+01
10	Bis(2-chloroethyl)er	<	1.5	1.12	19000	1.90E+02	1.14E+01	5.99E+01
1	Bis(2-chloroisopropyl)ether	<	0.5		19000	1.90E+02	5.00E+01	2.63E+02
2	Bis(2-chloroisopropyl)ether	<	1.4		19000	1.90E+02	1.40E+02	7.37E+02
3	Bis(2-chloroisopropyl)ether	<	1.7		19000	1.90E+02	1.70E+02	8.95E+02
4	Bis(2-chloroisopropyl)ether	<	1.8		19000	1.90E+02	1.80E+02	9.47E+02
10	Bis(2-chloroisopropyl)ether	<	1.5		19000	1.90E+02	1.50E+02	7.89E+02
1	Bis(chloromethyl)ether	<	0.008	-0.38		0.00E+00	1.92E+00	
1	Bis(2-ethylhexyl phthalate		2.2	4.2	3	3.00E-02	1.39E-02	4.63E+02

Table A-5 (continued)

Reach	Compound	Remarks[a]	Surface conc. (mg/kg)	log(K_{OW})	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
4	Bis(2-ethylhexyl phthalate	<	1.8	4.2	3	3.00E-02	1.14E-02	3.79E+02
10	Bis(2-ethylhexyl phthalate	<	1.5	4.2	3	3.00E-02	9.46E-03	3.15E+02
2	Bis(2-ethylhexyl) phthalate		1.9	4.2	3	3.00E-02	1.20E-02	4.00E+02
3	Bis(2-ethylhexyl) phthalate		96.7	4.2	3	3.00E-02	6.10E-01	1.78E+01
1	Bromoform	<	0.008	2.38	4000	4.00E+01	3.33E-03	8.34E-02
1	Carbon tetrachloride	<	0.008	2.72	4000	4.00E+01	1.52E-03	3.81E-02
1	Chlordane	<	2.5	6	0.0043	4.30E-05	2.50E-04	5.81E+03
1	Chlorobenzene	<	0.008	2.65	50	5.00E-01	1.79E-03	3.58E+00
1	Chlorodibromomethane	<	0.008	2.09	4000	4.00E+01	6.50E-03	1.63E-01
1	Chloroethane	<	0.008	1.43	20000	2.00E+02	2.97E-02	1.49E-01
1	Chloroform	<	0.008	1.94	1240	1.24E+01	9.19E-03	7.41E-04
1	Chrysene	<	0.5	5.91		0.00E+00	6.15E-05	
2	Chrysene	<	1.4	5.91		0.00E+00	1.72E-04	
3	Chrysene		0.7	5.91		0.00E+00	8.50E-05	
4	Chrysene	<	1.8	5.91		0.00E+00	2.21E-04	
10	Chrysene	<	1.5	5.91		0.00E+00	1.85E-04	
1	Dichlorobromomethane	<	0.008	1.88	4000	4.00E+01	1.05E-02	2.64E-01
1	Dichlorodifluoromethane	<	0.008	2.16	4000	4.00E+01	5.53E-03	1.38E-01
1	Dieldrin	<	0.5	5.16	0.0019	1.90E-05	3.46E-04	1.82E+04
1	Diethyl phthalate	<	2.5	1.4	3	3.00E-02	9.95E+00	3.32E+05
2	Diethyl phthalate	<	1.4	1.4	3	3.00E-02	5.57E+00	1.86E+05
3	Diethyl phthalate	<	1.7	1.4	3	3.00E-02	6.77E+00	2.26E+05
4	Diethyl phthalate	<	1.8	1.4	3	3.00E-02	7.17E+00	2.39E+05
10	Diethyl phthalate	<	1.5	1.4	3	3.00E-02	5.97E+00	1.99E+05
1	Dimethyl phthalate	<	0.5	2.12	3	3.00E-02	3.79E-01	1.26E+04
2	Dimethyl phthalate	<	1.4	2.12	3	3.00E-02	1.06E+00	3.54E+04
3	Dimethyl phthalate	<	1.7	2.12	3	3.00E-02	1.29E+00	4.30E+04
4	Dimethyl phthalate	<	1.8	2.12	3	3.00E-02	1.37E+00	4.55E+04
10	Dimethyl phthalate	<	1.5	2.12	3	3.00E-02	1.14E+00	3.79E+04
1	Di-n-butyl phthalate	<	0.5	5.2	3	3.00E-02	3.15E-04	1.05E+04
2	Di-n-butyl phthalate	<	1.4	5.2	3	3.00E-02	8.83E-04	2.94E+04
3	Di-n-butyl phthalate		0.3	5.2	3	3.00E-02	1.89E-04	6.30E-03
4	Di-n-butyl phthalate	<	1.8	5.2	3	3.00E-02	1.14E-03	3.79E+01
10	Di-n-butyl phthalate	<	1.5	5.2	3	3.00E-02	9.46E-04	3.15E+01
1	Di-n-octyl phthalate	<	0.5	5.55	3	3.00E-02	1.41E-04	4.70E+00
2	Di-n-octyl phthalate	<	1.4	5.55	3	3.00E-02	3.95E-04	1.32E+01
3	Di-n-octyl phthalate	<	1.7	5.55	3	3.00E-02	4.79E-04	1.60E+01
4	Di-n-octyl phthalate	<	1.8	5.55	3	3.00E-02	5.07E-04	1.69E+01
10	Di-n-octyl phthalate	<	1.5	5.55	3	3.00E-02	4.23E-04	1.41E+01
1	Endosulfan, alpha	<	0.5	3.83	0.056	5.60E-04	7.40E-03	1.32E+04
1	Endosulfan, beta	<	0.5	3.62	0.056	5.60E-04	1.20E-02	2.14E+04

Table A-5 (continued)

Reach	Compound	Remarks[a]	Surface conc. (mg/kg)	log(K_{ow})	Intermediate criteria (µg/L)	Lower criteria (µg/L)	Pore water (mg/L)	Lower quotient
1	Endosulfan sulfate	<	0.5	3.66	0.056	5.60E-04	1.09E-02	1.95E+04
1	Endrin	<	0.5	5.38	0.0023	2.30E-05	2.08E-04	9.06E+03
1	Endrin aldehyde	<	0.5	5.6		0.00E+00	1.26E-04	
1	Ethylbenzene	<	0.008	3.15	440	4.40E+00	5.66E-04	1.29E-01
1	Fluoranthene		0.59	5.22	16	1.60E-01	3.56E-04	2.23E+00
2	Fluoranthene	<	1.4	5.22	16	1.60E-01	8.44E-04	5.28E+00
3	Fluoranthene		2.6	5.22	16	1.60E-01	1.57E-03	9.81E+00
4	Fluoranthene	<	1.8	5.22	16	1.60E-01	1.08E-03	6.75E+00
10	Fluoranthene	<	1.5	5.22	16	1.60E-01	9.04E-04	5.65E+00
1	Fluorene	<	0.5	4.18	6	6.00E-02	3.30E-03	5.50E+01
2	Fluorene	<	1.4	4.18	6	6.00E-02	9.25E-03	1.54E+02
3	Fluorene	<	1.7	4.18	6	6.00E-02	1.12E-02	1.87E+02
4	Fluorene	<	1.8	4.18	6	6.00E-02	1.19E-02	1.98E+02
10	Fluorene	<	1.5	4.18	6	6.00E-02	9.91E-03	1.65E+02
1	Heptachlor	<	0.5	5.44	0.0038	3.80E-05	1.82E-04	4.78E+03
1	Heptachlor epoxide	<	0.5	5.4		0.00E+00	1.99E-04	
1	Hexachlorobenzene	<	0.5	5.31	38	3.80E-01	2.45E-04	6.44E-01
2	Hexachlorobenzene	<	1.4	5.31	38	3.80E-01	6.86E-04	1.80E+00
3	Hexachlorobenzene	<	1.7	5.31	38	3.80E-01	8.33E-04	2.19E+00
4	Hexachlorobenzene	<	1.8	5.31	38	3.80E-01	8.82E-04	2.32E+00
10	Hexachlorobenzene	<	1.5	5.31	38	3.80E-01	7.35E-04	1.93E+00
1	Hexachlorobutadiene	<	0.5	4.9	9.3	9.30E-02	6.29E-04	6.77E+00
2	Hexachlorobutadiene	<	1.4	4.9	9.3	9.30E-02	1.76E-03	1.90E+01
3	Hexachlorobutadiene	<	1.7	4.9	9.3	9.30E-02	2.14E-03	2.30E+01
4	Hexachlorobutadiene	<	1.8	4.9	9.3	9.30E-02	2.27E-03	2.44E+01
10	Hexachlorobutadiene	<	1.5	4.9	9.3	9.30E-02	1.89E-03	2.03E+01
1	Hexachlorocyclohexane, alpha	<	0.5	3.81		0.00E+00	7.74E-03	
1	Hexachlorocyclohexane, beta	<	0.5	3.96		0.00E+00	5.48E-03	
1	Hexachlorocyclohexane, delta	<	0.5	4.14		0.00E+00	3.62E-03	
1	Hexachlorocyclohexane, gamma	<	0.5	3.66	2	2.00E-02	1.09E-02	5.47E+02
1	Hexachlorocyclopentadiene	<	0.5	5.51	5.2	5.20E-02	1.55E-04	2.97E+00
2	Hexachlorocyclopentadiene	<	1.4	5.51	5.2	5.20E-02	4.33E-04	8.32E+00
3	Hexachlorocyclopentadiene	<	1.7	5.51	5.2	5.20E-02	5.25E-04	1.01E+01
4	Hexachlorocyclopentadiene	<	1.8	5.51	5.2	5.20E-02	5.56E-04	1.07E+01
10	Hexachlorocyclopentadiene	<	1.5	5.51	5.2	5.20E-02	4.64E-04	8.91E+00
1	Hexachloroethane	<	0.5	3.93	540	5.40E+00	5.87E-03	1.09E+00
2	Hexachloroethane	<	1.4	3.93	540	5.40E+00	1.64E-02	3.05E+00
3	Hexachloroethane	<	1.7	3.93	540	5.40E+00	2.00E-02	3.70E+00
4	Hexachloroethane	<	1.8	3.93	540	5.40E+00	2.11E-02	3.92E+00
10	Hexachloroethane	<	1.5	3.93	540	5.40E+00	1.76E-02	3.26E+00

Table A-5 (continued)

Reach	Compound	Remarks[a]	Surface conc. (mg/kg)	log(K_{OW})	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
2	Indeno (1,2,3-cd) pyrene	<	1.4	6.58		0.00E+00	3.68E-05	
3	Indeno (1,2,3-cd) pyrene	<	1.7	6.58		0.00E+00	4.47E-05	
4	Indeno (1,2,3-cd) pyrene	<	1.8	6.58		0.00E+00	4.73E-05	
10	Indeno (1,2,3-cd) pyrene	<	1.5	6.58		0.00E+00	3.95E-05	
1	Isophorone	<	0.5	1.67	14000	1.40E+02	1.07E+00	7.64E+00
2	Isophorone	<	1.4	1.67	14000	1.40E+02	2.99E+00	2.14E+01
3	Isophorone	<	1.7	1.67	14000	1.40E+02	3.63E+00	2.60E+01
4	Isophorone	<	1.8	1.67	14000	1.40E+02	3.85E+00	2.75E+01
10	Isophorone	<	1.5	1.67	14000	1.40E+02	3.21E+00	2.29E+01
1	Methyl bromide	<	0.008	1.19		0.00E+00	5.17E-02	
1	Methyl chloride	<	0.008	0.91		0.00E+00	9.84E-02	
1	Methylene chloride		0.1	1.25	4000	4.00E+01	5.62E-01	1.41E+01
1	Naphthalene	<	0.5	3.33	620	6.20E+00	2.34E-02	3.77E+00
2	Naphthalene	<	1.4	3.33	620	6.20E+00	6.55E-02	1.06E+01
3	Naphthalene	<	1.7	3.33	620	6.20E+00	7.95E-02	1.28E+01
4	Naphthalene	<	1.8	3.33	620	6.20E+00	8.42E-02	1.36E+01
10	Naphthalene	<	1.5	3.33	620	6.20E+00	7.02E-02	1.13E+01
1	Nitrobenzene	<	0.5	1.85	32000	3.20E+02	7.06E-01	2.21E+00
2	Nitrobenzene	<	1.4	1.85	32000	3.20E+02	1.98E+00	6.18E+00
3	Nitrobenzene	<	1.7	1.85	32000	3.20E+02	2.40E+00	7.50E+00
4	Nitrobenzene	<	1.8	1.85	32000	3.20E+02	2.54E+00	7.95E+00
10	Nitrobenzene	<	1.5	1.85	32000	3.20E+02	2.12E+00	6.62E+00
1	N-butyl benzyl phthalate	<	0.5	4.05	3	3.00E-02	4.46E-03	1.49E+02
2	N-butyl benzyl phthalate	<	1.4	4.05	3	3.00E-02	1.25E-02	4.16E+02
3	N-butyl benzyl phthalate	<	1.7	4.05	3	3.00E-02	1.52E-02	5.05E+02
4	N-butyl benzyl phthalate	<	1.8	4.05	3	3.00E-02	1.60E-02	5.35E+02
10	N-butyl benzyl phthalate	<	1.5	4.05	3	3.00E-02	1.34E-02	4.46E+02
1	N-nitrosodimethylamine	<	0.5	-0.57	58	5.80E-01	1.86E+02	3.20E+05
2	N-nitrosodimethylamine	<	1.4	-0.57	58	5.80E-01	5.20E+02	8.97E+05
3	N-nitrosodimethylamine	<	1.7	-0.57	58	5.80E-01	6.32E+02	1.09E+06
4	N-nitrosodimethylamine	<	1.8	-0.57	58	5.80E-01	6.69E+02	1.15E+06
10	N-nitrosodimethylamine	<	1.5	-0.57	58	5.80E-01	5.57E+02	9.61E+05
1	N-nitrosodiphenylamine	<	0.5	2.57	58	5.80E-01	1.35E-01	2.32E+02
2	N-nitrosodiphenylamine	<	1.4	2.57	58	5.80E-01	3.77E-01	6.50E+02
3	N-nitrosodiphenylamine	<	1.7	2.57	58	5.80E-01	4.58E-01	7.89E+02
4	N-nitrosodiphenylamine	<	1.8	2.57	58	5.80E-01	4.84E-01	8.35E+02
10	N-nitrosodiphenylamine	<	1.5	2.57	58	5.80E-01	4.04E-01	6.96E+02
1	N-nitrosodi-n-propylamine	<	0.5	1.36	58	5.80E-01	2.18E+00	3.76E+03
2	N-nitrosodi-n-propylamine	<	1.4	1.36	58	5.80E-01	6.11E+00	1.05E+04
3	N-nitrosodi-n-propylamine	<	1.7	1.36	58	5.80E-01	7.42E+00	1.28E+04
4	N-nitrosodi-n-propylamine	<	1.8	1.36	58	5.80E-01	7.86E+00	1.35E+04

Table A-5 (continued)

Reach	Compound	Remarks[a]	Surface conc. (mg/kg)	log(K_{OW})	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
10	N-nitrosodi-n-propylamine	<	1.5	1.36	58	5.80E-01	6.55E+00	1.13E+04
1	p,p'-DDD	<	0.5	6.02	0.001	1.00E-05	4.77E-05	4.77E+03
1	p,p'-DDE	<	0.5	5.83	0.001	1.00E-05	7.40E-05	7.40E+03
1	p,p'-DDT	<	0.5	5.69	0.001	1.00E-05	1.02E-04	1.02E+04
1	Parachlorometa cresol	<	0.5	3.1	2000	2.00E+01	3.97E-02	1.99E+00
1	PCB-1016	<	5	6	0.2	2.00E-03	5.00E-04	2.50E+02
2	PCB-1016	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
3	PCB-1016	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1016	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1016	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1016	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	PCB-1221	<	5	6	0.2	2.00E-03	5.00E-04	2.50E+02
2	PCB-1221	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
3	PCB-1221	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1221	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1221	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1221	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	PCB-1232	<	5	6	0.2	2.00E-03	5.00E-04	2.50E+02
2	PCB-1232	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
3	PCB-1232	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1232	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1232	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1232	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	PCB-1242	<	5	6	0.2	2.00E-03	5.00E-04	2.50E+02
2	PCB-1242	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
3	PCB-1242	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1242	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1242	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1242	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	PCB-1248	<	5	6	0.2	2.00E-03	5.00E-04	2.50E+02
2	PCB-1248	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
3	PCB-1248	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1248	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1248	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1248	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	PCB-1254	<	5	6	0.2	2.00E-03	5.00E-04	2.50E+02
2	PCB-1254		1.2	6	0.2	2.00E-03	1.20E-04	6.00E+01
3	PCB-1254	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1254	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1254	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1254	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00

Table A-5 (continued)

Reach	Compound	Remarks[a]	Surface conc. (mg/kg)	log(K_{OW})	Intermediate criteria (μg/L)	Lower criteria (μg/L)	Pore water (mg/L)	Lower quotient
1	PCB-1260	<	5	6	0.2	2.00E-03	5.00E-04	2.50E+02
2	PCB-1260		1.6	6	0.2	2.00E-03	1.60E-04	8.00E+01
3	PCB-1260	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
4	PCB-1260	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
5	PCB-1260	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
10	PCB-1260	<	0.1	6	0.2	2.00E-03	1.00E-05	5.00E+00
1	Pentachlorophenol	<	0.5	5.12	13	1.30E-01	3.79E-04	2.92E+00
1	Phenanthrene	<	0.5	4.57	3.7	3.70E-02	1.35E-03	3.64E+01
2	Phenanthrene	<	1.4	4.57	3.7	3.70E-02	3.77E-03	1.02E+02
3	Phenanthrene		2.7	4.57	3.7	3.70E-02	7.28E-03	1.96E-01
4	Phenanthrene	<	1.8	4.57	3.7	3.70E-02	4.84E-03	1.31E+02
10	Phenanthrene	<	1.5	4.57	3.7	3.70E-02	4.04E-03	1.09E+02
1	Phenol	<	0.5	1.48	2560	2.56E+01	1.66E+00	6.47E+01
1	Phenols		300	1.48	2560	2.56E+01	9.93E+02	3.88E+04
2	Phenols		0.6	1.48	2560	2.56E+01	1.99E+00	7.76E+01
3	Phenols	<	0.4	1.48	2560	2.56E+01	1.32E+00	5.17E+01
4	Phenols		0.6	1.48	2560	2.56E+01	1.99E+00	7.76E+01
10	Phenols		0.5	1.48	2560	2.56E+01	1.66E+00	6.47E+01
1	Pyrene	<	0.5	5.18		0.00E+00	3.30E-04	
2	Pyrene	<	1.4	5.18		0.00E+00	9.25E-04	
3	Pyrene		0.6	5.18		0.00E+00	3.96E-04	
4	Pyrene	<	1.8	5.18		0.00E+00	1.19E-03	
10	Pyrene	<	1.5	5.18		0.00E+00	9.91E-04	
1	Toluene	<	0.008	2.58	230	2.30E+00	2.10E-03	9.15E-01
1	Toxaphene	<	5	3.3	0.0002	2.00E-06	2.51E-01	1.25E+08
1	trans-1,2-Dichloroethene	<	0.008	1.4	2800	2.80E+01	3.18E-02	1.14E+00
1	Trichlorofluoromethane	<	0.008	2.53	4000	4.00E+01	2.36E-03	5.90E-02
1	Vinyl chloride	<	0.008	1.48		0.00E+00	2.65E-02	

[a]"<" indicates that the chemical was not detected and the reported concentration is the highest reported limit of detection; and "A" indicates that the value reported is the mean of two or more determinations.

Table A-6. Maximum concentrations in fish flesh, water concentrations estimated from bioaccumulation factors (BAF), and quotients for aquatic biota

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
1	Antimony	<	1	1600	1.60E-02	1	1.00E+00	6.25E+01
2	Antimony	<	1	1600	1.60E-02	1	1.00E+00	6.25E+01
3	Antimony	<	1	1600	1.60E-02	1	1.00E+00	6.25E+01
4	Antimony	<	1	1600	1.60E-02	1	1.00E+00	6.25E+01
14	Antimony	<	1	1600	1.60E-02	1	1.00E+00	6.25E+01
1	Arsenic		0.42	48	4.80E-04	2.44	1.72E-01	3.59E+02
2	Arsenic		0.4	48	4.80E-04	2.44	1.64E-01	3.42E+02
3	Arsenic		0.6	48	4.80E-04	2.44	2.46E-01	5.12E+02
4	Arsenic		0.4	48	4.80E-04	2.44	1.64E-01	3.42E+02
5	Arsenic		0.2	48	4.80E-04	2.44	8.20E-02	1.71E+02
14	Arsenic	<	0.1	48	4.80E-04	2.44	4.10E-02	8.54E+01
18	Arsenic		0.3	48	4.80E-04	2.44	1.23E-01	2.56E+02
99	Arsenic		0.2	48	4.80E-04	2.44	8.20E-02	1.71E+02
1	Beryllium	<	0.1	5.3	5.30E-05	2	5.00E-02	9.43E+02
2	Beryllium		0.04	5.3	5.30E-05	2	2.00E-02	3.77E+02
3	Beryllium	<	0.1	5.3	5.30E-05	2	5.00E-02	9.43E+02
4	Beryllium	<	0.1	5.3	5.30E-05	2	5.00E-02	9.43E+02
14	Beryllium	<	0.1	5.3	5.30E-05	2	5.00E-02	9.43E+02
1	Cadmium		0.14	1.1	1.10E-05	50	2.80E-03	2.55E+02
2	Cadmium		0.04	1.1	1.10E-05	50	8.00E-04	7.27E+01
3	Cadmium		0.02	1.1	1.10E-05	50	4.00E-04	3.64E+01
4	Cadmium		0.02	1.1	1.10E-05	50	4.00E-04	3.64E+01
5	Cadmium		0.05	1.1	1.10E-05	50	1.00E-03	9.09E+01
14	Cadmium	<	0.002	1.1	1.10E-05	50	4.00E-05	3.64E+00
18	Cadmium		0.01	1.1	1.10E-05	50	2.00E-04	1.82E+01
99	Cadmium		0.054	1.1	1.10E-05	50	1.08E-03	9.82E+01
1	Chromium		0.36	11	1.10E-04	200	1.80E-03	1.64E+01
2	Chromium		0.36	11	1.10E-04	200	1.80E-03	1.64E+01
3	Chromium		0.59	11	1.10E-04	200	2.95E-03	2.68E+01
4	Chromium		0.82	11	1.10E-04	200	4.10E-03	3.73E+01
5	Chromium		0.98	11	1.10E-04	200	4.90E-03	4.45E+01
14	Chromium		0.29	11	1.10E-04	200	1.45E-03	1.32E+01
18	Chromium		0.9	11	1.10E-04	200	4.50E-03	4.09E+01
99	Chromium		0.12	11	1.10E-04	200	6.00E-04	5.45E+00
1	Copper		1.8	12	1.20E-04	210	8.57E-03	7.14E+01
2	Copper		10	12	1.20E-04	210	4.76E-02	3.97E+02
3	Copper		4.1	12	1.20E-04	210	1.95E-02	1.63E+02
4	Copper		0.56	12	1.20E-04	210	2.67E-03	2.22E+01

Table A-6 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
14	Copper		2	12	1.20E-04	210	9.52E-03	7.94E+01
99	Copper		0.48	12	1.20E-04	210	2.29E-03	1.90E+01
1	Lead		1.6	3.2	3.20E-05	300	5.33E-03	1.67E+02
2	Lead		0.5	3.2	3.20E-05	300	1.67E-03	5.21E+01
3	Lead		0.36	3.2	3.20E-05	300	1.20E-03	3.75E+01
4	Lead		0.45	3.2	3.20E-05	300	1.50E-03	4.69E+01
14	Lead		0.15	3.2	3.20E-05	300	5.00E-04	1.56E+01
99	Lead		0.21	3.2	3.20E-05	300	7.00E-04	2.19E+01
1	Mercury		0.44	0.07	7.00E-07	63000	6.98E-06	9.98E+00
2	Mercury		0.56	0.07	7.00E-07	63000	8.89E-06	1.27E+01
3	Mercury		1.7	0.07	7.00E-07	63000	2.70E-05	3.85E+01
4	Mercury		1.2	0.07	7.00E-07	63000	1.90E-05	2.72E+01
5	Mercury		0.18	0.07	7.00E-07	63000	2.86E-06	4.08E+00
14	Mercury		0.93	0.07	7.00E-07	63000	1.48E-05	2.11E+01
18	Mercury		0.45	0.07	7.00E-07	63000	7.14E-06	1.02E+01
99	Mercury		0.57	0.07	7.00E-07	63000	9.05E-06	1.29E+01
1	Nickel	<	2	160	1.60E-03	100	2.00E-02	1.25E+01
2	Nickel	<	1	160	1.60E-03	100	1.00E-02	6.25E+00
3	Nickel		2	160	1.60E-03	100	2.00E-02	1.25E+01
4	Nickel	<	1	160	1.60E-03	100	1.00E-02	6.25E+00
5	Nickel	<	1	160	1.60E-03	100	1.00E-02	6.25E+00
14	Nickel	<	1	160	1.60E-03	100	1.00E-02	6.25E+00
18	Nickel	<	1	160	1.60E-03	100	1.00E-02	6.25E+00
99	Nickel	<	1	160	1.60E-03	100	1.00E-02	6.25E+00
1	Selenium		1.8	35	3.50E-04	8	2.25E-01	6.43E+02
2	Selenium		0.41	35	3.50E-04	8	5.13E-02	1.46E+02
3	Selenium		0.5	35	3.50E-04	8	6.25E-02	1.79E+02
4	Selenium		2.6	35	3.50E-04	8	3.25E-01	9.29E+02
14	Selenium		0.6	35	3.50E-04	8	7.50E-02	2.14E+02
99	Selenium		0.4	35	3.50E-04	8	5.00E-02	1.43E+02
1	Silver		0.7	0.12	1.20E-06	2	3.50E-01	2.92E+05
2	Silver		0.5	0.12	1.20E-06	2	2.50E-01	2.08E+05
3	Silver		0.6	0.12	1.20E-06	2	3.00E-01	2.50E+05
4	Silver	<	0.2	0.12	1.20E-06	2	1.00E-01	8.33E+04
5	Silver	<	0.2	0.12	1.20E-06	2	1.00E-01	8.33E+04
14	Silver	<	0.2	0.12	1.20E-06	2	1.00E-01	8.33E+04
18	Silver	<	0.2	0.12	1.20E-06	2	1.00E-01	8.33E+04
99	Silver	<	0.2	0.12	1.20E-06	2	1.00E-01	8.33E+04
1	Thallium		3.8	40	4.00E-04	10000	3.80E-04	9.50E-01
2	Thallium	<	1	40	4.00E-04	10000	1.00E-04	2.50E-01

Table A-6 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
3	Thallium	<	1	40	4.00E-04	10000	1.00E-04	2.50E-01
4	Thallium	<	1	40	4.00E-04	10000	1.00E-04	2.50E-01
14	Thallium	<	1	40	4.00E-04	10000	1.00E-04	2.50E-01
1	Zinc		11	110	1.10E-03	1000	1.10E-02	1.00E+01
2	Zinc		11	110	1.10E-03	1000	1.10E-02	1.00E+01
3	Zinc		16	110	1.10E-03	1000	1.60E-02	1.45E+01
4	Zinc		17	110	1.10E-03	1000	1.70E-02	1.55E+01
14	Zinc		8.2	110	1.10E-03	1000	8.20E-03	7.45E+00
99	Zinc		6.2	110	1.10E-03	1000	6.20E-03	5.64E+00
1	1,1,1-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
2	1,1,1-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
3	1,1,1-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
1	1,1,2,2-Tetrachloroethane	<	0.05	2400	2.40E-02	8	6.25E-03	2.60E-01
2	1,1,2,2-Tetrachloroethane	<	0.05	2400	2.40E-02	8	6.25E-03	2.60E-01
3	1,1,2,2-Tetrachloroethane	<	0.05	2400	2.40E-02	8	6.25E-03	2.60E-01
1	1,1,2-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
2	1,1,2-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
3	1,1,2-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
1	1,1-Dichloroethane	<	0.05	20000	2.00E-01	14	3.57E-03	1.79E-02
2	1,1-Dichloroethane	<	0.05	20000	2.00E-01	14	3.57E-03	1.79E-02
3	1,1-Dichloroethane	<	0.05	20000	2.00E-01	14	3.57E-03	1.79E-02
1	1,1-Dichloroethylene	<	0.05	11600	1.16E-01	7	7.14E-03	6.16E-02
2	1,1-Dichloroethylene	<	0.05	11600	1.16E-01	7	7.14E-03	6.16E-02
3	1,1-Dichloroethylene	<	0.05	11600	1.16E-01	7	7.14E-03	6.16E-02
1	1,2,4-Trichlorobenzene	<	3.3	50	5.00E-04	1200	2.75E-03	5.50E+00
2	1,2,4-Trichlorobenzene	<	0.67	50	5.00E-04	1200	5.58E-04	1.12E+00
3	1,2,4-Trichlorobenzene	<	0.67	50	5.00E-04	1200	5.58E-04	1.12E+00
1	1,2,5,6-Dibenzanthracene	<	3.3		0.00E+00			
2	1,2,5,6-Dibenzanthracene	<	0.67		0.00E+00			
3	1,2,5,6-Dibenzanthracene	<	0.67		0.00E+00			
1	1,2-Dichlorobenzene	<	3.3	763	7.63E-03	560	5.89E-03	7.72E-01
2	1,2-Dichlorobenzene	<	0.67	763	7.63E-03	560	1.20E-03	1.57E-01
3	1,2-Dichlorobenzene	<	0.67	763	7.63E-03	560	1.20E-03	1.57E-01
1	1,2-Dichloroethane	<	0.05	20000	2.00E-01	2	2.50E-02	1.25E-01
2	1,2-Dichloroethane	<	0.05	20000	2.00E-01	2	2.50E-02	1.25E-01
3	1,2-Dichloroethane	<	0.05	20000	2.00E-01	2	2.50E-02	1.25E-01
1	1,2-Dichloropropane	<	0.05	5700	5.70E-02	43	1.16E-03	2.04E-02
2	1,2-Dichloropropane	<	0.05	5700	5.70E-02	43	1.16E-03	2.04E-02
3	1,2-Dichloropropane	<	0.05	5700	5.70E-02	43	1.16E-03	2.04E-02
1	1,2-Diphenylhydrazine	<	3.3		0.00E+00			

Table A-6 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
2	1,2-Diphenylhydrazine	<	0.67		0.00E+00			
3	1,2-Diphenylhydrazine	<	0.67		0.00E+00			
1	1,3-Dichlorobenzene	<	3.3	763	7.63E-03	740	4.46E-03	5.84E-01
2	1,3-Dichlorobenzene	<	0.67	763	7.63E-03	740	9.05E-04	1.19E-01
3	1,3-Dichlorobenzene	<	0.67	763	7.63E-03	740	9.05E-04	1.19E-01
1	1,3-Dichloropropene	<	0.05	244	2.44E-03			
2	1,3-Dichloropropene	<	0.05	244	2.44E-03			
3	1,3-Dichloropropene	<	0.05	244	2.44E-03			
1	1,4-Dichlorobenzene	<	3.3	763	7.63E-03	690	4.78E-03	6.27E-01
2	1,4-Dichlorobenzene	<	0.67	763	7.63E-03	690	9.71E-04	1.27E-01
3	1,4-Dichlorobenzene	<	0.67	763	7.63E-03	690	9.71E-04	1.27E-01
1	2,4,6-Trichlorophenol	<	3.3	970	9.70E-03			
2	2,4,6-Trichlorophenol	<	0.67	970	9.70E-03			
3	2,4,6-Trichlorophenol	<	0.67	970	9.70E-03			
1	2,4-Dichlorophenol	<	3.3	365	3.65E-03			
2	2,4-Dichlorophenol	<	0.67	365	3.65E-03			
3	2,4-Dichlorophenol	<	0.67	365	3.65E-03			
1	2,4-Dimethylphenol	<	3.3	2200	2.20E-02	150	2.20E-02	1.00E+00
2	2,4-Dimethylphenol	<	0.67	2200	2.20E-02	150	4.47E-03	2.03E-01
3	2,4-Dimethylphenol	<	0.67	2200	2.20E-02	150	4.47E-03	2.03E-01
1	2,4-Dinitrophenol	<	33	150	1.50E-03			
2	2,4-Dinitrophenol	<	6.7	150	1.50E-03			
3	2,4-Dinitrophenol	<	6.7	150	1.50E-03			
1	2,4-Dinitrotoluene	<	3.3	230	2.30E-03	25	1.32E-01	5.74E+01
2	2,4-Dinitrotoluene	<	0.67	230	2.30E-03	25	2.68E-02	1.17E+01
3	2,4-Dinitrotoluene	<	0.67	230	2.30E-03	25	2.68E-02	1.17E+01
1	2,6-Dinitrotoluene	<	3.3	230	2.30E-03	22	1.50E-01	6.52E+01
2	2,6-Dinitrotoluene	<	0.67	230	2.30E-03	22	3.05E-02	1.32E+01
3	2,6-Dinitrotoluene	<	0.67	230	2.30E-03	22	3.05E-02	1.32E+01
1	2-Chloroethyl vinyl ether	<	0.05		0.00E+00			
2	2-Chloroethyl vinyl ether	<	0.05		0.00E+00			
3	2-Chloroethyl vinyl ether	<	0.05		0.00E+00			
1	2-Chloronaphthalene	<	3.3	440	4.40E-03			
2	2-Chloronaphthalene	<	0.67	440	4.40E-03			
3	2-Chloronaphthalene	<	0.67	440	4.40E-03			
1	2-Chlorophenol	<	3.3	2000	2.00E-02			
2	2-Chlorophenol	<	0.67	2000	2.00E-02			
3	2-Chlorophenol	<	0.67	2000	2.00E-02			
1	2-Nitrophenol	<	3.3	150	1.50E-03			
2	2-Nitrophenol	<	0.67	150	1.50E-03			

Table A-6 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
3	2-Nitrophenol	<	0.67	150	1.50E-03			
1	3,3′-Dichlorobenzidine	<	8.2		0.00E+00			
2	3,3′-Dichlorobenzidine	<	1.7		0.00E+00			
3	3,3′-Dichlorobenzidine	<	1.7		0.00E+00			
1	4,6-Dinitro-ortho-cresol	<	16	150	1.50E-03			
2	4,6-Dinitro-ortho-cresol	<	3.4	150	1.50E-03			
3	4,6-Dinitro-ortho-cresol	<	3.4	150	1.50E-03			
1	4-Bromophenyl phenyl ether	<	3.3	122	1.22E-03			
2	4-Bromophenyl phenyl ether	<	0.67	122	1.22E-03			
3	4-Bromophenyl phenyl ether	<	0.67	122	1.22E-03			
1	4-Chlorophenyl phenyl ether	<	3.3	122	1.22E-03			
2	4-Chlorophenyl phenyl ether	<	0.67	122	1.22E-03			
3	4-Chlorophenyl phenyl ether	<	0.67	122	1.22E-03			
1	4-Nitrophenol	<	3.3	150	1.50E-03			
2	4-Nitrophenol	<	0.67	150	1.50E-03			
3	4-Nitrophenol	<	0.67	150	1.50E-03			
1	Acenaphthene	<	3.3	520	5.20E-03	390	8.46E-03	1.63E+00
2	Acenaphthene	<	0.67	520	5.20E-03	390	1.72E-03	3.30E-01
3	Acenaphthene	<	0.67	520	5.20E-03	390	1.72E-03	3.30E-01
1	Acenaphthylene	<	3.3		0.00E+00			
2	Acenaphthylene	<	0.67		0.00E+00			
3	Acenaphthylene	<	0.67		0.00E+00			
1	Acrolein	<	0.05	21	2.10E-04	350	1.43E-04	6.80E-01
2	Acrolein	<	0.05	21	2.10E-04	350	1.43E-04	6.80E-01
3	Acrolein	<	0.05	21	2.10E-04	350	1.43E-04	6.80E-01
1	Acrylonitrile	<	0.05	2600	2.60E-02	48	1.04E-03	4.01E-02
2	Acrylonitrile	<	0.05	2600	2.60E-02	48	1.04E-03	4.01E-02
3	Acrylonitrile	<	0.05	2600	2.60E-02	48	1.04E-03	4.01E-02
1	Aldrin	<	0.01		0.00E+00	11000	9.09E-07	
2	Aldrin	<	0.01		0.00E+00	11000	9.09E-07	
3	Aldrin	<	0.01		0.00E+00	11000	9.09E-07	
1	Anthracene	<	3.3		0.00E+00	485	6.80E-03	
2	Anthracene	<	0.67		0.00E+00	485	1.38E-03	
3	Anthracene	<	0.67		0.00E+00	485	1.38E-03	
1	Benzene	<	0.05	727	7.27E-03	32	1.56E-03	2.15E-01
2	Benzene	<	0.05	727	7.27E-03	32	1.56E-03	2.15E-01
3	Benzene	<	0.05	727	7.27E-03	32	1.56E-03	2.15E-01
1	Benzidine	<	16	74	7.40E-04	41	3.90E-01	5.27E+02
2	Benzidine	<	3.4	74	7.40E-04	41	8.29E-02	1.12E+02
3	Benzidine	<	3.4	74	7.40E-04	41	8.29E-02	1.12E+02

Table A-6 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
1	Benzo(a)anthracene	<	3.3		0.00E+00	10109	3.26E-04	
2	Benzo(a)anthracene	<	0.67		0.00E+00	10109	6.63E-05	
3	Benzo(a)anthracene	<	0.67		0.00E+00	10109	6.63E-05	
1	Benzo(b)fluoranthene	<	3.3		0.00E+00			
2	Benzo(b)fluoranthene	<	0.67		0.00E+00			
3	Benzo(b)fluoranthene	<	0.67		0.00E+00			
1	Benzo(ghi)perylene	<	3.3		0.00E+00			
2	Benzo(ghi)perylene	<	0.67		0.00E+00			
3	Benzo(ghi)perylene	<	0.67		0.00E+00			
1	Benzo(k)flouranthene	<	3.3		0.00E+00			
2	Benzo(k)flouranthene	<	0.67		0.00E+00			
3	Benzo(k)flouranthene	<	0.67		0.00E+00			
1	Benzo-a-pyrene	<	3.3		0.00E+00	30	1.10E-01	
2	Benzo-a-pyrene	<	0.67		0.00E+00	30	2.23E-02	
3	Benzo-a-pyrene	<	0.67		0.00E+00	30	2.23E-02	
1	Bis(2-chloroethoxy)methane	<	3.3		0.00E+00			
2	Bis(2-chloroethoxy)methane	<	0.67		0.00E+00			
3	Bis(2-chloroethoxy)methane	<	0.67		0.00E+00			
1	Bis(2-chloroethyl)ether	<	3.3	1900	1.90E-02	11	3.00E-01	1.58E+01
2	Bis(2-chloroethyl)ether	<	0.67	1900	1.90E-02	11	6.09E-02	3.21E+00
3	Bis(2-chloroethyl)ether	<	0.67	1900	1.90E-02	11	6.09E-02	3.21E+00
1	Bis(2-chloroisopropyl)ether	<	3.3	1900	1.90E-02			
2	Bis(2-chloroisopropyl)ether	<	0.67	1900	1.90E-02			
3	Bis(2-chloroisopropyl)ether	<	0.67	1900	1.90E-02			
1	Bis(chloromethyl)ether	<	0.05		0.00E+00			
2	Bis(chloromethyl)ether	<	0.05		0.00E+00			
3	Bis(chloromethyl)ether	<	0.05		0.00E+00			
1	Bis(2-ethylhexyl)phthalate	<	3.3	3	3.00E-05	310	1.06E-02	3.55E+02
2	Bis(2-ethylhexyl)phthalate	<	0.67	3	3.00E-05	310	2.16E-03	7.20E+01
3	Bis(2-ethylhexyl)phthalate	<	0.67	3	3.00E-05	310	2.16E-03	7.20E+01
1	Bromoform	<	0.05	4000	4.00E-02			
2	Bromoform	<	0.05	4000	4.00E-02			
3	Bromoform	<	0.05	4000	4.00E-02			
1	Carbon tetrachloride	<	0.05	4000	4.00E-02	23	2.17E-03	5.43E-02
2	Carbon tetrachloride	<	0.05	4000	4.00E-02	23	2.17E-03	5.43E-02
3	Carbon tetrachloride	<	0.05	4000	4.00E-02	23	2.17E-03	5.43E-02
1	Chlordane(tech mix and metabs)		0.16	0.0043	4.30E-08	1400000	4.28E-07	9.96E+00
2	Chlordane(tech mix and metabs)		0.25	0.0043	4.30E-08	1400000	1.79E-07	4.15E+01
3	Chlordane(tech mix and metabs)	<	0.1	0.0043	4.30E-08	1400000	7.14E-08	1.66E+00
4	Chlordane(tech mix and metabs)		0.298	0.0043	4.30E-08	1400000	1.91E-07	4.95E-01
1	Chlorobenzene	<	0.05	50	5.00E-04	450	1.11E-04	2.22E-01

Table A-6 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
2	Chlorobenzene	<	0.05	50	5.00E-04	450	1.11E-04	2.22E-01
3	Chlorobenzene	<	0.05	50	5.00E-04	450	1.11E-04	2.22E-01
1	Chlorodibromomethane	<	0.05	4000	4.00E-02	28	1.79E-03	4.46E-02
2	Chlorodibromomethane	<	0.05	4000	4.00E-02	28	1.79E-03	4.46E-02
3	Chlorodibromomethane	<	0.05	4000	4.00E-02	28	1.79E-03	4.46E-02
1	Chloroethane	<	0.05	20000	2.00E-01	6	8.33E-03	4.17E-02
2	Chloroethane	<	0.05	20000	2.00E-01	6	8.33E-03	4.17E-02
3	Chloroethane	<	0.05	20000	2.00E-01	6	8.33E-03	4.17E-02
1	Chloroform	<	0.05	1240	1.24E-02	6	8.33E-03	6.72E-01
2	Chloroform	<	0.05	1240	1.24E-02	6	8.33E-03	6.72E-01
3	Chloroform	<	0.05	1240	1.24E-02	6	8.33E-03	6.72E-01
1	Chrysene	<	3.3		0.00E+00	300	1.10E-02	
2	Chrysene	<	0.67		0.00E+00	300	2.23E-03	
3	Chrysene	<	0.67		0.00E+00	300	2.23E-03	
1	Dichlorobromomethane	<	0.05	4000	4.00E-02	17	2.94E-03	7.35E-02
2	Dichlorobromomethane	<	0.05	4000	4.00E-02	17	2.94E-03	7.35E-02
3	Dichlorobromomethane	<	0.05	4000	4.00E-02	17	2.94E-03	7.35E-02
1	Dichlorodifluoromethane	<	0.05	4000	4.00E-02	32	1.56E-03	3.91E-02
2	Dichlorodifluoromethane	<	0.05	4000	4.00E-02	32	1.56E-03	3.91E-02
3	Dichlorodifluoromethane	<	0.05	4000	4.00E-02	32	1.56E-03	3.91E-02
1	Dieldrin	<	0.01	0.0019	1.90E-08	14000	7.14E-07	3.76E+01
2	Dieldrin	<	0.01	0.0019	1.90E-08	14000	7.14E-07	3.76E+01
3	Dieldrin	<	0.01	0.0019	1.90E-08	14000	7.14E-07	3.76E+01
1	Diethyl phthalate	<	3.3	3	3.00E-05	120	2.75E-02	9.17E+02
2	Diethyl phthalate	<	0.67	3	3.00E-05	120	5.58E-03	1.86E+02
3	Diethyl phthalate	<	0.67	3	3.00E-05	120	5.58E-03	1.86E+02
1	Dimethyl phthalate	<	3.3	3	3.00E-05			
2	Dimethyl phthalate	<	0.67	3	3.00E-05			
3	Dimethyl phthalate	<	0.67	3	3.00E-05			
1	Di-n-butyl phthalate	<	3.3	3	3.00E-05	89	3.71E-02	1.24E+03
2	Di-n-butyl phthalate	<	0.67	3	3.00E-05	89	7.53E-03	2.51E+02
3	Di-n-butyl phthalate	<	0.67	3	3.00E-05	89	7.53E-03	2.51E+02
1	Di-n-octyl phthalate	<	3.3	3	3.00E-05	9300	3.55E-04	1.18E+01
2	Di-n-octyl phthalate	<	0.67	3	3.00E-05	9300	7.20E-05	2.40E+00
3	Di-n-octyl phthalate	<	0.67	3	3.00E-05	9300	7.20E-05	2.40E+00
1	Endosulfan, alpha	<	0.01	0.056	5.60E-07			
2	Endosulfan, alpha	<	0.01	0.056	5.60E-07			
3	Endosulfan, alpha	<	0.01	0.056	5.60E-07			
1	Endosulfan, beta	<	0.01	0.056	5.60E-07			
2	Endosulfan, beta	<	0.01	0.056	5.60E-07			

Table A-6 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
3	Endosulfan, beta	<	0.01	0.056	5.60E-07			
1	Endosulfan sulfate	<	0.01		0.00E+00			
2	Endosulfan sulfate	<	0.01		0.00E+00			
3	Endosulfan sulfate	<	0.01		0.00E+00			
1	Endrin	<	0.01	0.0023	2.30E-08	2600	3.85E-06	1.67E+02
2	Endrin	<	0.01	0.0023	2.30E-08	2600	3.85E-06	1.67E+02
3	Endrin	<	0.01	0.0023	2.30E-08	2600	3.85E-06	1.67E+02
1	Endrin aldehyde	<	0.01		0.00E+00			
2	Endrin aldehyde	<	0.01		0.00E+00			
3	Endrin aldehyde	<	0.01		0.00E+00			
1	Ethylbenzene	<	0.05	440	4.40E-03	290	1.72E-04	3.92E-02
2	Ethylbenzene	<	0.05	440	4.40E-03	290	1.72E-04	3.92E-02
3	Ethylbenzene	<	0.05	440	4.40E-03	290	1.72E-04	3.92E-02
1	Fluoranthene	<	3.3	16	1.60E-04	379	8.71E-03	5.44E+01
2	Fluoranthene	<	0.67	16	1.60E-04	379	1.77E-03	1.11E+01
3	Fluoranthene	<	0.67	16	1.60E-04	379	1.77E-03	1.11E+01
1	Fluorene	<	3.3	6	6.00E-05	600	5.50E-03	9.17E+01
2	Fluorene	<	0.67	6	6.00E-05	600	1.12E-03	1.86E+01
3	Fluorene	<	0.67	6	6.00E-05	600	1.12E-03	1.86E+01
1	Heptachlor	<	0.01	0.0038	3.80E-08	14000	7.14E-07	1.88E+01
2	Heptachlor	<	0.01	0.0038	3.80E-08	14000	7.14E-07	1.88E+01
3	Heptachlor	<	0.01	0.0038	3.80E-08	14000	7.14E-07	1.88E+01
1	Heptachlor epoxide	<	0.01		0.00E+00	14000	7.14E-07	
2	Heptachlor epoxide	<	0.01		0.00E+00	14000	7.14E-07	
3	Heptachlor epoxide	<	0.01		0.00E+00	14000	7.14E-07	
1	Hexachlorobenzene	<	3.3	38	3.80E-04			
2	Hexachlorobenzene	<	0.67	38	3.80E-04			
3	Hexachlorobenzene	<	0.67	38	3.80E-04			
1	Hexachlorobutadiene	<	3.3	9.3	9.30E-05			
2	Hexachlorobutadiene	<	0.67	9.3	9.30E-05			
3	Hexachlorobutadiene	<	0.67	9.3	9.30E-05			
1	Hexachlorocyclohexane, alpha	<	0.01		0.00E+00	710	1.41E-05	
2	Hexachlorocyclohexane, alpha	<	0.01		0.00E+00	710	1.41E-05	
3	Hexachlorocyclohexane, alpha	<	0.01		0.00E+00	710	1.41E-05	
1	Hexachlorocyclohexane, beta	<	0.01		0.00E+00	720	1.39E-05	
2	Hexachlorocyclohexane, beta	<	0.01		0.00E+00	720	1.39E-05	
3	Hexachlorocyclohexane, beta	<	0.01		0.00E+00	720	1.39E-05	
1	Hexachlorocyclohexane, delta	<	0.01		0.00E+00			
2	Hexachlorocyclohexane, delta	<	0.01		0.00E+00			
3	Hexachlorocyclohexane, delta	<	0.01		0.00E+00			

Table A-6 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
1	Hexachlorocyclohexane, gamma	<	0.01	0.06	6.00E-07	1000	1.00E-05	1.67E+01
2	Hexachlorocyclohexane, gamma	<	0.01	0.06	6.00E-07	1000	1.00E-05	1.67E+01
3	Hexachlorocyclohexane, gamma	<	0.01	0.06	6.00E-07	1000	1.00E-05	1.67E+01
1	Hexachlorocyclopentadiene	<	3.3	5.2	5.20E-05	30	1.10E-01	2.12E+03
2	Hexachlorocyclopentadiene	<	0.67	5.2	5.20E-05	30	2.23E-02	4.29E+02
3	Hexachlorocyclopentadiene	<	0.67	5.2	5.20E-05	30	2.23E-02	4.29E+02
1	Hexachloroethane	<	3.3	540	5.40E-03	140	2.36E-02	4.37E+00
2	Hexachloroethane	<	0.67	540	5.40E-03	140	4.79E-03	8.86E-01
3	Hexachloroethane	<	0.67	540	5.40E-03	140	4.79E-03	8.86E-01
1	Indeno (1,2,3-cd) pyrene	<	3.3		0.00E+00			
2	Indeno (1,2,3-cd) pyrene	<	0.67		0.00E+00			
3	Indeno (1,2,3-cd) pyrene	<	0.67		0.00E+00			
1	Isophorone	<	3.3	14000	1.40E-01	7	4.71E-01	3.37E+00
2	Isophorone	<	0.67	14000	1.40E-01	7	9.57E-02	6.84E-01
3	Isophorone	<	0.67	14000	1.40E-01	7	9.57E-02	6.84E-01
1	Methyl bromide	<	0.05	4000	4.00E-02			
2	Methyl bromide	<	0.05	4000	4.00E-02			
3	Methyl bromide	<	0.05	4000	4.00E-02			
1	Methyl chloride	<	0.05	4000	4.00E-02			
2	Methyl chloride	<	0.05	4000	4.00E-02			
3	Methyl chloride	<	0.05	4000	4.00E-02			
1	Methylene chloride	<	0.25	4000	4.00E-02	4	6.25E-02	1.56E+00
2	Methylene chloride	<	0.25	4000	4.00E-02	4	6.25E-02	1.56E+00
3	Methylene chloride	<	0.25	4000	4.00E-02	4	6.25E-02	1.56E+00
1	Naphthalene	<	3.3	620	6.20E-03	430	7.67E-03	1.24E+00
2	Naphthalene	<	0.67	620	6.20E-03	430	1.56E-03	2.51E-01
3	Naphthalene	<	0.67	620	6.20E-03	430	1.56E-03	2.51E-01
1	Nitrobenzene	<	3.3	32000	3.20E-01			
2	Nitrobenzene	<	0.67	32000	3.20E-01			
3	Nitrobenzene	<	0.67	32000	3.20E-01			
1	N-butyl benzyl phthalate	<	3.3	3	3.00E-05	660	5.00E-03	1.67E+02
2	N-butyl benzyl phthalate	<	0.67	3	3.00E-05	660	1.02E-03	3.38E+01
3	N-butyl benzyl phthalate	<	0.67	3	3.00E-05	660	1.02E-03	3.38E+01
1	N-nitrosodimethylamine	<	3.3	58	5.80E-04	0.08	4.13E+01	7.11E+04
2	N-nitrosodimethylamine	<	0.67	58	5.80E-04	0.08	8.38E+00	1.44E+04
3	N-nitrosodimethylamine	<	0.67	58	5.80E-04	0.08	8.38E+00	1.44E+04
1	N-nitrosodiphenylamine	<	3.3	58	5.80E-04	91	3.63E-02	6.25E+01
2	N-nitrosodiphenylamine	<	0.67	58	5.80E-04	91	7.36E-03	1.27E+01
3	N-nitrosodiphenylamine	<	0.67	58	5.80E-04	91	7.36E-03	1.27E+01
1	N-nitrosodi-n-propylamine	<	3.3	58	5.80E-04			

Table A-6 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (µg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
2	N-nitrosodi-n-propylamine	<	0.67	58	5.80E-04			
3	N-nitrosodi-n-propylamine	<	0.67	58	5.80E-04			
1	Oxychlordane	<	0.01		0.00E+00			
1	p,p'-DDD		0.1		0.00E+00	170000	5.88E-07	
2	p,p'-DDD	<	0.01		0.00E+00	170000	5.88E-08	
3	p,p'-DDD	<	0.01		0.00E+00	170000	5.88E-08	
1	p,p'-DDE	<	0.01		0.00E+00	18000000	5.56E-10	
2	p,p'-DDE	<	0.01		0.00E+00	18000000	5.56E-10	
3	p,p'-DDE	<	0.01		0.00E+00	18000000	5.56E-10	
1	p,p'-DDT		0.16	0.001	1.00E-08	34000	4.71E-06	4.71E+02
2	p,p'-DDT		0.09	0.001	1.00E-08	34000	2.65E-06	2.65E+02
3	p,p'-DDT	<	0.01	0.001	1.00E-08	34000	2.94E-07	2.94E+01
1	Parachlorometa cresol	<	3.3	2000	2.00E-02			
2	Parachlorometa cresol	<	0.67	2000	2.00E-02			
3	Parachlorometa cresol	<	0.67	2000	2.00E-02			
1	PCBs, TOTAL		4.7	0.2	2.00E-06	10000000	4.70E-07	2.35E-01
2	PCBs, total		5.6	0.2	2.00E-06	10000000	5.60E-07	2.80E-01
3	PCBs, total		3.4	0.2	2.00E-06	10000000	3.40E-07	1.70E-01
4	PCBs, total		4.6	0.2	2.00E-06	10000000	4.60E-07	2.30E-01
5	PCBs, total		7.5	0.2	2.00E-06	10000000	7.50E-07	3.75E-01
18	PCBs, total		7.4	0.2	2.00E-06	10000000	7.40E-07	3.70E-01
99	PCBs, total		1	0.2	2.00E-06	10000000	1.00E-07	5.00E-02
1	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
2	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
3	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
4	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
5	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
18	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
99	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
1	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
2	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
3	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
4	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
5	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
18	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
99	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
1	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
2	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
3	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
4	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03

Table A-6 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
5	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
18	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
99	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
1	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
2	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
3	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
4	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
5	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
18	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
99	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
1	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
2	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
3	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
4	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
5	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
18	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
99	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
1	PCB-1254		1.4	0.2	2.00E-06	10000000	1.40E-07	7.00E-02
2	PCB-1254		2	0.2	2.00E-06	10000000	2.00E-07	1.00E-01
3	PCB-1254		0.6	0.2	2.00E-06	10000000	6.00E-08	3.00E-02
4	PCB-1254		1.1	0.2	2.00E-06	10000000	1.10E-07	5.50E-02
5	PCB-1254		1.7	0.2	2.00E-06	10000000	1.70E-07	8.50E-02
18	PCB-1254		0.5	0.2	2.00E-06	10000000	5.00E-08	2.50E-02
99	PCB-1254		1	0.2	2.00E-06	10000000	1.00E-07	5.00E-02
1	PCB-1260		3.4	0.2	2.00E-06	10000000	3.40E-07	1.70E-01
2	PCB-1260		3.6	0.2	2.00E-06	10000000	3.60E-07	1.80E-01
3	PCB-1260		2.8	0.2	2.00E-06	10000000	2.80E-07	1.40E-01
4	PCB-1260		1.2	0.2	2.00E-06	10000000	1.20E-07	6.00E-02
5	PCB-1260		3.4	0.2	2.00E-06	10000000	3.40E-07	1.70E-01
18	PCB-1260	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
99	PCB-1260		0.3	0.2	2.00E-06	10000000	3.00E-08	1.50E-02
1	Pentachlorophenol	<	3.3	13	1.30E-04	780	4.23E-03	3.25E+01
2	Pentachlorophenol	<	0.67	13	1.30E-04	780	8.59E-04	6.61E+00
3	Pentachlorophenol	<	0.67	13	1.30E-04	780	8.59E-04	6.61E+00
1	Phenanthrene	<	3.3	3.7	3.70E-05	325	1.02E-02	2.74E+02
2	Phenanthrene	<	0.67	3.7	3.70E-05	325	2.06E-03	5.57E+01
3	Phenanthrene	<	0.67	3.7	3.70E-05	325	2.06E-03	5.57E+01
1	Phenol	<	3.3	2560	2.56E-02	780	4.23E-03	1.65E-01
2	Phenol	<	0.67	2560	2.56E-02	780	8.59E-04	3.36E-02
3	Phenol	<	0.67	2560	2.56E-02	780	8.59E-04	3.36E-02

Table A-6 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Intermediate criteria (μg/L)	Lower screening criteria ((mg/L))	BAF	Estimated water conc. ((mg/L))	Lower quotient
1	Pyrene	<	3.3		0.00E+00	69	4.78E-02	
2	Pyrene	<	0.67		0.00E+00	69	9.71E-03	
3	Pyrene	<	0.67		0.00E+00	69	9.71E-03	
1	Tetrachloroethylene	<	0.05	840	8.40E-03	44	1.14E-03	1.35E-01
2	Tetrachloroethylene	<	0.05	840	8.40E-03	44	1.14E-03	1.35E-01
3	Tetrachloroethylene	<	0.05	840	8.40E-03	44	1.14E-03	1.35E-01
1	Toluene	<	0.05	230	2.30E-03	83	6.02E-04	2.62E-01
2	Toluene	<	0.05	230	2.30E-03	83	6.02E-04	2.62E-01
3	Toluene	<	0.05	230	2.30E-03	83	6.02E-04	2.62E-01
1	Toxaphene	<	0.5	0.0002	2.00E-09			
2	Toxaphene	<	0.5	0.0002	2.00E-09			
3	Toxaphene	<	0.5	0.0002	2.00E-09			
1	trans-1,2-Dichloroethene	<	0.05	2800	2.80E-02			
2	trans-1,2-Dichloroethene	<	0.05	2800	2.80E-02			
3	trans-1,2-Dichloroethene	<	0.05	2800	2.80E-02			
1	Trichloroethylene	<	0.05	21900	2.19E-01	17	2.94E-03	1.34E-02
2	Trichloroethylene	<	0.05	21900	2.19E-01	17	2.94E-03	1.34E-02
3	Trichloroethylene	<	0.05	21900	2.19E-01	17	2.94E-03	1.34E-02
1	Trichlorofluoromethane	<	0.05	4000	4.00E-02	74	6.76E-04	1.69E-02
2	Trichlorofluoromethane	<	0.05	4000	4.00E-02	74	6.76E-04	1.69E-02
3	Trichlorofluoromethane	<	0.05	4000	4.00E-02	74	6.76E-04	1.69E-02
1	Vinyl chloride	<	0.05		0.00E+00	7	7.14E-03	
2	Vinyl chloride	<	0.05		0.00E+00	7	7.14E-03	
3	Vinyl chloride	<	0.05		0.00E+00	7	7.14E-03	

[a]"<" indicates that the chemical was not detected and the reported concentration is the highest reported limit of detection; and "A" indicates that the value reported is the mean of two or more determinations.

Table A-7. Mean concentrations in fish flesh, water concentrations estimated from bioaccumulation factors (BAF), criteria, and quotients for aquatic biota

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
1	Antimony		1.0	1600	1.60E-02	1	1.10E+00	6.25E+01
2	Antimony		1.0	1600	1.60E-02	1	1.08E+00	6.25E+01
3	Antimony	<	1	1600	1.60E-02	1	1.00E+00	6.25E+01
4	Antimony	<	1	1600	1.60E-02	1	1.00E+00	6.25E+01
14	Antimony	<	1	1600	1.60E-02	1	1.00E+00	6.25E+01
1	Arsenic		0.0843	48	4.80E-04	2.44	3.44E-02	7.20E+01
2	Arsenic		0.226	48	4.80E-04	2.44	9.26E-02	1.93E+02
3	Arsenic		0.22	48	4.80E-04	2.44	9.02E-02	1.88E+02
4	Arsenic		0.1786	48	4.80E-04	2.44	7.32E-02	1.52E+02
5	Arsenic		0.2	48	4.80E-04	2.44	8.20E-02	1.71E+02
14	Arsenic	<	0.1	48	4.80E-04	2.44	4.10E-02	8.54E+01
18	Arsenic		0.117391	48	4.80E-04	2.44	4.81E-02	1.00E+02
99	Arsenic		0.110526	48	4.80E-04	2.44	4.53E-02	9.44E+01
1	Beryllium		0.0292	5.3	5.30E-05	2	1.46E-02	2.75E+02
2	Beryllium		0.025	5.3	5.30E-05	2	1.25E-02	2.36E+02
3	Beryllium		0.025	5.3	5.30E-05	2	1.25E-02	2.36E+02
4	Beryllium	<	0.1	5.3	5.30E-05	2	5.00E-02	9.43E+02
14	Beryllium	<	0.1	5.3	5.30E-05	2	5.00E-02	9.43E+02
1	Cadmium		0.0133	1.1	1.10E-05	50	2.66E-04	2.42E+01
2	Cadmium		0.0072	1.1	1.10E-05	50	1.44E-49	8.69E+00
3	Cadmium		0.0099	1.1	1.10E-05	50	1.98E-04	1.20E+01
4	Cadmium		0.0086	1.1	1.10E-05	50	1.72E-04	1.56E+01
5	Cadmium		0.015	1.1	1.10E-05	50	3.00E-04	2.73E+01
14	Cadmium	<	0.002	1.1	1.10E-05	50	4.00E-05	3.64E+00
18	Cadmium		0.004565	1.1	1.10E-05	50	9.13E-05	8.30E+00
99	Cadmium		0.010895	1.1	1.10E-05	50	2.18E-04	1.98E+01
1	Chromium		0.0654	11	1.10E-04	200	3.27E-04	2.97E+00
2	Chromium		0.09	11	1.10E-04	200	4.50E-04	4.09E+00
3	Chromium		0.162	11	1.10E-04	200	8.10E-04	7.36E+00
4	Chromium		0.113	11	1.10E-04	200	5.65E-04	5.14E+00
5	Chromium		0.23	11	1.10E-04	200	1.15E-03	1.05E+01
14	Chromium		0.1325	11	1.10E-04	200	6.63E-04	6.02E+00
18	Chromium		0.131304	11	1.10E-04	200	6.57E-04	5.97E+00
99	Chromium		0.035263	11	1.10E-04	200	1.76E-04	1.60E+00
1	Copper		0.649	12	1.20E-04	210	3.09E-03	2.58E+01
2	Copper		1.6327	12	1.20E-04	210	7.77E-03	6.48E+01
3	Copper		0.784	12	1.20E-04	210	3.73E-03	3.11E+01
4	Copper		0.48	12	1.20E-04	210	2.27E-03	1.70E+01

Table A-7 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
14	Copper		0.855	12	1.20E-04	210	4.07E-03	3.39E+01
1	Lead		0.228621	3.2	3.20E-05	300	7.62E-04	2.38E+01
2	Lead		0.172	3.2	3.20E-05	300	5.73E-04	1.79E+01
3	Lead		0.0886	3.2	3.20E-05	300	2.95E-04	9.75E+00
4	Lead		0.19	3.2	3.20E-05	300	6.33E-04	9.23E+01
14	Lead		0.09	3.2	3.20E-05	300	3.00E-04	9.38E+00
1	Mercury		0.0897	0.07	7.00E-07	63000	1.40E-06	1.99E+00
2	Mercury		0.0836	0.07	7.00E-07	63000	1.33E-06	1.90E+00
3	Mercury		0.49	0.07	7.00E-07	63000	7.78E-06	1.11E+01
4	Mercury		0.1876	0.07	7.00E-07	63000	2.98E-06	4.25E+00
5	Mercury		0.1343	0.07	7.00E-07	63000	2.13E-06	3.05E+00
14	Mercury		0.75	0.07	7.00E-07	63000	1.19E-05	1.70E+01
18	Mercury		0.154348	0.07	7.00E-07	63000	2.45E-06	3.50E+00
99	Mercury		0.221053	0.07	7.00E-07	63000	3.51E-06	5.01E+00
1	Nickel		1.0	160	1.60E-03	100	1.00E-02	6.25E+00
2	Nickel		1	160	1.60E-03	100	1.00E-02	6.25E+00
3	Nickel		1.5	160	1.60E-03	100	1.50E-02	9.38E+00
4	Nickel		1	160	1.60E-03	100	1.00E-02	6.25E+00
5	Nickel	<	1	160	1.60E-03	100	1.00E-02	6.25E+00
14	Nickel	<	1	160	1.60E-03	100	1.00E-02	6.25E+00
18	Nickel	<	1	160	1.60E-03	100	1.00E-02	6.25E+00
99	Nickel	<	1	160	1.60E-03	100	1.00E-02	6.25E+00
1	Selenium		0.675517	35	3.50E-04	8	8.44E-02	2.41E+02
2	Selenium		0.2609	35	3.50E-04	8	3.26E-02	9.32E+01
3	Selenium		0.278667	35	3.50E-04	8	3.48E-02	9.95E+01
4	Selenium		1.35	35	3.50E-04	8	1.69E-01	4.82E+02
14	Selenium		0.45	35	3.50E-04	8	5.63E-02	1.61E+02
99	Selenium		0.4	35	3.50E-04	8	5.00E-02	1.43E+02
1	Silver		0.2909	0.12	1.20E-06	2	1.45E-01	1.21E+05
2	Silver		0.375	0.12	1.20E-06	2	1.88E-01	1.56E+05
3	Silver		0.4	0.12	1.20E-06	2	2.00E-01	1.67E+05
4	Silver	<	0.2	0.12	1.20E-06	2	1.00E-01	8.33E+04
5	Silver	<	0.2	0.12	1.20E-06	2	1.00E-01	8.33E+04
14	Silver	<	0.2	0.12	1.20E-06	2	1.00E-01	8.33E+04
18	Silver	<	0.2	0.12	1.20E-06	2	1.00E-01	8.33E+04
99	Silver	<	0.2	0.12	1.20E-06	2	1.00E-01	8.33E+04
1	Thallium		2.2	40	4.00E-04	10000	2.20E-04	5.50E-01
2	Thallium	<	1	40	4.00E-04	10000	1.00E-04	2.50E-01
3	Thallium	<	1	40	4.00E-04	10000	1.00E-04	2.50E-01
4	Thallium	<	1	40	4.00E-04	10000	1.00E-04	2.50E-01

Table A-7 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
14	Thallium	<	1	40	4.00E-04	10000	1.00E-04	2.50E-01
1	Zinc		7.296552	110	1.10E-03	1000	7.30E-03	6.63E+00
2	Zinc		7.333333	110	1.10E-03	1000	7.33E-03	6.67E+00
3	Zinc		7.953333	110	1.10E-03	1000	7.95E-03	7.23E+00
4	Zinc		10.375	110	1.10E-03	1000	1.04E-02	9.43E+00
14	Zinc		7.1	110	1.10E-03	1000	7.10E-03	6.45E+00
99	Zinc			110	1.10E-03	1000	0.00E+00	0.00E+00
1	1,1,1-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
2	1,1,1-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
3	1,1,1-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
1	1,1,2,2-Tetrachloroethane	<	0.05	2400	2.40E-02	8	6.25E-03	2.60E-01
2	1,1,2,2-Tetrachloroethane	<	0.05	2400	2.40E-02	8	6.25E-03	2.60E-01
3	1,1,2,2-Tetrachloroethane	<	0.05	2400	2.40E-02	8	6.25E-03	2.60E-01
1	1,1,2-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
2	1,1,2-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
3	1,1,2-Trichloroethane	<	0.05	9400	9.40E-02	9	5.56E-03	5.91E-02
1	1,1-Dichloroethane	<	0.05	20000	2.00E-01	14	3.57E-03	1.79E-02
2	1,1-Dichloroethane	<	0.05	20000	2.00E-01	14	3.57E-03	1.79E-02
3	1,1-Dichloroethane	<	0.05	20000	2.00E-01	14	3.57E-03	1.79E-02
1	1,1-Dichloroethylene	<	0.05	11600	1.16E-01	7	7.14E-03	6.16E-02
2	1,1-Dichloroethylene	<	0.05	11600	1.16E-01	7	7.14E-03	6.16E-02
3	1,1-Dichloroethylene	<	0.05	11600	1.16E-01	7	7.14E-03	6.16E-02
1	1,2,4-Trichlorobenzene	<	1.222	50	5.00E-04	1200	1.02E-03	2.04E+00
2	1,2,4-Trichlorobenzene	<	0.67	50	5.00E-04	1200	5.58E-04	1.12E+00
3	1,2,4-Trichlorobenzene	<	0.67	50	5.00E-04	1200	5.58E-04	1.12E+00
1	1,2,5,6-Dibenzanthracene	<	1.222		0.00E+00			
2	1,2,5,6-Dibenzanthracene	<	0.67		0.00E+00			
3	1,2,5,6-Dibenzanthracene	<	0.67		0.00E+00			
1	1,2-Dichlorobenzene	<	1.222	763	7.63E-03	560	2.18E-03	2.86E-01
2	1,2-Dichlorobenzene	<	0.67	763	7.63E-03	560	1.20E-03	1.57E-01
3	1,2-Dichlorobenzene	<	0.67	763	7.63E-03	560	1.20E-03	1.57E-01
1	1,2-Dichloroethane	<	0.05	20000	2.00E-01	2	2.50E-02	1.25E-01
2	1,2-Dichloroethane	<	0.05	20000	2.00E-01	2	2.50E-02	1.25E-01
3	1,2-Dichloroethane	<	0.05	20000	2.00E-01	2	2.50E-02	1.25E-01
1	1,2-Dichloropropane	<	0.05	5700	5.70E-02	43	1.16E-03	2.04E-02
2	1,2-Dichloropropane	<	0.05	5700	5.70E-02	43	1.16E-03	2.04E-02
3	1,2-Dichloropropane	<	0.05	5700	5.70E-02	43	1.16E-03	2.04E-02
1	1,2-Diphenylhydrazine	<	1.222		0.00E+00			
2	1,2-Diphenylhydrazine	<	0.67		0.00E+00			
3	1,2-Diphenylhydrazine	<	0.67		0.00E+00			

Table A-7 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
1	1,3-Dichlorobenzene	<	1.222	763	7.63E-03	740	1.65E-03	2.16E-01
2	1,3-Dichlorobenzene	<	0.67	763	7.63E-03	740	9.05E-04	1.19E-01
3	1,3-Dichlorobenzene	<	0.67	763	7.63E-03	740	9.05E-04	1.19E-01
1	1,3-Dichloropropene	<	0.05	244	2.44E-03			
2	1,3-Dichloropropene	<	0.05	244	2.44E-03			
3	1,3-Dichloropropene	<	0.05	244	2.44E-03			
1	1,4-Dichlorobenzene	<	1.222	763	7.63E-03	690	1.77E-03	2.32E-01
2	1,4-Dichlorobenzene	<	0.67	763	7.63E-03	690	9.71E-04	1.27E-01
3	1,4-Dichlorobenzene	<	0.67	763	7.63E-03	690	9.71E-04	1.27E-01
1	2,4,6-Trichlorophenol	<	1.222	970	9.70E-03			
2	2,4,6-Trichlorophenol	<	0.67	970	9.70E-03			
3	2,4,6-Trichlorophenol	<	0.67	970	9.70E-03			
1	2,4-Dichlorophenol	<	1.222	365	3.65E-03			
2	2,4-Dichlorophenol	<	0.67	365	3.65E-03			
3	2,4-Dichlorophenol	<	0.67	365	3.65E-03			
1	2,4-Dimethylphenol	<	1.222	2200	2.20E-02	150	8.15E-03	3.70E-01
2	2,4-Dimethylphenol	<	0.67	2200	2.20E-02	150	4.47E-03	2.03E-01
3	2,4-Dimethylphenol	<	0.67	2200	2.20E-02	150	4.47E-03	2.03E-01
1	2,4-Dinitrophenol	<	12.22	150	1.50E-03			
2	2,4-Dinitrophenol	<	6.7	150	1.50E-03			
3	2,4-Dinitrophenol	<	6.7	150	1.50E-03			
1	2,4-Dinitrotoluene	<	1.222	230	2.30E-03	25	4.89E-02	2.13E+01
2	2,4-Dinitrotoluene	<	0.67	230	2.30E-03	25	2.68E-02	1.17E+01
3	2,4-Dinitrotoluene	<	0.67	230	2.30E-03	25	2.68E-02	1.17E+01
1	2,6-Dinitrotoluene	<	1.222	230	2.30E-03	22	5.55E-02	2.42E+01
2	2,6-Dinitrotoluene	<	0.67	230	2.30E-03	22	3.05E-02	1.32E+01
3	2,6-Dinitrotoluene	<	0.67	230	2.30E-03	22	3.05E-02	1.32E+01
1	2-Chloroethyl vinyl ether	<	0.05		0.00E+00			
2	2-Chloroethyl vinyl ether	<	0.05		0.00E+00			
3	2-Chloroethyl vinyl ether	<	0.05		0.00E+00			
1	2-Chloronaphthalene	<	1.222	440	4.40E-03			
2	2-Chloronaphthalene	<	0.67	440	4.40E-03			
3	2-Chloronaphthalene	<	0.67	440	4.40E-03			
1	2-Chlorophenol	<	1.222	2000	2.00E-02			
2	2-Chlorophenol	<	0.67	2000	2.00E-02			
3	2-Chlorophenol	<	0.67	2000	2.00E-02			
1	2-Nitrophenol	<	1.222	150	1.50E-03			
2	2-Nitrophenol	<	0.67	150	1.50E-03			
3	2-Nitrophenol	<	0.67	150	1.50E-03			
1	3,3′-Dichlorobenzidine	<	3.08		0.00E+00			

Table A-7 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
2	3,3'-Dichlorobenzidine	<	1.7		0.00E+00			
3	3,3'-Dichlorobenzidine	<	1.7		0.00E+00			
1	4,6-Dinitro-ortho-cresol	<	6.1	150	1.50E-03			
2	4,6-Dinitro-ortho-cresol	<	3.4	150	1.50E-03			
3	4,6-Dinitro-ortho-cresol	<	3.4	150	1.50E-03			
1	4-Bromophenyl phenyl ether	<	1.222	122	1.22E-03			
2	4-Bromophenyl phenyl ether	<	0.67	122	1.22E-03			
3	4-Bromophenyl phenyl ether	<	0.67	122	1.22E-03			
1	4-Chlorophenyl phenyl ether	<	1.222	122	1.22E-03			
2	4-Chlorophenyl phenyl ether	<	0.67	122	1.22E-03			
3	4-Chlorophenyl phenyl ether	<	0.67	122	1.22E-03			
1	4-Nitrophenol	<	1.222	150	1.50E-03			
2	4-Nitrophenol	<	0.67	150	1.50E-03			
3	4-Nitrophenol	<	0.67	150	1.50E-03			
1	Acenaphthene	<	1.222	520	5.20E-03	390	3.13E-03	6.03E-01
2	Acenaphthene	<	0.67	520	5.20E-03	390	1.72E-03	3.30E-01
3	Acenaphthene	<	0.67	520	5.20E-03	390	1.72E-03	3.30E-01
1	Acenaphthylene	<	1.222		0.00E+00			
2	Acenaphthylene	<	0.67		0.00E+00			
3	Acenaphthylene	<	0.67		0.00E+00			
1	Acrolein	<	0.05	21	2.10E-04	350	1.43E-04	6.80E-01
2	Acrolein	<	0.05	21	2.10E-04	350	1.43E-04	6.80E-01
3	Acrolein	<	0.05	21	2.10E-04	350	1.43E-04	6.80E-01
1	Acrylonitrile	<	0.05	2600	2.60E-02	48	1.04E-03	4.01E-02
2	Acrylonitrile	<	0.05	2600	2.60E-02	48	1.04E-03	4.01E-02
3	Acrylonitrile	<	0.05	2600	2.60E-02	48	1.04E-03	4.01E-02
1	Aldrin	<	0.01		0.00E+00	11000	9.09E-07	
2	Aldrin	<	0.01		0.00E+00	11000	9.09E-07	
3	Aldrin	<	0.01		0.00E+00	11000	9.09E-07	
1	Anthracene	<	1.222		0.00E+00	485	2.52E-03	
2	Anthracene	<	0.67		0.00E+00	485	1.38E-03	
3	Anthracene	<	0.67		0.00E+00	485	1.38E-03	
1	Benzene	<	0.05	727	7.27E-03	32	1.56E-03	2.15E-01
2	Benzene	<	0.05	727	7.27E-03	32	1.56E-03	2.15E-01
3	Benzene	<	0.05	727	7.27E-03	32	1.56E-03	2.15E-01
1	Benzidine	<	6.1	74	7.40E-04	41	1.49E-01	2.01E+02
2	Benzidine	<	3.4	74	7.40E-04	41	8.29E-02	1.12E+02
3	Benzidine	<	3.4	74	7.40E-04	41	8.29E-02	1.12E+02
1	Benzo(a)anthracene	<	1.222		0.00E+00	10109	1.21E-04	
2	Benzo(a)anthracene	<	0.67		0.00E+00	10109	6.63E-05	

Table A-7 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
3	Benzo(a)anthracene	<	0.67		0.00E+00	10109	6.63E-05	
1	Benzo(b)fluoranthene	<	1.222		0.00E+00			
2	Benzo(b)fluoranthene	<	0.67		0.00E+00			
3	Benzo(b)fluoranthene	<	0.67		0.00E+00			
1	Benzo(ghi)perylene	<	1.222		0.00E+00			
2	Benzo(ghi)perylene	<	0.67		0.00E+00			
3	Benzo(ghi)perylene	<	0.67		0.00E+00			
1	Benzo(k)flouranthene	<	1.222		0.00E+00			
2	Benzo(k)flouranthene	<	0.67		0.00E+00			
3	Benzo(k)flouranthene	<	0.67		0.00E+00			
1	Benzo-a-pyrene	<	1.222		0.00E+00	30	4.07E-02	
2	Benzo-a-pyrene	<	0.67		0.00E+00	30	2.23E-02	
3	Benzo-a-pyrene	<	0.67		0.00E+00	30	2.23E-02	
1	Bis(2-chloroethoxy)methane	<	1.222		0.00E+00			
2	Bis(2-chloroethoxy)methane	<	0.67		0.00E+00			
3	Bis(2-chloroethoxy)methane	<	0.67		0.00E+00			
1	Bis(2-chloroethyl)ether	<	1.222	1900	1.90E-02	11	1.11E-01	5.85E+00
2	Bis(2-chloroethyl)ether	<	0.67	1900	1.90E-02	11	6.09E-02	3.21E+00
3	Bis(2-chloroethyl)ether	<	0.67	1900	1.90E-02	11	6.09E-02	3.21E+00
1	Bis(2-chloroisopropyl)ether	<	1.222	1900	1.90E-02			
2	Bis(2-chloroisopropyl)ether	<	0.67	1900	1.90E-02			
3	Bis(2-chloroisopropyl)ether	<	0.67	1900	1.90E-02			
1	Bis(chloromethyl)ether	<	0.05		0.00E+00			
2	Bis(chloromethyl)ether	<	0.05		0.00E+00			
3	Bis(chloromethyl)ether	<	0.05		0.00E+00			
1	Bis(2-ethylhexyl)phthalate	<	1.222	3	3.00E-05	310	3.94E-03	1.31E+02
2	Bis(2-ethylhexyl)phthalate	<	0.67	3	3.00E-05	310	2.16E-03	7.20E+01
3	Bis(2-ethylhexyl)phthalate	<	0.67	3	3.00E-05	310	2.16E-03	7.20E+01
1	Bromoform	<	0.05	4000	4.00E-02			
2	Bromoform	<	0.05	4000	4.00E-02			
3	Bromoform	<	0.05	4000	4.00E-02			
1	Carbon tetrachloride	<	0.05	4000	4.00E-02	23	2.17E-03	5.43E-02
2	Carbon tetrachloride	<	0.05	4000	4.00E-02	23	2.17E-03	5.43E-02
3	Carbon tetrachloride	<	0.05	4000	4.00E-02	23	2.17E-03	5.43E-02
1	Chlordane(tech mix and metabs)		0.16	0.0043	4.30E-08	1400000	1.14E-07	2.66E-02
2	Chlordane(tech mix and metabs)		0.25	0.0043	4.30E-08	1400000	1.79E-07	4.15E-02
3	Chlordane(tech mix and metabs)	<	0.026364	0.0043	4.30E-08	1400000	1.88E-08	4.38E-01
4	Chlordane(tech mix and metabs)		0.0298	0.0043	4.30E-08	1400000	2.13E-07	4.95E-02
1	Chlorobenzene	<	0.05	50	5.00E-04	450	1.11E-04	2.22E-01
2	Chlorobenzene	<	0.05	50	5.00E-04	450	1.11E-04	2.22E-01
3	Chlorobenzene	<	0.05	50	5.00E-04	450	1.11E-04	2.22E-01

Table A-7 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
1	Chlorodibromomethane	<	0.05	4000	4.00E-02	28	1.79E-03	4.46E-02
2	Chlorodibromomethane	<	0.05	4000	4.00E-02	28	1.79E-03	4.46E-02
3	Chlorodibromomethane	<	0.05	4000	4.00E-02	28	1.79E-03	4.46E-02
1	Chloroethane	<	0.05	20000	2.00E-01	6	8.33E-03	4.17E-02
2	Chloroethane	<	0.05	20000	2.00E-01	6	8.33E-03	4.17E-02
3	Chloroethane	<	0.05	20000	2.00E-01	6	8.33E-03	4.17E-02
1	Chloroform	<	0.05	1240	1.24E-02	6	8.33E-03	6.72E-01
2	Chloroform	<	0.044636	1240	1.24E-02	6	7.44E-03	6.00E-01
3	Chloroform	<	0.05	1240	1.24E-02	6	8.33E-03	6.72E-01
1	Chrysene	<	1.222		0.00E+00	300	4.07E-03	
2	Chrysene	<	0.67		0.00E+00	300	2.23E-03	
3	Chrysene	<	0.67		0.00E+00	300	2.23E-03	
1	Dichlorobromomethane	<	0.05	4000	4.00E-02	17	2.94E-03	7.35E-02
2	Dichlorobromomethane	<	0.05	4000	4.00E-02	17	2.94E-03	7.35E-02
3	Dichlorobromomethane	<	0.05	4000	4.00E-02	17	2.94E-03	7.35E-02
1	Dichlorodifluoromethane	<	0.05	4000	4.00E-02	32	1.56E-03	3.91E-02
2	Dichlorodifluoromethane	<	0.05	4000	4.00E-02	32	1.56E-03	3.91E-02
3	Dichlorodifluoromethane	<	0.05	4000	4.00E-02	32	1.56E-03	3.91E-02
1	Dieldrin	<	0.01	0.0019	1.90E-08	14000	7.14E-07	3.76E+01
2	Dieldrin	<	0.01	0.0019	1.90E-08	14000	7.14E-07	3.76E+01
3	Dieldrin	<	0.01	0.0019	1.90E-08	14000	7.14E-07	3.76E+01
1	Diethyl phthalate	<	1.222	3	3.00E-05	120	1.02E-02	3.39E+02
2	Diethyl phthalate	<	0.67	3	3.00E-05	120	5.58E-03	1.86E+02
3	Diethyl phthalate	<	0.67	3	3.00E-05	120	5.58E-03	1.86E+02
1	Dimethyl phthalate	<	1.222	3	3.00E-05			
2	Dimethyl phthalate	<	0.67	3	3.00E-05			
3	Dimethyl phthalate	<	0.67	3	3.00E-05			
1	Di-n-butyl phthalate	<	1.237	3	3.00E-05	89	1.39E-02	4.63E+02
2	Di-n-butyl phthalate	<	0.67	3	3.00E-05	89	7.53E-03	2.51E+02
3	Di-n-butyl phthalate	<	0.67	3	3.00E-05	89	7.53E-03	2.51E+02
1	Di-n-octyl phthalate	<	1.222	3	3.00E-05	9300	1.31E-04	4.38E+00
2	Di-n-octyl phthalate	<	0.67	3	3.00E-05	9300	7.20E-05	2.40E+00
3	Di-n-octyl phthalate	<	0.67	3	3.00E-05	9300	7.20E-05	2.40E+00
1	Endosulfan, alpha	<	0.01	0.056	5.60E-07			
2	Endosulfan, alpha	<	0.01	0.056	5.60E-07			
3	Endosulfan, alpha	<	0.01	0.056	5.60E-07			
1	Endosulfan, beta	<	0.01	0.056	5.60E-07			
2	Endosulfan, beta	<	0.01	0.056	5.60E-07			
3	Endosulfan, beta	<	0.01	0.056	5.60E-07			
1	Endosulfan sulfate	<	0.01		0.00E+00			

Table A-7 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (µg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
2	Endosulfan sulfate	<	0.01		0.00E+00			
3	Endosulfan sulfate	<	0.01		0.00E+00			
1	Endrin	<	0.01	0.0023	2.30E-08	2600	3.85E-06	1.67E+02
2	Endrin	<	0.01	0.0023	2.30E-08	2600	3.85E-06	1.67E+02
3	Endrin	<	0.01	0.0023	2.30E-08	2600	3.85E-06	1.67E+02
1	Endrin aldehyde	<	0.01		0.00E+00			
2	Endrin aldehyde	<	0.01		0.00E+00			
3	Endrin aldehyde	<	0.01		0.00E+00			
1	Ethylbenzene	<	0.05	440	4.40E-03	290	1.72E-04	3.92E-02
2	Ethylbenzene	<	0.05	440	4.40E-03	290	1.72E-04	3.92E-02
3	Ethylbenzene	<	0.05	440	4.40E-03	290	1.72E-04	3.92E-02
1	Fluoranthene	<	1.222	16	1.60E-04	379	3.22E-03	2.01E+01
2	Fluoranthene	<	0.67	16	1.60E-04	379	1.77E-03	1.11E+01
3	Fluoranthene	<	0.67	16	1.60E-04	379	1.77E-03	1.11E+01
1	Fluorene	<	1.222	6	6.00E-05	600	2.04E-03	3.39E+01
2	Fluorene	<	0.67	6	6.00E-05	600	1.12E-03	1.86E+01
3	Fluorene	<	0.67	6	6.00E-05	600	1.12E-03	1.86E+01
1	Heptachlor	<	0.01	0.0038	3.80E-08	14000	7.14E-07	1.88E+01
2	Heptachlor	<	0.01	0.0038	3.80E-08	14000	7.14E-07	1.88E+01
3	Heptachlor	<	0.01	0.0038	3.80E-08	14000	7.14E-07	1.88E+01
1	Heptachlor epoxide	<	0.01		0.00E+00	14000	7.14E-07	
2	Heptachlor epoxide	<	0.01		0.00E+00	14000	7.14E-07	
3	Heptachlor epoxide	<	0.01		0.00E+00	14000	7.14E-07	
1	Hexachlorobenzene	<	1.222	38	3.80E-04			
2	Hexachlorobenzene	<	0.67	38	3.80E-04			
3	Hexachlorobenzene	<	0.67	38	3.80E-04			
1	Hexachlorobutadiene	<	1.222	9.3	9.30E-05			
2	Hexachlorobutadiene	<	0.67	9.3	9.30E-05			
3	Hexachlorobutadiene	<	0.67	9.3	9.30E-05			
1	Hexachlorocyclohexane, alpha	<	0.01		0.00E+00	710	1.41E-05	
2	Hexachlorocyclohexane, alpha	<	0.01		0.00E+00	710	1.41E-05	
3	Hexachlorocyclohexane, alpha	<	0.01		0.00E+00	710	1.41E-05	
1	Hexachlorocyclohexane, beta	<	0.01		0.00E+00	720	1.39E-05	
2	Hexachlorocyclohexane, beta	<	0.01		0.00E+00	720	1.39E-05	
3	Hexachlorocyclohexane, beta	<	0.01		0.00E+00	720	1.39E-05	
1	Hexachlorocyclohexane, delta	<	0.01		0.00E+00			
2	Hexachlorocyclohexane, delta	<	0.01		0.00E+00			
3	Hexachlorocyclohexane, delta	<	0.01		0.00E+00			
1	Hexachlorocyclohexane, gamma	<	0.01	0.06	6.00E-07	1000	1.00E-05	1.67E+01
2	Hexachlorocyclohexane, gamma	<	0.01	0.06	6.00E-07	1000	1.00E-05	1.67E+01

Table A-7 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
3	Hexachlorocyclohexane, gamma	<	0.01	0.06	6.00E-07	1000	1.00E-05	1.67E+01
1	Hexachlorocyclopentadiene	<	1.222	5.2	5.20E-05	30	4.07E-02	7.83E+02
2	Hexachlorocyclopentadiene	<	0.67	5.2	5.20E-05	30	2.23E-02	4.29E+02
3	Hexachlorocyclopentadiene	<	0.67	5.2	5.20E-05	30	2.23E-02	4.29E+02
1	Hexachloroethane	<	1.222	540	5.40E-03	140	8.73E-03	1.62E+00
2	Hexachloroethane	<	0.67	540	5.40E-03	140	4.79E-03	8.86E-01
3	Hexachloroethane	<	0.67	540	5.40E-03	140	4.79E-03	8.86E-01
1	Indeno (1,2,3-cd) pyrene	<	1.222		0.00E+00			
2	Indeno (1,2,3-cd) pyrene	<	0.67		0.00E+00			
3	Indeno (1,2,3-cd) pyrene	<	0.67		0.00E+00			
1	Isophorone	<	1.222	14000	1.40E-01	7	1.75E-01	1.25E+00
2	Isophorone	<	0.67	14000	1.40E-01	7	9.57E-02	6.84E-01
3	Isophorone	<	0.67	14000	1.40E-01	7	9.57E-02	6.84E-01
1	Methyl bromide	<	0.05	4000	4.00E-02			
2	Methyl bromide	<	0.05	4000	4.00E-02			
3	Methyl bromide	<	0.05	4000	4.00E-02			
1	Methyl chloride	<	0.05	4000	4.00E-02			
2	Methyl chloride	<	0.05	4000	4.00E-02			
3	Methyl chloride	<	0.05	4000	4.00E-02			
1	Methylene chloride	<	0.25	4000	4.00E-02	4	6.25E-02	1.56E+00
2	Methylene chloride	<	0.25	4000	4.00E-02	4	6.25E-02	1.56E+00
3	Methylene chloride	<	0.25	4000	4.00E-02	4	6.25E-02	1.56E+00
1	Naphthalene	<	1.222	620	6.20E-03	430	2.84E-03	4.58E-01
2	Naphthalene	<	0.67	620	6.20E-03	430	1.56E-03	2.51E-01
3	Naphthalene	<	0.67	620	6.20E-03	430	1.56E-03	2.51E-01
1	Nitrobenzene	<	1.222	32000	3.20E-01			
2	Nitrobenzene	<	0.67	32000	3.20E-01			
3	Nitrobenzene	<	0.67	32000	3.20E-01			
1	N-butyl benzyl phthalate	<	1.222	3	3.00E-05	660	1.85E-03	6.17E+01
2	N-butyl benzyl phthalate	<	0.67	3	3.00E-05	660	1.02E-03	3.38E+01
3	N-butyl benzyl phthalate	<	0.67	3	3.00E-05	660	1.02E-03	3.38E+01
1	N-nitrosodimethylamine	<	1.222	58	5.80E-04	0.08	1.53E+01	2.63E+04
2	N-nitrosodimethylamine	<	0.67	58	5.80E-04	0.08	8.38E+00	1.44E+04
3	N-nitrosodimethylamine	<	0.67	58	5.80E-04	0.08	8.38E+00	1.44E+04
1	N-nitrosodiphenylaminee	<	1.222	58	5.80E-04	91	1.34E-02	2.32E+01
2	N-nitrosodiphenylamine	<	0.67	58	5.80E-04	91	7.36E-03	1.27E+01
3	N-nitrosodiphenylamine	<	0.67	58	5.80E-04	91	7.36E-03	1.27E+01
1	N-nitrosodi-n-propylamine	<	1.222	58	5.80E-04			
2	N-nitrosodi-n-propylamine	<	0.67	58	5.80E-04			
3	N-nitrosodi-n-propylamine	<	0.67	58	5.80E-04			

Table A-7 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
1	Oxychlordane	<	0.01		0.00E+00			
1	p,p'-DDD		0.1	0.001	1.00E-08	170000	1.38E-07	1.38E+01
2	p,p'-DDD	<	0.01	0.001	1.00E-08	170000	5.88E-08	5.88E+00
3	p,p'-DDD	<	0.01	0.001	1.00E-08	170000	5.88E-08	5.88E+00
1	p,p'-DDE	<	0.01	0.001	1.00E-08	18000000	5.56E-10	5.56E-02
2	p,p'-DDE	<	0.01	0.001	1.00E-08	18000000	5.56E-10	5.56E-02
3	p,p'-DDE	<	0.01	0.001	1.00E-08	18000000	5.56E-10	5.56E-02
1	p,p'-DDT		0.017143	0.001	1.00E-08	34000	5.04E-07	5.04E+01
2	p,p'-DDT		0.09	0.001	1.00E-08	34000	2.65E-06	5.08E+02
3	p,p'-DDT	<	0.01	0.001	1.00E-08	34000	2.94E-07	2.94E+01
1	Parachlorometa cresol	<	1.222	2000	2.00E-02			
2	Parachlorometa cresol	<	0.67	2000	2.00E-02			
3	Parachlorometa cresol	<	0.67	2000	2.00E-02			
1	PCBs, total		0.447	0.2	2.00E-06	10000000	4.47E-08	2.24E-02
2	PCBs, total		1.15	0.2	2.00E-06	10000000	1.15E-07	5.75E-02
3	PCBs, total		1.03	0.2	2.00E-06	10000000	1.03E-07	5.15E-02
4	PCBs, total		1.053667	0.2	2.00E-06	10000000	1.05E-07	5.27E-02
5	PCBs, total		1.569433	0.2	2.00E-06	10000000	1.57E-07	7.85E-02
18	PCBs, total		0.26	0.2	2.00E-06	10000000	2.60E-08	1.30E-02
99	PCBs, total		1.013929	0.2	2.00E-06	10000000	1.01E-07	5.07E-02
1	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
2	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
3	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
4	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
5	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
18	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
99	PCB-1016	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
1	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
2	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
3	PCB-1221	<	0.059091	0.2	2.00E-06	10000000	5.91E-09	2.95E-03
4	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
5	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
18	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
99	PCB-1221	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
1	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
2	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
3	PCB-1232	<	0.059091	0.2	2.00E-06	10000000	5.91E-09	2.95E-03
4	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
5	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
18	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03

Table A-7 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
99	PCB-1232	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
1	PCB-1242	<	0.090357	0.2	2.00E-06	10000000	9.04E-09	4.52E-03
2	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
3	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
4	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
5	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
18	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
99	PCB-1242	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
1	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
2	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
3	PCB-1248	<	0.059091	0.2	2.00E-06	10000000	5.91E-09	2.95E-03
4	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
5	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
18	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
99	PCB-1248	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
1	PCB-1254		0.1383	0.2	2.00E-06	10000000	1.38E-08	6.90E-03
2	PCB-1254		0.3781	0.2	2.00E-06	10000000	3.78E-08	1.89E-02
3	PCB-1254		0.42	0.2	2.00E-06	10000000	4.20E-08	2.10E-02
4	PCB-1254		0.364	0.2	2.00E-06	10000000	3.64E-08	1.82E-02
5	PCB-1254		0.627	0.2	2.00E-06	10000000	6.27E-08	3.14E-02
18	PCB-1254		0.26	0.2	2.00E-06	10000000	2.60E-08	1.30E-02
99	PCB-1254		0.431071	0.2	2.00E-06	10000000	4.31E-08	2.16E-02
1	PCB-1260		0.2561	0.2	2.00E-06	10000000	2.56E-08	1.28E-02
2	PCB-1260		0.6382	0.2	2.00E-06	10000000	6.38E-08	3.16E-02
3	PCB-1260		1.425	0.2	2.00E-06	10000000	1.92E-07	7.10E-01
4	PCB-1260		0.3571	0.2	2.00E-06	10000000	3.57E-08	1.79E-02
5	PCB-1260		0.8788	0.2	2.00E-06	10000000	8.79E-08	4.40E-02
18	PCB-1260	<	0.1	0.2	2.00E-06	10000000	1.00E-08	5.00E-03
99	PCB-1260		0.682857	0.2	2.00E-06	10000000	6.83E-08	3.41E-02
1	Pentachlorophenol	<	1.222	13	1.30E-04	780	1.57E-03	1.21E+01
2	Pentachlorophenol	<	0.67	13	1.30E-04	780	8.59E-04	6.61E+00
3	Pentachlorophenol	<	0.67	13	1.30E-04	780	8.59E-04	6.61E+00
1	Phenanthrene	<	1.222	3.7	3.70E-05	325	3.76E-03	1.02E+02
2	Phenanthrene	<	0.67	3.7	3.70E-05	325	2.06E-03	5.57E+01
3	Phenanthrene	<	0.67	3.7	3.70E-05	325	2.06E-03	5.57E+01
1	Phenol	<	1.222	2560	2.56E-02	780	1.57E-03	6.12E-02
2	Phenol	<	0.67	2560	2.56E-02	780	8.59E-04	3.36E-02
3	Phenol	<	0.67	2560	2.56E-02	780	8.59E-04	3.36E-02
1	Pyrene	<	1.222		0.00E+00	69	1.77E-02	
2	Pyrene	<	0.67		0.00E+00	69	9.71E-03	

Table A-7 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Chronic NWQC equivalent (μg/L)	Lower screening criteria (mg/L)	BAF	Estimated water conc. (mg/L)	Lower quotient
3	Pyrene	<	0.67		0.00E+00	69	9.71E-03	
1	Tetrachloroethylene	<	0.05	840	8.40E-03	44	1.14E-03	1.35E-01
2	Tetrachloroethylene	<	0.05	840	8.40E-03	44	1.14E-03	1.35E-01
3	Tetrachloroethylene	<	0.05	840	8.40E-03	44	1.14E-03	1.35E-01
1	Toluene	<	0.05	230	2.30E-03	83	6.02E-04	2.62E-01
2	Toluene	<	0.05	230	2.30E-03	83	6.02E-04	2.62E-01
3	Toluene	<	0.05	230	2.30E-03	83	6.02E-04	2.62E-01
1	Toxaphene	<	0.5	0.0002	2.00E-09			
2	Toxaphene	<	0.5	0.0002	2.00E-09			
3	Toxaphene	<	0.5	0.0002	2.00E-09			
1	trans-1,2-Dichloroethene	<	0.05	2800	2.80E-02			
2	trans-1,2-Dichloroethene	<	0.05	2800	2.80E-02			
3	trans-1,2-Dichloroethene	<	0.05	2800	2.80E-02			
1	Trichloroethylene	<	0.05	21900	2.19E-01	17	2.94E-03	1.34E-02
2	Trichloroethylene	<	0.05	21900	2.19E-01	17	2.94E-03	1.34E-02
3	Trichloroethylene	<	0.05	21900	2.19E-01	17	2.94E-03	1.34E-02
1	Trichlorofluoromethane	<	0.05	4000	4.00E-02	74	6.76E-04	1.69E-02
2	Trichlorofluoromethane	<	0.05	4000	4.00E-02	74	6.76E-04	1.69E-02
3	Trichlorofluoromethane	<	0.05	4000	4.00E-02	74	6.76E-04	1.69E-02
1	Vinyl chloride	<	0.05		0.00E+00	7	7.14E-03	
2	Vinyl chloride	<	0.05		0.00E+00	7	7.14E-03	
3	Vinyl chloride	<	0.05		0.00E+00	7	7.14E-03	

[a]"<" indicates that the chemical was not detected and the reported concentration is the highest reported limit of detection; and "A" indicates that the value reported is the mean of two or more determinations.

Table A-8. Maximum concentrations in fish flesh by reach, criteria, and quotients for piscivorous wildlife

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
1	Antimony	<	1	0.3	3.33E+00
2	Antimony	<	1	0.3	3.33E+00
3	Antimony	<	1	0.3	3.33E+00
4	Antimony	<	1	0.3	3.33E+00
14	Antimony	<	1	0.3	3.33E+00
1	Arsenic		0.42	3	1.40E-01
2	Arsenic		0.4	3	1.33E-01
3	Arsenic		0.6	3	2.00E-01
4	Arsenic		0.4	3	1.33E-01
5	Arsenic		0.2	3	6.67E-02
14	Arsenic	<	0.1	3	3.33E-02
18	Arsenic		0.3	3	1.00E-01
99	Arsenic		0.2	3	6.67E-02
1	Beryllium		0.06	25	2.40E-03
2	Beryllium		0.04	25	1.60E-03
3	Beryllium		0.04	25	1.60E-03
4	Beryllium	<	0.1	25	4.00E-03
14	Beryllium	<	0.1	25	4.00E-03
1	Cadmium		0.14	0.25	5.60E-01
2	Cadmium		0.04	0.25	1.60E-01
3	Cadmium		0.02	0.25	8.00E-02
4	Cadmium		0.02	0.25	8.00E-02
5	Cadmium		0.05	0.25	2.00E-01
14	Cadmium	<	0.002	0.25	8.00E-03
18	Cadmium		0.01	0.25	4.00E-02
99	Cadmium		0.054	0.25	2.16E-01

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
1	Chromium		0.36	1	3.60E-01
2	Chromium		0.36	1	3.60E-01
3	Chromium		0.59	1	5.90E-01
4	Chromium		0.82	1	8.20E-01
5	Chromium		0.98	1	9.80E-01
14	Chromium		0.29	1	2.90E-01
18	Chromium		0.9	1	9.00E-01
99	Chromium		0.12	1	1.20E-01
1	Copper		1.8	50	3.60E-02
2	Copper		10	50	2.00E-01
3	Copper		4.1	50	8.20E-02
4	Copper		0.56	50	1.12E-02
14	Copper		2	50	4.00E-02
99	Copper		0.48	50	9.60E-03
1	Lead		1.6	15	1.07E-01
2	Lead		0.5	15	3.33E-02
3	Lead		0.36	15	2.40E-02
4	Lead		0.45	15	3.00E-02
14	Lead		0.15	15	1.00E-02
99	Lead		0.21	15	1.40E-02
1	Mercury		0.44	0.01	4.40E+01
2	Mercury		0.56	0.01	5.60E+01
3	Mercury		1.7	0.01	1.70E+02
4	Mercury		1.2	0.01	1.20E+02
5	Mercury		0.18	0.01	1.80E+01
14	Mercury		0.93	0.01	9.30E+01
18	Mercury		0.45	0.01	4.50E+01
99	Mercury		0.57	0.01	5.70E+01

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
1	Nickel		1	50	4.00E-02
2	Nickel	<	1	50	2.00E-02
3	Nickel		2	50	4.00E-02
4	Nickel	<	1	50	2.00E-02
5	Nickel	<	1	50	2.00E-02
14	Nickel	<	1	50	2.00E-02
18	Nickel	<	1	50	2.00E-02
99	Nickel	<	1	50	2.00E-02
1	Selenium		1.8	0.5	3.60E+00
2	Selenium		0.41	0.5	8.20E-01
3	Selenium		0.5	0.5	1.00E+00
4	Selenium		2.6	0.5	5.20E+00
14	Selenium		0.6	0.5	1.20E+00
99	Selenium		0.4	0.5	8.00E-01
1	Silver		0.7	10	7.00E-02
2	Silver		0.5	10	5.00E-02
3	Silver		0.6	10	6.00E-02
4	Silver	<	0.2	10	2.00E-02
5	Silver	<	0.2	10	2.00E-02
14	Silver	<	0.2	10	2.00E-02
18	Silver	<	0.2	10	2.00E-02
99	Silver	<	0.2	10	2.00E-02
1	Thallium		3.8	0.5	7.60E+00
2	Thallium	<	1	0.5	2.00E+00
3	Thallium	<	1	0.5	2.00E+00
4	Thallium	<	1	0.5	2.00E+00
14	Thallium	<	1	0.5	2.00E+00
1	Zinc		11	60	1.83E-01

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
2	Zinc		11	60	1.83E-01
3	Zinc		16	60	2.67E-01
4	Zinc		17	60	2.83E-01
14	Zinc		8.2	60	1.37E-01
99	Zinc		6.2	60	1.03E-01
1	1,1,1-Trichloroethane	<	0.05		
2	1,1,1-Trichloroethane	<	0.05		
3	1,1,1-Trichloroethane	<	0.05		
1	1,1,2,2-Tetrachloroethane	<	0.05		
2	1,1,2,2-Tetrachloroethane	<	0.05		
3	1,1,2,2-Tetrachloroethane	<	0.05		
1	1,1,2-Trichloroethane	<	0.05		
2	1,1,2-Trichloroethane	<	0.05		
3	1,1,2-Trichloroethane	<	0.05		
1	1,1-Dichloroethane	<	0.05		
2	1,1-Dichloroethane	<	0.05		
3	1,1-Dichloroethane	<	0.05		
1	1,1-Dichloroethylene	<	0.05		
2	1,1-Dichloroethylene	<	0.05		
3	1,1-Dichloroethylene	<	0.05		
1	1,2,4-Trichlorobenzene	<	3.3	0.3	1.10E+01
2	1,2,4-Trichlorobenzene	<	0.67	0.3	2.23E+00
3	1,2,4-Trichlorobenzene	<	0.67	0.3	2.23E+00
1	1,2,5,6-Dibenzanthracene	<	3.3	3	1.10E+00
2	1,2,5,6-Dibenzanthracene	<	0.67	3	2.23E-01
3	1,2,5,6-Dibenzanthracene	<	0.67	3	2.23E-01
1	1,2-Dichlorobenzene	<	3.3	0.3	1.10E+01
2	1,2-Dichlorobenzene	<	0.67	0.3	2.23E+00

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
3	1,2-Dichlorobenzene	<	0.67	0.3	2.23E+00
1	1,2-Dichloroethane	<	0.05		
2	1,2-Dichloroethane	<	0.05		
3	1,2-Dichloroethane	<	0.05		
1	1,2-Dichloropropane	<	0.05		
2	1,2-Dichloropropane	<	0.05		
3	1,2-Dichloropropane	<	0.05		
1	1,2-Diphenylhydrazine	<	3.3		
2	1,2-Diphenylhydrazine	<	0.67		
3	1,2-Diphenylhydrazine	<	0.67		
1	1,3-Dichlorobenzene	<	3.3	0.3	1.10E+01
2	1,3-Dichlorobenzene	<	0.67	0.3	2.23E+00
3	1,3-Dichlorobenzene	<	0.67	0.3	2.23E+00
1	1,3-Dichloropropene	<	0.05		
2	1,3-Dichloropropene	<	0.05		
3	1,3-Dichloropropene	<	0.05		
1	1,4-Dichlorobenzene	<	3.3	0.3	1.10E+01
2	1,4-Dichlorobenzene	<	0.67	0.3	2.23E+00
3	1,4-Dichlorobenzene	<	0.67	0.3	2.23E+00
1	2,4,6-Trichlorophenol	<	3.3	100	3.30E-02
2	2,4,6-Trichlorophenol	<	0.67	100	6.70E-03
3	2,4,6-Trichlorophenol	<	0.67	100	6.70E-03
1	2,4-Dichlorophenol	<	3.3	100	3.30E-02
2	2,4-Dichlorophenol	<	0.67	100	6.70E-03
3	2,4-Dichlorophenol	<	0.67	100	6.70E-03
1	2,4-Dimethylphenol	<	3.3	90	3.67E-02
2	2,4-Dimethylphenol	<	0.67	90	7.44E-03
3	2,4-Dimethylphenol	<	0.67	90	7.44E-03

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
1	2,4-Dinitrophenol	<	33	30	1.10E+00
2	2,4-Dinitrophenol	<	6.7	30	2.23E-01
3	2,4-Dinitrophenol	<	6.7	30	2.23E-01
1	2,4-Dinitrotoluene	<	3.3	0.05	6.60E+01
2	2,4-Dinitrotoluene	<	0.67	0.05	1.34E+01
3	2,4-Dinitrotoluene	<	0.67	0.05	1.34E+01
1	2,6-Dinitrotoluene	<	3.3	0.05	6.60E+01
2	2,6-Dinitrotoluene	<	0.67	0.05	1.34E+01
3	2,6-Dinitrotoluene	<	0.67	0.05	1.34E+01
1	2-Chloroethyl vinyl ether	<	0.05		
2	2-Chloroethyl vinyl ether	<	0.05		
3	2-Chloroethyl vinyl ether	<	0.05		
1	2-Chloronaphthalene	<	3.3	0.3	1.10E+01
2	2-Chloronaphthalene	<	0.67	0.3	2.23E+00
3	2-Chloronaphthalene	<	0.67	0.3	2.23E+00
1	2-Chlorophenol	<	3.3	100	3.30E-02
2	2-Chlorophenol	<	0.67	100	6.70E-03
3	2-Chlorophenol	<	0.67	100	6.70E-03
1	2-Nitrophenol	<	3.3	240	1.38E-02
2	2-Nitrophenol	<	0.67	240	2.79E-03
3	2-Nitrophenol	<	0.67	240	2.79E-03
1	3,3'-Dichlorobenzidine	<	8.2	0.3	2.73E+01
2	3,3'-Dichlorobenzidine	<	1.7	0.3	5.67E+00
3	3,3'-Dichlorobenzidine	<	1.7	0.3	5.67E+00
1	4,6-Dinitro-ortho-cresol	<	16	4	4.00E+00
2	4,6-Dinitro-ortho-cresol	<	3.4	4	8.50E-01
3	4,6-Dinitro-ortho-cresol	<	3.4	4	8.50E-01
1	4-Bromophenyl phenyl ether	<	3.3		

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
2	4-Bromophenyl phenyl ether	<	0.67		
3	4-Bromophenyl phenyl ether	<	0.67		
1	4-Chlorophenyl phenyl ether	<	3.3	0.3	1.10E+01
2	4-Chlorophenyl phenyl ether	<	0.67	0.3	2.23E+00
3	4-Chlorophenyl phenyl ether	<	0.67	0.3	2.23E+00
1	4-Nitrophenol	<	3.3	240	1.38E-02
2	4-Nitrophenol	<	0.67	240	2.79E-03
3	4-Nitrophenol	<	0.67	240	2.79E-03
1	Acenaphthene	<	3.3	3	1.10E+00
2	Acenaphthene	<	0.67	3	2.23E-01
3	Acenaphthene	<	0.67	3	2.23E-01
1	Acenaphthylene	<	3.3	3	1.10E+00
2	Acenaphthylene	<	0.67	3	2.23E-01
3	Acenaphthylene	<	0.67	3	2.23E-01
1	Acrolein	<	0.05		
2	Acrolein	<	0.05		
3	Acrolein	<	0.05		
1	Acrylonitrile	<	0.05		
2	Acrylonitrile	<	0.05		
3	Acrylonitrile	<	0.05		
1	Aldrin	<	0.01		
2	Aldrin	<	0.01		
3	Aldrin	<	0.01		
1	Anthracene	<	3.3	3	1.10E+00
2	Anthracene	<	0.67	3	2.23E-01
3	Anthracene	<	0.67	3	2.23E-01
1	Benzene	<	0.05		
2	Benzene	<	0.05		

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
3	Benzenee	<	0.05		
1	Benzidine	<	16	30	5.33E-01
2	Benzidine	<	3.4	30	1.13E-01
3	Benzidine	<	3.4	30	1.13E-01
1	Benzo(a)anthracene	<	3.3	3	1.10E+00
2	Benzo(a)anthracene	<	0.67	3	2.23E-01
3	Benzo(a)anthracene	<	0.67	3	2.23E-01
1	Benzo(b)fluoranthene	<	3.3	3	1.10E+00
2	Benzo(b)fluoranthene	<	0.67	3	2.23E-01
3	Benzo(b)fluoranthene	<	0.67	3	2.23E-01
1	Benzo(ghi)perylene	<	3.3	3	1.10E+00
2	Benzo(ghi)perylene	<	0.67	3	2.23E-01
3	Benzo(ghi)perylene	<	0.67	3	2.23E-01
1	Benzo(k)flouranthene	<	3.3	3	1.10E+00
2	Benzo(k)flouranthene	<	0.67	3	2.23E-01
3	Benzo(k)flouranthene	<	0.67	3	2.23E-01
1	Benzo-a-pyrene	<	3.3	3	1.10E+00
2	Benzo-a-pyrene	<	0.67	3	2.23E-01
3	Benzo-a-pyrene	<	0.67	3	2.23E-01
1	Bis(2-chloroethoxy)methane	<	3.3	0.3	1.10E+01
2	Bis(2-chloroethoxy)methane	<	0.67	0.3	2.23E+00
3	Bis(2-chloroethoxy)methane	<	0.67	0.3	2.23E+00
1	Bis(2-chloroethyl)ether	<	3.3	0.3	1.10E+01
2	Bis(2-chloroethyl)ether	<	0.67	0.3	2.23E+00
3	Bis(2-chloroethyl)ether	<	0.67	0.3	2.23E+00
1	Bis(2-chloroisopropyl)ether	<	3.3	0.3	1.10E+01
2	Bis(2-chloroisopropyl)ether	<	0.67	0.3	2.23E+00
3	Bis(2-chloroisopropyl)ether	<	0.67	0.3	2.23E+00

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
1	Bis(chloromethyl)ether	<	0.05	0.3	1.67E-01
2	Bis(chloromethyl)ether	<	0.05	0.3	1.67E-01
3	Bis(chloromethyl)ether	<	0.05	0.3	1.67E-01
1	Bis(2-ethylhexyl)phthalate	<	3.3	70	4.71E-02
2	Bis(2-ethylhexyl)phthalate	<	0.67	70	9.57E-03
3	Bis(2-ethylhexyl)phthalate	<	0.67	70	9.57E-03
1	Bromoform	<	0.05		
2	Bromoform	<	0.05		
3	Bromoform	<	0.05		
1	Carbon tetrachloride	<	0.05		
2	Carbon tetrachloride	<	0.05		
3	Carbon tetrachloride	<	0.05		
1	Chlordane(tech mix and metabs)		0.6		
2	Chlordane(tech mix and metabs)		0.25		
3	Chlordane(tech mix and metabs)	<	0.1		
4	Chlordane(tech mix and metabs)		0.298		
1	Chlorobenzene	<	0.05		
2	Chlorobenzene	<	0.05		
3	Chlorobenzene	<	0.05		
1	Chlorodibromomethane	<	0.05		
2	Chlorodibromomethane	<	0.05		
3	Chlorodibromomethane	<	0.05		
1	Chloroethane	<	0.05		
2	Chloroethane	<	0.05		
3	Chloroethane	<	0.05		
1	Chloroform	<	0.05		
2	Chloroform	<	0.05		
3	Chloroform	<	0.05		
1	Chrysene	<	3.3	3	1.10E+00

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
2	Chrysene	<	0.67	3	2.23E-01
3	Chrysene	<	0.67	3	2.23E-01
1	Dichlorobromomethane	<	0.05		
2	Dichlorobromomethane	<	0.05		
3	Dichlorobromomethane	<	0.05		
1	Dichlorodifluoromethane	<	0.05		
2	Dichlorodifluoromethane	<	0.05		
3	Dichlorodifluoromethane	<	0.05		
1	Dieldrin	<	0.01		
2	Dieldrin	<	0.01		
3	Dieldrin	<	0.01		
1	Diethyl phthalate	<	3.3	2000	1.65E-03
2	Diethyl phthalate	<	0.67	2000	3.35E-04
3	Diethyl phthalate	<	0.67	2000	3.35E-04
1	Dimethyl phthalate	<	3.3	1000	3.30E-03
2	Dimethyl phthalate	<	0.67	1000	6.70E-04
3	Dimethyl phthalate	<	0.67	1000	6.70E-04
1	Di-n-butyl phthalae	<	3.3	80	4.13E-02
2	Di-n-butyl phthalate	<	0.67	80	8.38E-03
3	Di-n-butyl phthalate	<	0.67	80	8.38E-03
1	Di-n-octyl phthalate	<	3.3	70	4.71E-02
2	Di-n-octyl phthalate	<	0.67	70	9.57E-03
3	Di-n-octyl phthalate	<	0.67	70	9.57E-03
1	Endosulfan, alpha	<	0.01		
2	Endosulfan, alpha	<	0.01		
3	Endosulfan, alpha	<	0.01		
1	Endosulfan, beta	<	0.01		
2	Endosulfan, beta	<	0.01		

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
3	Endosulfan, beta	<	0.01		
1	Endosulfan sulfate	<	0.01		
2	Endosulfan sulfate	<	0.01		
3	Endosulfan sulfate	<	0.01		
1	Endrin	<	0.01		
2	Endrin	<	0.01		
3	Endrin	<	0.01		
1	Endrin aldehyde	<	0.01		
2	Endrin aldehyde	<	0.01		
3	Endrin aldehyde	<	0.01		
1	Ethylbenzene	<	0.05		
2	Ethylbenzene	<	0.05		
3	Ethylbenzene	<	0.05		
1	Fluoranthene	<	3.3	3	1.10E+00
2	Fluoranthene	<	0.67	3	2.23E-01
3	Fluoranthene	<	0.67	3	2.23E-01
1	Fluorene	<	3.3	3	1.10E+00
2	Fluorene	<	0.67	3	2.23E-01
3	Fluorene	<	0.67	3	2.23E-01
1	Heptachlor	<	0.01		
2	Heptachlor	<	0.01		
3	Heptachlor	<	0.01		
1	Heptachlor epoxide	<	0.01		
2	Heptachlor epoxide	<	0.01		
3	Heptachlor epoxide	<	0.01		
1	Hexachlorobenzene	<	3.3	0.3	1.10E+01
2	Hexachlorobenzene	<	0.67	0.3	2.23E+00
3	Hexachlorobenzene	<	0.67	0.3	2.23E+00

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
1	Hexachlorobutadiene	<	3.3	0.3	1.10E+01
2	Hexachlorobutadiene	<	0.67	0.3	2.23E+00
3	Hexachlorobutadiene	<	0.67	0.3	2.23E+00
1	Hexachlorocyclohexane, alpha	<	0.01		
2	Hexachlorocyclohexane, alpha	<	0.01		
3	Hexachlorocyclohexane, alpha	<	0.01		
1	Hexachlorocyclohexane, beta	<	0.01		
2	Hexachlorocyclohexane, beta	<	0.01		
3	Hexachlorocyclohexane, beta	<	0.01		
1	Hexachlorocyclohexane, delta	<	0.01		
2	Hexachlorocyclohexane, delta	<	0.01		
3	Hexachlorocyclohexane, delta	<	0.01		
1	Hexachlorocyclohexane, gamma	<	0.01		
2	Hexachlorocyclohexane, gamma	<	0.01		
3	Hexachlorocyclohexane, gamma	<	0.01		
1	Hexachlorocyclopentadiene	<	3.3	0.3	1.10E+01
2	Hexachlorocyclopentadiene	<	0.67	0.3	2.23E+00
3	Hexachlorocyclopentadiene	<	0.67	0.3	2.23E+00
1	Hexachloroethane	<	3.3	0.3	1.10E+01
2	Hexachloroethane	<	0.67	0.3	2.23E+00
3	Hexachloroethane	<	0.67	0.3	2.23E+00
1	Indeno (1,2,3-cd) pyrene	<	3.3	3	1.10E+00
2	Indeno (1,2,3-cd) pyrene	<	0.67	3	2.23E-01
3	Indeno (1,2,3-cd) pyrene	<	0.67	3	2.23E-01
1	Isophorone	<	3.3	100	3.30E-02
2	Isophorone	<	0.67	100	6.70E-03
3	Isophorone	<	0.67	100	6.70E-03
1	Methyl bromide	<	0.05		

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
2	Methyl bromide	<	0.05		
3	Methyl bromide	<	0.05		
1	Methyl chloride	<	0.05		
2	Methyl chloride	<	0.05		
3	Methyl chloride	<	0.05		
1	Methylene chloride	<	0.25		
2	Methylene chloride	<	0.25		
3	Methylene chloride	<	0.25		
1	Naphthalene	<	3.3	3	1.10E+00
2	Naphthalene	<	0.67	3	2.23E-01
3	Naphthalene	<	0.67	3	2.23E-01
1	Nitrobenzene	<	3.3	2	1.65E+00
2	Nitrobenzene	<	0.67	2	3.35E-01
3	Nitrobenzene	<	0.67	2	3.35E-01
1	N-butyl benzyl phthalate	<	3.3	70	4.71E-02
2	N-butyl benzyl phthalate	<	0.67	70	9.57E-03
3	N-butyl benzyl phthalate	<	0.67	70	9.57E-03
1	N-nitrosodimethylamine	<	3.3		
2	N-nitrosodimethylamine	<	0.67		
3	N-nitrosodimethylamine	<	0.67		
1	N-nitrosodiphenylamine	<	3.3		
2	N-nitrosodiphenylamine	<	0.67		
3	N-nitrosodiphenylamine	<	0.67		
1	N-nitrosodi-n-propylamine	<	3.3		
2	N-nitrosodi-n-propylamine	<	0.67		
3	N-nitrosodi-n-propylamine	<	0.67		
1	Oxychlordane	<	0.01		
1	p,p'-DDD		0.1	0.01	1.00E+01

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
2	p,p'-DDD	<	0.01	0.01	1.00E+00
3	p,p'-DDD	<	0.01	0.01	1.00E+00
1	p,p'-DDE	<	0.01	0.01	1.00E+00
2	p,p'-DDE	<	0.01	0.01	1.00E+00
3	p,p'-DDE	<	0.01	0.01	1.00E+00
1	p,p'-DDT		0.16	0.01	1.60E+01
2	p,p'-DDT		0.09	0.01	9.00E+00
3	p,p'-DDT	<	0.01	0.01	1.00E+00
1	Parachlorometa cresol	<	3.3	100	3.30E-02
2	Parachlorometa cresol	<	0.67	100	6.70E-03
3	Parachlorometa cresol	<	0.67	100	6.70E-03
1	PCBs, total		4.7	0.04	1.18E+02
2	PCBs, total		5.6	0.04	1.40E+02
3	PCBs, total		3.4	0.04	8.50E+01
4	PCBs, total		4.6	0.04	1.15E+02
5	PCBs, total		7.5	0.04	1.88E+02
18	PCBs, total		7.4	0.04	1.85E+02
99	PCBs, total		1	0.04	2.50E+01
1	PCB-1016	<	0.1	0.04	2.50E+00
2	PCB-1016	<	0.1	0.04	2.50E+00
3	PCB-1016	<	0.1	0.04	2.50E+00
4	PCB-1016	<	0.1	0.04	2.50E+00
5	PCB-1016	<	0.1	0.04	2.50E+00
18	PCB-1016	<	0.1	0.04	2.50E+00
99	PCB-1016	<	0.1	0.04	2.50E+00
1	PCB-1221	<	0.1	0.04	2.50E+00
2	PCB-1221	<	0.1	0.04	2.50E+00
3	PCB-1221	<	0.1	0.04	2.50E+00

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
4	PCB-1221	<	0.1	0.04	2.50E+00
5	PCB-1221	<	0.1	0.04	2.50E+00
18	PCB-1221	<	0.1	0.04	2.50E+00
99	PCB-1221	<	0.1	0.04	2.50E+00
1	PCB-1232	<	0.1	0.04	2.50E+00
2	PCB-1232	<	0.1	0.04	2.50E+00
3	PCB-1232	<	0.1	0.04	2.50E+00
4	PCB-1232	<	0.1	0.04	2.50E+00
5	PCB-1232	<	0.1	0.04	2.50E+00
18	PCB-1232	<	0.1	0.04	2.50E+00
99	PCB-1232	<	0.1	0.04	2.50E+00
1	PCB-1242	<	0.1	0.04	2.50E+00
2	PCB-1242	<	0.1	0.04	2.50E+00
3	PCB-1242	<	0.1	0.04	2.50E+00
4	PCB-1242	<	0.1	0.04	2.50E+00
5	PCB-1242	<	0.1	0.04	2.50E+00
18	PCB-1242	<	0.1	0.04	2.50E+00
99	PCB-1242	<	0.1	0.04	2.50E+00
1	PCB-1248	<	0.1	0.04	2.50E+00
2	PCB-1248	<	0.1	0.04	2.50E+00
3	PCB-1248	<	0.1	0.04	2.50E+00
4	PCB-1248	<	0.1	0.04	2.50E+00
5	PCB-1248	<	0.1	0.04	2.50E+00
18	PCB-1248	<	0.1	0.04	2.50E+00
99	PCB-1248	<	0.1	0.04	2.50E+00
1	PCB-1254		1.4	0.04	3.50E+01
2	PCB-1254		2	0.04	5.00E+01
3	PCB-1254		0.6	0.04	1.50E+01

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
4	PCB-1254		1.1	0.04	2.75E+01
5	PCB-1254		1.7	0.04	4.25E+01
18	PCB-1254		0.5	0.04	1.25E+01
99	PCB-1254		1	0.04	2.50E+01
1	PCB-1260		3.4	0.04	8.50E+01
2	PCB-1260		3.6	0.04	9.00E+01
3	PCB-1260		2.8	0.04	7.00E+01
4	PCB-1260		1.2	0.04	3.00E+01
5	PCB-1260		3.4	0.04	8.50E+01
18	PCB-1260	<	0.1	0.04	2.50E+00
99	PCB-1260		0.3	0.04	7.50E+00
1	Pentachlorophenol	<	3.3	1	3.30E+00
2	Pentachlorophenol	<	0.67	1	6.70E-01
3	Pentachlorophenol	<	0.67	1	6.70E-01
1	Phenanthrene	<	3.3	3	1.10E+00
2	Phenanthrene	<	0.67	3	2.23E-01
3	Phenanthrene	<	0.67	3	2.23E-01
1	Phenol	<	3.3	90	3.67E-02
2	Phenol	<	0.67	90	7.44E-03
3	Phenol	<	0.67	90	7.44E-03
1	Pyrene	<	3.3	3	1.10E+00
2	Pyrene	<	0.67	3	2.23E-01
3	Pyrene	<	0.67	3	2.23E-01
1	Tetrachloroethylene	<	0.05		
2	Tetrachloroethylene	<	0.05		
3	Tetrachloroethylene	<	0.05		
1	Toluene	<	0.05		
2	Toluene	<	0.05		

Table A-8 (continued)

Reach	Compound	Remarks[a]	Maximum conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
3	Toluene	<	0.05		
1	Toxaphene	<	0.5		
2	Toxaphene	<	0.5		
3	Toxaphene	<	0.5		
1	trans-1,2-Dichloroethene	<	0.05		
2	trans-1,2-Dichloroethene	<	0.05		
3	trans-1,2-Dichloroethene	<	0.05		
1	Trichloroethylene	<	0.05		
2	Trichloroethylene	<	0.05		
3	Trichloroethylene	<	0.05		
1	Trichlorofluoromethane	<	0.05		
2	Trichlorofluoromethane	<	0.05		
3	Trichlorofluoromethane	<	0.05		
1	Vinyl chloride	<	0.05		
2	Vinyl chloride	<	0.05		
3	Vinyl chloride	<	0.05		

[a]"<" indicates that the chemical was not detected and the reported concentration is the highest reported limit of detection; and "A" indicates that the value reported is the mean of two or more determinations.

Table A-9. Mean concentrations in fish flesh by reach, criteria, and quotients for piscivorous wildlife

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
1	Antimony		1.0	0.3	3.33E+00
2	Antimony		1.0	0.3	3.33E+00
3	Antimony	<	1	0.3	3.33E+00
4	Antimony	<	1	0.3	3.33E+00
14	Antimony	<	1	0.3	3.33E+00
1	Arsenic		0.0843	3	2.81E-02
2	Arsenic		0.226	3	7.53E-02
3	Arsenic		0.22	3	7.33E-02
4	Arsenic		0.1786	3	5.95E-02
5	Arsenic		0.2	3	6.67E-02
14	Arsenic	<	0.1	3	3.33E-02
18	Arsenic		0.117391	3	3.91E-02
99	Arsenic		0.110526	3	3.68E-02
1	Beryllium		0.0292	25	1.17E-03
2	Beryllium		0.025	25	1.00E-03
3	Beryllium		0.025	25	1.00E-03
4	Beryllium	<	0.1	25	4.00E-03
14	Beryllium	<	0.1	25	4.00E-03
1	Cadmium		0.0133	0.25	5.32E-02
2	Cadmium		0.0072	0.25	2.88E-02
3	Cadmium		0.0099	0.25	3.96E-02
4	Cadmium		0.0086	0.25	3.20E-02
5	Cadmium		0.015	0.25	6.00E-03
14	Cadmium	<	0.002	0.25	8.00E-03
18	Cadmium		0.004565	0.25	1.83E-02
99	Cadmium		0.010895	0.25	4.36E-02
1	Chromium		0.0654	1	6.54E-02

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
2	Chromium		0.09	1	9.00E-02
3	Chromium		0.162	1	1.62E-01
4	Chromium		0.113	1	1.13E-01
5	Chromium		0.023	1	2.30E-01
14	Chromium		0.1325	1	1.33E-01
18	Chromium		0.131304	1	1.31E-01
99	Chromium		0.035263	1	3.53E-02
1	Copper		0.649	50	1.30E-02
2	Copper		1.6327	50	3.26E-02
3	Copper		0.784	50	1.57E-02
4	Copper		0.48	50	9.60E-03
14	Copper		0.855	50	1.71E-02
99	Copper			50	0.00E+00
1	Lead		0.228621	15	1.52E-02
2	Lead		0.172	15	1.15E-02
3	Lead		0.08886	15	5.91E-03
4	Lead		0.19	15	1.27E-02
14	Lead		0.09	15	6.00E-03
1	Mercury		0.0879	0.01	8.79E+00
2	Mercury		0.0836	0.01	8.36E+00
3	Mercury		0.49	0.01	4.90E+01
4	Mercury		0.1876	0.01	1.88E+01
5	Mercury		0.1343	0.01	1.34E+01
14	Mercury		0.75	0.01	7.50E+01
18	Mercury		0.154348	0.01	1.54E+01
99	Mercury		0.221053	0.01	2.21E+01
1	Nickel		1.0	50	2.00E-02

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
2	Nickel		1	50	2.00E-02
3	Nickel		1.5	50	3.00E-02
4	Nickel		1	50	2.00E-02
5	Nickel	<	1	50	2.00E-02
14	Nickel	<	1	50	2.00E-02
18	Nickel	<	1	50	2.00E-02
99	Nickel	<	1	50	2.00E-02
1	Selenium		0.675517	0.5	1.35E+00
2	Selenium		0.2609	0.5	5.22E-01
3	Selenium		0.278667	0.5	5.57E-01
4	Selenium		1.35	0.5	2.70E+00
14	Selenium		0.45	0.5	9.00E-01
99	Selenium		0.4	0.5	8.00E-01
1	Silver		0.2909	10	2.91E-02
2	Silver		0.375	10	3.75E-02
3	Silver		0.4	10	4.00E-02
4	Silver	<	0.2	10	2.00E-02
5	Silver	<	0.2	10	2.00E-02
14	Silver	<	0.2	10	2.00E-02
18	Silver	<	0.2	10	2.00E-02
99	Silver	<	0.2	10	2.00E-02
1	Thallium		2.2	0.5	4.40E+00
2	Thallium	<	1	0.5	2.00E+00
3	Thallium	<	1	0.5	2.00E+00
4	Thallium	<	1	0.5	2.00E+00
14	Thallium	<	1	0.5	2.00E+00
1	Zinc		7.296552	60	1.22E-01
2	Zinc		7.333333	60	1.22E-01

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
3	Zinc		7.953333	60	1.33E-01
4	Zinc		10.375	60	1.73E-01
14	Zinc		7.1	60	1.18E-01
99	Zinc			60	0.00E+00
1	1,1,1-Trichloroethane	<	0.05		
2	1,1,1-Trichloroethane	<	0.05		
3	1,1,1-Trichloroethane	<	0.05		
1	1,1,2,2-Tetrachloroethane	<	0.05		
2	1,1,2,2-Tetrachloroethane	<	0.05		
3	1,1,2,2-Tetrachloroethane	<	0.05		
1	1,1,2-Trichloroethane	<	0.05		
2	1,1,2-Trichloroethane	<	0.05		
3	1,1,2-Trichloroethane	<	0.05		
1	1,1-Dichloroethane	<	0.05		
2	1,1-Dichloroethane	<	0.05		
3	1,1-Dichloroethane	<	0.05		
1	1,1-Dichloroethylene	<	0.05		
2	1,1-Dichloroethylene	<	0.05		
3	1,1-Dichloroethylene	<	0.05		
1	1,2,4-Trichlorobenzene	<	1.222	0.3	4.07E+00
2	1,2,4-Trichlorobenzene	<	0.67	0.3	2.23E+00
3	1,2,4-Trichlorobenzene	<	0.67	0.3	2.23E+00
1	1,2,5,6-Dibenzanthracene	<	1.222	3	4.07E-01
2	1,2,5,6-Dibenzanthracene	<	0.67	3	2.23E-01
3	1,2,5,6-Dibenzanthracene	<	0.67	3	2.23E-01
1	1,2-Dichlorobenzene	<	1.222	0.3	4.07E+00
2	1,2-Dichlorobenzene	<	0.67	0.3	2.23E+00
3	1,2-Dichlorobenzene	<	0.67	0.3	2.23E+00

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
1	1,2-Dichloroethane	<	0.05		
2	1,2-Dichloroethane	<	0.05		
3	1,2-Dichloroethane	<	0.05		
1	1,2-Dichloropropane	<	0.05		
2	1,2-Dichloropropane	<	0.05		
3	1,2-Dichloropropane	<	0.05		
1	1,2-Diphenylhydrazine	<	1.222		
2	1,2-Diphenylhydrazine	<	0.67		
3	1,2-Diphenylhydrazine	<	0.67		
1	1,3-Dichlorobenzene	<	1.222	0.3	4.07E+00
2	1,3-Dichlorobenzene	<	0.67	0.3	2.23E+00
3	1,3-Dichlorobenzene	<	0.67	0.3	2.23E+00
1	1,3-Dichloropropene	<	0.05		
2	1,3-Dichloropropene	<	0.05		
3	1,3-Dichloropropene	<	0.05		
1	1,4-Dichlorobenzene	<	1.222	0.3	4.07E+00
2	1,4-Dichlorobenzene	<	0.67	0.3	2.23E+00
3	1,4-Dichlorobenzene	<	0.67	0.3	2.23E+00
1	2,4,6-Trichlorophenol	<	1.222	100	1.22E-02
2	2,4,6-Trichlorophenol	<	0.67	100	6.70E-03
3	2,4,6-Trichlorophenol	<	0.67	100	6.70E-03
1	2,4-Dichlorophenol	<	1.222	100	1.22E-02
2	2,4-Dichlorophenol	<	0.67	100	6.70E-03
3	2,4-Dichlorophenol	<	0.67	100	6.70E-03
1	2,4-Dimethylphenol	<	1.222	90	1.36E-02
2	2,4-Dimethylphenol	<	0.67	90	7.44E-03
3	2,4-Dimethylphenol	<	0.67	90	7.44E-03
1	2,4-Dinitrophenol	<	12.22	30	4.07E-01

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
2	2,4-Dinitrophenol	<	6.7	30	2.23E-01
3	2,4-Dinitrophenol	<	6.7	30	2.23E-01
1	2,4-Dinitrotoluene	<	1.222	0.05	2.44E+01
2	2,4-Dinitrotoluene	<	0.67	0.05	1.34E+01
3	2,4-Dinitrotoluene	<	0.67	0.05	1.34E+01
1	2,6-Dinitrotoluene	<	1.222	0.05	2.44E+01
2	2,6-Dinitrotoluene	<	0.67	0.05	1.34E+01
3	2,6-Dinitrotoluene	<	0.67	0.05	1.34E+01
1	2-Chloroethyl vinyl ether	<	0.05		
2	2-Chloroethyl vinyl ether	<	0.05		
3	2-Chloroethyl vinyl ether	<	0.05		
1	2-Chloronaphthalene	<	1.222	0.3	4.07E+00
2	2-Chloronaphthalene	<	0.67	0.3	2.23E+00
3	2-Chloronaphthalene	<	0.67	0.3	2.23E+00
1	2-Chlorophenol	<	1.222	100	1.22E-02
2	2-Chlorophenol	<	0.67	100	6.70E-03
3	2-Chlorophenol	<	0.67	100	6.70E-03
1	2-Nitrophenol	<	1.222	240	5.09E-03
2	2-Nitrophenol	<	0.67	240	2.79E-03
3	2-Nitrophenol	<	0.67	240	2.79E-03
1	3,3'-Dichlorobenzidine	<	3.08	0.3	1.03E+01
2	3,3'-Dichlorobenzidine	<	1.7	0.3	5.67E+00
3	3,3'-Dichlorobenzidine	<	1.7	0.3	5.67E+00
1	4,6-Dinitro-ortho-cresol	<	6.1	4	1.53E+00
2	4,6-Dinitro-ortho-cresol	<	3.4	4	8.50E-01
3	4,6-Dinitro-ortho-cresol	<	3.4	4	8.50E-01
1	4-Bromophenyl phenyl ether	<	1.222		
2	4-Bromophenyl phenyl ether	<	0.67		

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
3	4-Bromophenyl phenyl ether	<	0.67		
1	4-Chlorophenyl phenyl ether	<	1.222	0.3	4.07E+00
2	4-Chlorophenyl phenyl ether	<	0.67	0.3	2.23E+00
3	4-Chlorophenyl phenyl ether	<	0.67	0.3	2.23E+00
1	4-Nitrophenol	<	1.222	240	5.09E-03
2	4-Nitrophenol	<	0.67	240	2.79E-03
3	4-Nitrophenol	<	0.67	240	2.79E-03
1	Acenaphthene	<	1.222	3	4.07E-01
2	Acenaphthene	<	0.67	3	2.23E-01
3	Acenaphthene	<	0.67	3	2.23E-01
1	Acenaphthylene	<	1.222	3	4.07E-01
2	Acenaphthylene	<	0.67	3	2.23E-01
3	Acenaphthylene	<	0.67	3	2.23E-01
1	Acrolein	<	0.05		
2	Acrolein	<	0.05		
3	Acrolein	<	0.05		
1	Acrylonitrile	<	0.05		
2	Acrylonitrile	<	0.05		
3	Acrylonitrile	<	0.05		
1	Aldrin	<	0.01		
2	Aldrin	<	0.01		
3	Aldrin	<	0.01		
1	Hexachlorocyclohexane, alpha	<	0.01		
2	Hexachlorocyclohexane, alpha	<	0.01		
3	Hexachlorocyclohexane, alpha	<	0.01		
1	Anthracene	<	1.222	3	4.07E-01
2	Anthracene	<	0.67	3	2.23E-01
3	Anthracene	<	0.67	3	2.23E-01

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
1	Benzene	<	0.05		
2	Benzene	<	0.05		
3	Benzene	<	0.05		
1	Benzidine	<	6.1	30	2.03E-01
2	Benzidine	<	3.4	30	1.13E-01
3	Benzidine	<	3.4	30	1.13E-01
1	Benzo(a)anthracene	<	1.222	3	4.07E-01
2	Benzo(a)anthracene	<	0.67	3	2.23E-01
3	Benzo(a)anthracene	<	0.67	3	2.23E-01
1	Benzo(b)fluoranthene	<	1.222	3	4.07E-01
2	Benzo(b)fluoranthene	<	0.67	3	2.23E-01
3	Benzo(b)fluoranthene	<	0.67	3	2.23E-01
1	Benzo(ghi)perylene	<	1.222	3	4.07E-01
2	Benzo(ghi)perylene	<	0.67	3	2.23E-01
3	Benzo(ghi)perylene	<	0.67	3	2.23E-01
1	Benzo(k)flouranthene	<	1.222	3	4.07E-01
2	Benzo(k)flouranthene	<	0.67	3	2.23E-01
3	Benzo(k)flouranthene	<	0.67	3	2.23E-01
1	Benzo-a-pyrene	<	1.222	3	4.07E-01
2	Benzo-a-pyrene	<	0.67	3	2.23E-01
3	Benzo-a-pyrene	<	0.67	3	2.23E-01
1	Hexachlorocyclohexane, beta	<	0.01		
2	Hexachlorocyclohexane, beta	<	0.01		
3	Hexachlorocyclohexane, beta	<	0.01		
1	Bis(2-chloroethoxy)methane	<	1.222	0.3	4.07E+00
2	Bis(2-chloroethoxy)methane	<	0.67	0.3	2.23E+00
3	Bis(2-chloroethoxy)methane	<	0.67	0.3	2.23E+00
1	Bis(2-chloroethyl)ether	<	1.222	0.3	4.07E+00

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
2	Bis(2-chloroethyl)ether	<	0.67	0.3	2.23E+00
3	Bis(2-chloroethyl)ether	<	0.67	0.3	2.23E+00
1	Bis(2-chloroisopropyl)ether	<	1.222	0.3	4.07E+00
2	Bis(2-chloroisopropyl)ether	<	0.67	0.3	2.23E+00
3	Bis(2-chloroisopropyl)ether	<	0.67	0.3	2.23E+00
1	Bis(chloromethyl)ether	<	0.05		
2	Bis(chloromethyl)ether	<	0.05		
3	Bis(chloromethyl)ether	<	0.05		
1	Bis(2-ethylhexyl)phthalate	<	1.222	70	1.75E-02
2	Bis(2-ethylhexyl)phthalate	<	0.67	70	9.57E-03
3	Bis(2-ethylhexyl)phthalate	<	0.67	70	9.57E-03
1	Bromoforme	<	0.05		
2	Bromoform	<	0.05		
3	Bromoform	<	0.05		
1	Carbon tetrachloride	<	0.05		
2	Carbon tetrachloride	<	0.05		
3	Carbon tetrachloride	<	0.05		
1	Chlordane(tech mix and metabs)		0.016		
2	Chlordane(tech mix and metabs)		0.25		
3	Chlordane(tech mix and metabs)	<	0.026364		
4	Chlordane(tech mix and metabs)		0.298		
1	Chlorobenzene	<	0.05		
2	Chlorobenzene	<	0.05		
3	Chlorobenzene	<	0.05		
1	Chlorodibromomethane	<	0.05		
2	Chlorodibromomethane	<	0.05		
3	Chlorodibromomethane	<	0.05		
1	Chloroethane	<	0.05		
2	Chloroethane	<	0.05		

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
3	Chloroethane	<	0.05		
1	Chloroform	<	0.05		
2	Chloroform	<	0.044636		
3	Chloroform	<	0.05		
1	Chrysene	<	1.222	3	4.07E-01
2	Chrysene	<	0.67	3	2.23E-01
3	Chrysene	<	0.67	3	2.23E-01
1	Hexachlorocyclohexane, delta	<	0.01		
2	Hexachlorocyclohexane, delta	<	0.01		
3	Hexachlorocyclohexane, delta	<	0.01		
1	Dichlorobromomethane	<	0.05		
2	Dichlorobromomethane	<	0.05		
3	Dichlorobromomethanee	<	0.05		
1	Dichlorodifluorometha	<	0.05		
2	Dichlorodifluoromethane	<	0.05		
3	Dichlorodifluoromethane	<	0.05		
1	Dieldrin	<	0.01		
2	Dieldrin	<	0.01		
3	Dieldrin	<	0.01		
1	Diethyl phthalate	<	1.222	2000	6.11E-04
2	Diethyl phthalate	<	0.67	2000	3.35E-04
3	Diethyl phthalate	<	0.67	2000	3.35E-04
1	Dimethyl phthalate	<	1.222	1000	1.22E-03
2	Dimethyl phthalate	<	0.67	1000	6.70E-04
3	Dimethyl phthalate	<	0.67	1000	6.70E-04
1	Di-n-butyl phthalate	<	1.237	80	1.55E-02
2	Di-n-butyl phthalate	<	0.67	80	8.38E-03
3	Di-n-butyl phthalate	<	0.67	80	8.38E-03

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
1	Di-n-octyl phthalate	<	1.222	70	1.75E-02
2	Di-n-octyl phthalate	<	0.67	70	9.57E-03
3	Di-n-octyl phthalate	<	0.67	70	9.57E-03
1	Endosulfan, alpha	<	0.01		
2	Endosulfan, alpha	<	0.01		
3	Endosulfan, alpha	<	0.01		
1	Endosulfan, beta	<	0.01		
2	Endosulfan, beta	<	0.01		
3	Endosulfan, beta	<	0.01		
1	Endosulfan sulfate	<	0.01		
2	Endosulfan sulfate	<	0.01		
3	Endosulfan sulfate	<	0.01		
1	Endrin	<	0.01		
2	Endrin	<	0.01		
3	Endrin	<	0.01		
1	Endrin aldehyde	<	0.01		
2	Endrin aldehyde	<	0.01		
3	Endrin aldehyde	<	0.01		
1	Ethylbenzene	<	0.05		
2	Ethylbenzene	<	0.05		
3	Ethylbenzene	<	0.05		
1	Fluoranthene	<	1.222	3	4.07E-01
2	Fluoranthene	<	0.67	3	2.23E-01
3	Fluoranthene	<	0.67	3	2.23E-01
1	Fluorene	<	1.222	3	4.07E-01
2	Fluorene	<	0.67	3	2.23E-01
3	Fluorene	<	0.67	3	2.23E-01
1	Hexachlorocyclohexane, gamma	<	0.01		

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
2	Hexachlorocyclohexane, gamma	<	0.01		
3	Hexachlorocyclohexane, gamma	<	0.01		
1	Heptachlor	<	0.01		
2	Heptachlor	<	0.01		
3	Heptachlor	<	0.01		
1	Heptachlor epoxide	<	0.01		
2	Heptachlor epoxide	<	0.01		
3	Heptachlor epoxide	<	0.01		
1	Hexachlorobenzene	<	1.222	0.3	4.07E+00
2	Hexachlorobenzene	<	0.67	0.3	2.23E+00
3	Hexachlorobenzene	<	0.67	0.3	2.23E+00
1	Hexachlorobutadiene	<	1.222	0.3	4.07E+00
2	Hexachlorobutadiene	<	0.67	0.3	2.23E+00
3	Hexachlorobutadiene	<	0.67	0.3	2.23E+00
1	Hexachlorocyclopentadiene	<	1.222	0.3	4.07E+00
2	Hexachlorocyclopentadiene	<	0.67	0.3	2.23E+00
3	Hexachlorocyclopentadiene	<	0.67	0.3	2.23E+00
1	Hexachloroethane	<	1.222	0.3	4.07E+00
2	Hexachloroethane	<	0.67	0.3	2.23E+00
3	Hexachloroethane	<	0.67	0.3	2.23E+00
1	Indeno (1,2,3-cd) pyrene	<	1.222	3	4.07E-01
2	Indeno (1,2,3-cd) pyrene	<	0.67	3	2.23E-01
3	Indeno (1,2,3-cd) pyrene	<	0.67	3	2.23E-01
1	Isophorone	<	1.222	100	1.22E-02
2	Isophorone	<	0.67	100	6.70E-03
3	Isophorone	<	0.67	100	6.70E-03
1	Methyl bromide	<	0.05		
2	Methyl bromide	<	0.05		

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
3	Methyl bromide	<	0.05		
1	Methyl chloride	<	0.05		
2	Methyl chloride	<	0.05		
3	Methyl chloride	<	0.05		
1	Methylene chloride	<	0.25		
2	Methylene chloride	<	0.25		
3	Methylene chloride	<	0.25		
1	Naphthalene	<	1.222	3	4.07E-01
2	Naphthalene	<	0.67	3	2.23E-01
3	Naphthalene	<	0.67	3	2.23E-01
1	Nitrobenzene	<	1.222	2	6.11E-01
2	Nitrobenzene	<	0.67	2	3.35E-01
3	Nitrobenzene	<	0.67	2	3.35E-01
1	N-butyl benzyl phthalate	<	1.222	70	1.75E-02
2	N-butyl benzyl phthalate	<	0.67	70	9.57E-03
3	N-butyl benzyl phthalate	<	0.67	70	9.57E-03
1	N-nitrosodimethylamine	<	1.222		
2	N-nitrosodimethylamine	<	0.67		
3	N-nitrosodimethylamine	<	0.67		
1	N-nitrosodiphenylamine	<	1.222		
2	N-nitrosodiphenylamine	<	0.67		
3	N-nitrosodiphenylamine	<	0.67		
1	N-nitrosodi-n-propylamine	<	1.222		
2	N-nitrosodi-n-propylamine	<	0.67		
3	N-nitrosodi-n-propylamine	<	0.67		
1	Oxychlordane	<	0.01		
1	p,p'-DDD		0.1	0.01	1.00E+01
2	p,p'-DDD	<	0.01	0.01	1.00E+00

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
3	p,p'-DDD	<	0.01	0.01	1.00E+00
1	p,p'-DDE	<	0.01	0.01	1.00E+00
2	p,p'-DDE	<	0.01	0.01	1.00E+00
3	p,p'-DDE	<	0.01	0.01	1.00E+00
1	p,p'-DDT		0.017143	0.01	1.71E+00
2	p,p'-DDT		0.09	0.01	9.00E+00
3	p,p'-DDT	<	0.01	0.01	1.00E+00
1	Parachlorometa cresol	<	1.222	100	1.22E-02
2	Parachlorometa cresol	<	0.67	100	6.70E-03
3	Parachlorometa cresol	<	0.67	100	6.70E-03
1	PCBs, total		0.447	0.04	1.12E+01
2	PCBs, total		1.15	0.04	2.88E+01
3	PCBs, total		1.03	0.04	2.58E+01
4	PCBs, total		1.053667	0.04	2.63E+01
5	PCBs, total		1.569433	0.04	3.92E+01
18	PCBs, total		0.26	0.04	6.50E+00
99	PCBs, total		1.013929	0.04	2.53E+01
1	PCB-1016	<	0.1	0.04	2.50E+00
2	PCB-1016	<	0.1	0.04	2.50E+00
3	PCB-1016	<	0.1	0.04	2.50E+00
4	PCB-1016	<	0.1	0.04	2.50E+00
5	PCB-1016	<	0.1	0.04	2.50E+00
18	PCB-1016	<	0.1	0.04	2.50E+00
99	PCB-1016	<	0.1	0.04	2.50E+00
1	PCB-1221	<	0.1	0.04	2.50E+00
2	PCB-1221	<	0.1	0.04	2.50E+00
3	PCB-1221	<	0.059091	0.04	1.48E+00
4	PCB-1221	<	0.1	0.04	2.50E+00

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
5	PCB-1221	<	0.1	0.04	2.50E+00
18	PCB-1221	<	0.1	0.04	2.50E+00
99	PCB-1221	<	0.1	0.04	2.50E+00
1	PCB-1232	<	0.1	0.04	2.50E+00
2	PCB-1232	<	0.1	0.04	2.50E+00
3	PCB-1232	<	0.059091	0.04	1.48E+00
4	PCB-1232	<	0.1	0.04	2.50E+00
5	PCB-1232	<	0.1	0.04	2.50E+00
18	PCB-1232	<	0.1	0.04	2.50E+00
99	PCB-1232	<	0.1	0.04	2.50E+00
1	PCB-1242	<	0.090357	0.04	2.26E+00
2	PCB-1242	<	0.1	0.04	2.50E+00
3	PCB-1242	<	0.1	0.04	2.50E+00
4	PCB-1242	<	0.1	0.04	2.50E+00
5	PCB-1242	<	0.1	0.04	2.50E+00
18	PCB-1242	<	0.1	0.04	2.50E+00
99	PCB-1242	<	0.1	0.04	2.50E+00
1	PCB-1248	<	0.1	0.04	2.50E+00
2	PCB-1248	<	0.1	0.04	2.50E+00
3	PCB-1248	<	0.059091	0.04	1.48E+00
4	PCB-1248	<	0.1	0.04	2.50E+00
5	PCB-1248	<	0.1	0.04	2.50E+00
18	PCB-1248	<	0.1	0.04	2.50E+00
99	PCB-1248	<	0.1	0.04	2.50E+00
1	PCB-1254		0.1383	0.04	3.45E+00
2	PCB-1254		0.3781	0.04	9.45E+00
3	PCB-1254		0.42	0.04	1.05E+01
4	PCB-1254		0.364	0.04	9.10E+00

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
5	PCB-1254		0.627	0.04	1.57E+01
18	PCB-1254		0.26	0.04	6.50E+00
99	PCB-1254		0.431071	0.04	1.08E+01
1	PCB-1260		0.2561	0.04	6.40E+00
2	PCB-1260		0.6382	0.04	1.60E+01
3	PCB-1260		1.425	0.04	3.56E+01
4	PCB-1260		0.3571	0.04	8.73E+00
5	PCB-1260		0.8788	0.04	2.19E+01
18	PCB-1260	<	0.1	0.04	2.50E+00
99	PCB-1260		0.682857	0.04	1.71E+01
1	Pentachlorophenol	<	1.222	1	1.22E+00
2	Pentachlorophenol	<	0.67	1	6.70E-01
3	Pentachlorophenol	<	0.67	1	6.70E-01
1	Phenanthrene	<	1.222	3	4.07E-01
2	Phenanthrene	<	0.67	3	2.23E-01
3	Phenanthrene	<	0.67	3	2.23E-01
1	Phenol	<	1.222	90	1.36E-02
2	Phenol	<	0.67	90	7.44E-03
3	Phenol	<	0.67	90	7.44E-03
1	Pyrene	<	1.222	3	4.07E-01
2	Pyrene	<	0.67	3	2.23E-01
3	Pyrene	<	0.67	3	2.23E-01
1	Tetrachloroethylene	<	0.05		
2	Tetrachloroethylene	<	0.05		
3	Tetrachloroethylene	<	0.05		
1	Toluene	<	0.05		
2	Toluene	<	0.05		
3	Toluene	<	0.05		

Table A-9 (continued)

Reach	Compound	Remarks[a]	Mean conc. (mg/kg)	Lower piscivore criteria (mg/kg)	Lower quotient
1	Toxaphene	<	0.5		
2	Toxaphene	<	0.5		
3	Toxaphene	<	0.5		
1	trans-1,2-Dichloroethene	<	0.05		
2	trans-1,2-Dichloroethene	<	0.05		
3	trans-1,2-Dichloroethene	<	0.05		
1	Trichloroethylene	<	0.05		
2	Trichloroethylene	<	0.05		
3	Trichloroethylene	<	0.05		
1	Trichlorofluoromethane	<	0.05		
2	Trichlorofluoromethane	<	0.05		
3	Trichlorofluoromethane	<	0.05		
1	Vinyl chloride	<	0.05		
2	Vinyl chloride	<	0.05		
3	Vinyl chloride	<	0.05		

[a]"<" indicates that the chemical was not detected and the reported concentration is the highest reported limit of detection; and "A" indicates that the value reported is the mean of two or more determinations.

1. S. M. Adams
2. L. W. Barnthouse
3. S. M. Bartell
4. L. D. Bates
5. B. G. Blaylock
6. K. L. Brady
7. G. E. Butterworth
8. T. R. Butz
9. J. S. Colley
10. K. W. Cook
11. R. B. Cook
12. C. C. Coutant
13. E. L. Etnier
14. C. J. Ford
15. M. L. Frank
16. C. E. Frye
17. C. W. Gehrs
18. M. Gentry
19. J. Grebmeier
20. C. S. Haase
21. J. L. Haymore
22. S. G. Hildebrand
23. F. O. Hoffman
24. L. A. Hook
25. D. D. Huff
26. S. V. Kaye
27. C. Kimbrough
28-47. B. L. Kimmel
48. I. L. Larson
49. J. M. Loar
50. L. W. Long
51. P.-Y. Lu
52. A. P. Malinauskas
53. L. W. McMahon
54. L. E. McNeese
55. M. E. Mitchell
56. C. E. Nix
57. C. R. Olsen
58. P. T. Owen
59. T. P. Perry
60. S. F. Railsback
61. D. E. Reichle
62. P. S. Rohwer
63. T. H. Row
64. M. J. Sale
65. C. L. Stair
66. J. E. Stone
67. S. H. Stow
68-77. G. W. Suter
78. D. W. Swindle
79. C. C. Travis
80. R. R. Turner
81. R. I. Van Hook
82. W. Van Winkle
83. K. Van Damm
84. L. D. Voorhees
85. S. H. Welch
86. R. K. White
87. L. F. Willis
88. Central Research Library
89. Enrichment Technology Library
90-110. ER Document Management Center
111-113. ESD Library
114-115. Laboratory Records Department
116. Laboratory Records, RC
117. ORNL Patent Section
118. PGDP Library
119. X-10 Library (Portsmouth)
120. Y-12 Technical Library

EXTERNAL DISTRIBUTION

121. J. Bascietto, EH23, U.S. Department of Energy, 1000 Independence Avenue, Washington, DC 20585
122. J. F. Franklin, Bloedel Professor of Ecosystem Analysis, College of Forest Resources, University of Washington, Anderson Hall (AR-10), Seattle, WA 98195
123. C. Gist, Oak Ridge Operations, U.S. Department of Energy, Oak Ridge, TN 37830
124. S. Glover, Oak Ridge Operations, U.S. Department of Energy, Oak Ridge, TN 37830
125. G. M. Hornberger, Professor, Department of Environmental Sciences, University of Virginia, Charlottesville, VA 22903

126. T. Joseph, Oak Ridge Operations, U.S. Department of Energy, Oak Ridge, TN 37830

127. G. E. Likens, Director, The New York Botanical Garden, Institute of Ecosystem Studies, The Mary Flagler Cary Arboretum, Box AB, Millbrook, NY 12545

128-137. R. C. Sleeman, Environmental Restoration Division, ER-12, Oak Ridge Operations, U.S. Department of Energy, Oak Ridge, TN 37830

138. Office of Assistant Manager for Energy Research and Development, Oak Ridge Operations, P. O. Box 2001, U.S. Department of Energy, Oak Ridge, TN 37831-8600

139-150. Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TN 37831