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Approach to the Assessment of Sediment Quality in Florida Coastal Waters

Volume 1 - Development and Evaluation of Sediment Quality Assessment Guidelines

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Executive Summary

In Florida, conservation and protection of natural resources has been identified as a high priority environmental management goal. Realization of this goal requires protection of living resources and their habitats in estuarine, nearshore, and marine ecosystems. In the last decade, there has been a significant increase in the level of scientific understanding (and public recognition) of the important role sediments play in the functioning of coastal ecosystems. In addition to providing important habitats for aquatic organisms, sediments play a critical role in determining the fate and effects of environmental contaminants. Hence, sediment quality issues and concerns are becoming more important in the management of natural resources.

Recent monitoring data indicate that concentrations of various contaminants are present at elevated levels at a number of locations in Florida coastal sediments. While these chemical data provide essential information on the nature and areal extent of contamination, they provide neither a direct measure of adverse biological effects nor an indication of the potential for such effects. Therefore, effects-based SQAGs have been developed to evaluate the potential for biological effects associated with sediment-sorbed contaminants and to provide assistance in managing coastal resources. The primary uses of these SQAGs have been identified in this document. In addition, a framework for using the SQAGs in conjunction with other assessment tools has been presented.

The metals interpretive tool (Schropp and Windom 1988) and the preliminary SQAGs were used to conduct an initial assessment to determine the nature, extent, and severity of contamination in Florida coastal sediments. The degree of anthropogenic enrichment and the potential for adverse biological effects associated with measured levels of sediment-sorbed contaminants were used as indices of contamination. Data contained in the Florida Department of Environmental Protection coastal sediment chemistry database were used to identify priority areas and priority substances with respect to sediment contamination. The results of this evaluation are considered to be preliminary due to various limitations, including the dearth of data from certain areas, the lack of information on many organic chemicals, and the age of some chemical data (i.e., they may not reflect present conditions). This type of assessment should be repeated when the limitations have been addressed.

The initial assessment screened information from 21 coastal areas. The vicinity of Miami, Jacksonville, Tampa Bay, Pensacola, and Panama City were identified as the highest priority areas in terms of the extent and severity of sediment contamination. As surveys have recently been ccompleted in Tampa Bay and Pensacola Bay, the highest priority areas for new studies are Biscayne Bay and the St. Johns River. The contaminants of greatest concern in Florida sediment included lead, mercury, benzo(a)pyrene, pyrene, acenaphthene, benz(a)anthracene, chrysene, fluoranthene, and phenanthrene.

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Chapter 1

Introduction

Contaminated sediments have been identified in marine and estuarine ecosystems throughout the United States (Bolton *et al.* 1985). The highest levels of sediment-associated contaminants have been measured in coastal areas that are influenced by point sources of pollution, primarily from municipal and industrial sources (NOAA 1990). However, high and biologically significant concentrations of many substances have also been observed in coastal areas that are mainly affected by non-point pollution sources, usually in the vicinity of urban and agricultural developments (O'Connor 1990). As Florida coastal waters may be affected by both point and non-point sources of pollution, there is a significant potential for degradation of environmental quality in these ecosystems.

Over the past 10 years, Florida Department of Environmental Protection (FDEP 1994) and others (e.g., Delfino *et al.* 1991; Long and Morgan 1990; Long *et al.* 1991) have collected a substantial quantity of information on the chemical composition of Florida sediments. Examination of these data indicates that numerous areas in Florida are contaminated by metals (such as chromium, copper, lead, silver, and mercury) and organic substances (such as polycyclic aromatic hydrocarbons and pesticides). However, sediment chemistry data alone are not adequate for identifying or managing potential sediment quality problems in the state. For this reason, FDEP has implemented a program to develop and evaluate tools that support the efficient and effective assessment of sediment quality.

The numerical sediment quality assessment guidelines (SQAGs) developed for Florida coastal waters using the weight of evidence approach are reported in the companion Volume 1 (MacDonald 1994). An evaluation of the overall reliability of the SQAGs also was conducted in Volume 1 to provide potential users of the tools with general guidance on using the guidelines. However, potential SQAG users also require further instructions on the appropriate uses and limitations of these sediment management tools (Sediment Quality Subcommittee 1992). For this reason, guidance in this document is provided to assist potential users in applying the SQAGs and other relevant sediment quality assessment tools.

The purpose of this report is to clearly identify the intended uses of the SQAGs and to list the applications that are considered to be inappropriate. In addition, a general framework for assessing the significance of sediment-associated contaminants is presented. Numerical SQAGs are an integral component of this framework, as they provide a basis for assessing the ***potential*** effects of sediment-associated contaminants (MacDonald 1994). A metals interpretive tool (Schropp and Windom 1988; Schropp *et al.* 1990) and various bioassessment tools (i.e., toxicity and bioaccumulation tests; benthic invertebrate community assessments) are also included in this framework because they provide essential information for evaluating sediment quality. Finally, this document reports the results of a preliminary assessment of sediment quality in Florida coastal waters, which may be used as a basis for identifying priority contaminants and priority areas for further investigation.

Chapter 2

Potential Applications of the Recommended Sediment Quality Assessment Guidelines

2.0 Introduction

Contaminated sediments can be associated with a diverse array of adverse effects on aquatic organisms, including the plants and animals that live in, on, or near bed sediments. Numerical sediment quality assessment guidelines (SQAGs) may be used to identify and designate sediments that have high, moderate, and low probabilities of being associated with adverse effects on aquatic organisms. This feature of the SQAGs makes them useful in a range of management applications, including:

- interpreting sediment chemistry data;
- designing monitoring programs;
- supporting regulatory decisions;
- conducting risk assessments at contaminated sites;
- developing remediation objectives for contaminated sites; and,
- developing sediment quality objectives.

Each of these applications are briefly discussed in the following sections. In addition, the inappropriate uses of the guidelines are identified and discussed. Potential users of the SQAGs are encouraged to review the advantages and limitations of the weight of evidence approach used to derive the guidelines, as well as the results of the evaluation of the guidelines presented in MacDonald (1994).

2.1 Data Interpretation

Over the past decade, sediment chemistry data have been collected at a wide range of sites for many purposes. By themselves, these data may be used to assess the status and trends in environmental quality; however, they do not provide a basis for determining if the concentrations of contaminants represent potential hazards to aquatic organisms. Numerical SQAGs contribute to the sediment quality assessment

assessment tools or 'scientific yardsticks' against which the biological importance of sediment chemistry data can be assessed. In this context, SQAGs may be used as screening tools to *identify areas and contaminants of concern on site-specific,* regional, or national bases. To illustrate this process, an initial assessment of the potential for biological effects associated with measured concentrations of contaminants in Florida coastal waters is presented in Chapter 4 of this document.

As part of this study, two SQAGs were recommended for each contaminant of concern in Florida coastal waters, if sufficient data were available to support their development. Specifically, threshold effect levels (TELs) were formulated to define concentrations of contaminants below which biological effects are not expected. Likewise, probable effect levels (PELs) for each substance were developed to define ranges of concentrations above which biological effects are likely. When contaminant concentrations exceed one or more PELs, sediment samples are predicted to be toxic. Further investigations, including bioassessment, should be considered to be a high priority at sites with multiple exceedances of the PELs. Similarly, investigations into the sources and possible control measures should be conducted when the concentrations of individual contaminants exceed the PELs at multiple sites. Between the TELs and the PELs adverse biological effects are possible; however, further investigations are required to evaluate the actual nature and severity of these effects. The SQAGs provide the scientific information necessary to interpret the potential biological implications of contaminated sediments and, hence, a basis for focussing further investigations and identifying the need for remedial measures. The SQAGs also provide a basis for interpreting relationships between sediment chemistry and biological effects. In this application, the contaminants that are most likely to be associated with observed biological responses (e.g., acute toxicity) are those that exceed the PELs. Those substances which do not exceed the PELs are less likely to be one of the causative factors in the observed response, even if they are significantly correlated with toxicity. More detailed investigations of the contaminants that are associated most strongly with biological effects would require use of toxicity identification evaluation (TIE) procedures (Ankley and Thomas 1992).

2.2 Monitoring Program Design

Monitoring is an integral component of environmental surveillance programs. While such programs may be undertaken for a number of reasons (e.g., trend assessment, impact assessment, compliance, etc.), limitations on available resources dictate that they must be effective and efficient. For this reason, it is important for sediment quality monitoring programs to be well-focused and to provide the type of information that is necessary to manage contaminated sediments.

Numerical SQAGs support the design of environmental monitoring programs in several ways. First, comparison of existing sediment chemistry data with the SQAGs provides a systematic basis for identifying high priority areas for implementing monitoring activities. Second, when used in conjunction with existing sediment chemistry data, the SQAGs may be used to identify priority contaminants within an area of concern. By considering the potential sources of these contaminants, it may be possible to further identify priority sites for investigation. Lastly, the SQAGs assist in monitoring program design by identifying the required detection limits for each substance (e.g., TEL ÷ 2). Determination of the detection limits required for further interpretation of the data should help to avoid many of the difficulties that have resulted from the use of standard, yet inappropriate, analytical methods.

2.3 Support for Regulatory Decisions

Generally, SQAGs alone would not be used to make decisions on the management of contaminated sediments. However, the SQAGs are effective tools for identifying the need for site-specific investigations to support regulatory decisions, including source control and other remedial measures. In this context, SQAGs may be used to assess existing sediment chemistry data from contaminated sites and to identify substances of concern. Typically, further investigations would then be implemented to identify contaminant sources, assess the areal extent and severity of the contamination, evaluate potential source control measures, and determine the need for other remedial measures. The SQAGs would also be used to evaluate the success of any regulatory actions that are implemented at the site.

2.4 Ecological Risk Assessment

Ecological risk assessment is the process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors (EPA 1992). By estimating the probabilities of observing adverse biological effects under a variety of exposure scenarios, ecological risk assessment strives to provide science-based guidance for managing environmental quality, particularly at contaminated sites. While the Society of Environmental Toxicology and Chemistry (SETAC) is currently in the process of developing procedures for assessing the risks associated with contaminated sediments, such methods are not yet available. In addition, the scientific information required to support ecological risk assessment has not been available in a summarized form. However, the SQAGs contribute directly to the ecological risk assessment process because they define three ranges of contaminant concentrations that are rarely, sometimes, and usually associated with adverse biological effects. Moreover, the supporting documentation (MacDonald *et al.* 1994) can be used to calculate the percent incidence (or probability) of adverse effects within each of these ranges (Long *et al.* In press). Furthermore, the evaluation of the predictability of the SQAGs (presented in MacDonald 1994) provides a basis for assigning probabilities to the adverse effects that may be associated with contaminant concentrations that exceed the recommended guidelines. Hence, the SQAGs should form an integral part of ecological risk assessments that are conducted at sites with contaminated sediments in Florida.

2.5 Development of Sediment Quality Remediation Objectives

While the majority of coastal sites in Florida are likely to be relatively uncontaminated, high and biologically-significant concentrations of certain substances in sediments may be present in the vicinity of major urban and/or industrial developments. At these sites, further investigations would be required to evaluate the extent, severity, and effects of sediment-associated contaminants. When the results of focused environmental assessments indicate that aquatic habitats are seriously degraded, remediation may be required to restore the designated water uses at the site and achieve long-term water management goals.

Sediment quality remediation objectives are an essential component of the remediation process because they help establish the target clean-up levels for a site. In this context, SQAGs are useful because they provide the basic scientific information required to formulate site-specific remediation objectives. In addition, the SQAGs provide information that help evaluate the costs and benefits associated with various remediation options. However, the SQAGs should not be used directly as target clean-up levels at contaminated sites. Procedures for deriving site-specific remediation objectives have been recommended by MacDonald and Sobolewski (1993), and these could be employed on an interim basis in the state.

2.6 Development of Sediment Quality Objectives

Sediment quality issues are rarely entirely the province of one agency or one level of government. For this reason, it may be necessary to establish agreements between various levels of government to define their respective responsibilities with respect to the prevention, assessment, and remediation of sediment contamination. Multi-jurisdictional agreements may include accords on a number of issues; however, establishment of site-specific sediment quality objectives is important because they provide a common yardstick against which the success of a range of environmental management activities can be measured. In this context, sediment quality objectives are defined as numerical concentrations of sediment-associated contaminants which have been established to support and protect aquatic life at a specific site (MacDonald and Sobolewski 1993).

Numerical SQAGs contribute significantly to the objectives development process because they provide basic scientific information on the biological effects of sediment-associated contaminants. As such, the SQAGs may be used as the technical basis for establishing site-specific sediment quality objectives. It is important to note, however, that these guidelines should not be regarded as blanket values for regional sediment quality. Variations in environmental conditions throughout the state could affect sediment quality in different ways and, hence, necessitate the modification of the guidelines to reflect local conditions. While no specific guidance on the derivation of site-specific sediment quality objectives for Florida coastal waters is available, MacDonald and Sobolewski (1993) provide some general instructions that may help address this issue.

2.7 Inappropriate Uses of the Sediment Quality Assessment Guidelines

While the recommended SQAGs are likely to have a number of important uses in Florida and elsewhere, they have certain limitations that should be recognized. First, the SQAGs should not be used as mandatory target clean-up levels, or standards, at contaminated sites (e.g., Superfund sites) unless additional site-specific studies are conducted (Sediment Quality Subcommittee 1992). However, the SQAGs and the supporting documentation may be used, in conjunction with other information, as a technical basis for establishing target clean-up levels. MacDonald and Sobolewski (1993) provide explicit guidance on the derivation of site-specific sediment quality remediation objectives for contaminated sites in Canada. It is likely that these recommendations would apply in other areas, including Florida coastal waters.

The recommended SQAGs are not intended to define uniform values for sediment quality on a state-wide basis. That is, the SQAGs should not be used as sediment quality criteria. In certain areas, local conditions may influence the applicability of the guidelines. For example, high background levels of certain trace metals (e.g., lead) have been reported in Apalachicola Bay. Some of the samples collected from this area exceed the threshold effect level (TEL) for lead, even though there is no evidence of significant anthropogenic enrichment (FDEP 1994; see Section 3.4). Therefore, it would not be appropriate to evaluate sediment quality in Apalachicola Bay using the recommended TEL for lead by itself. This example illustrates the importance of using the SQAGs in conjunction with other tools (such as the metals interpretive tool and various bioassessment tools) for conducting sediment quality assessments.

Various organizations have expressed concerns regarding the potential use of the SQAGs as criteria for the disposal of dredged material. It is important for potential users to remember that the SQAGs are not intended to be used as pass/fail criteria for dredged disposal analysis, nor are they intended to replace formal assessment protocols developed by federal agencies (EPA and ACE 1991). Nonetheless, the SQAGs may provide useful information for evaluating the quality of dredged material and could be utilized as part of the dredged disposal analysis process, subject to approval by the responsible agencies.

The SQAGs are not intended to replace the water quality criteria that are used in various state programs. However, the SQAGs do provide useful information for evaluating the effectiveness of certain regulatory programs. For example, more stringent regulations may be required at sites where water quality criteria (WQC) have been established, ambient monitoring data indicate compliance with the WQC, and the SQAGs have been exceeded. This situation could occur because water quality regulations generally do not consider the potential for contamination of bed sediments. Consideration of both sediment quality and water quality will increase the probability that the beneficial uses of aquatic ecosystems are adequately protected.

Lastly, it is important to note that SQAGs developed using the weight of evidence do not provide a basis for identifying the substance or substances that **caused** an effect in field-collected samples. Instead, the SQAGs define contaminant concentrations that are unlikely or usually **associated** with adverse effects. Exceedance of the PEL for a certain substance indicates that the chemical may be, in part, responsible for the observed effects; however, confirmation of the role of individual chemicals which occur in complex mixtures in sediment toxicity requires the use of toxicity identification evaluation procedures (Ankley and Thomas 1992). Alternatively, toxicity tests using sediments that have been spiked with individual chemicals or contaminant mixtures may be conducted to establish dose-response relationships (Lamberson and Swartz 1992). Once the cause(s) of sediment toxicity has been identified, better decisions can be made regarding sediment management.

Chapter 3

A Framework for Assessing Site-Specific Sediment Quality Conditions in Florida

3.0 Introduction

The numerical sediment quality assessment guidelines (SQAGs) recommended in Volume 1 (MacDonald 1994) provide a strong technical basis for assessing sediment quality in Florida. These guidelines explicitly address the uncertainty associated with the sediment quality assessment process by identifying ranges of contaminant concentrations instead of absolute values. In addition, the probability of observing adverse biological effects within these ranges has been calculated in Volume 1 to provide further guidance on the use of these management tools. Nonetheless, the possibility of arriving at erroneous conclusions still exists if the SQAGs are used in isolation. For this reason, an evaluation framework has been developed to assist potential SQAG users in the implementation of sediment quality assessments.

The purpose of this Chapter is to provide a framework for using SQAGs and related tools. This framework identifies the essential considerations that should be addressed in conducting site-specific sediment quality assessment programs and is comprised of the following steps (Figure 1) :

(i) Collect Historical Land and Water Use Information;

(ii) Collect and Evaluate Existing Sediment Chemistry Data;

(iii) Collect Supplemental Sediment Chemistry Data;

(iv) Evaluate the Origin of Sediment-Associated Contaminants;

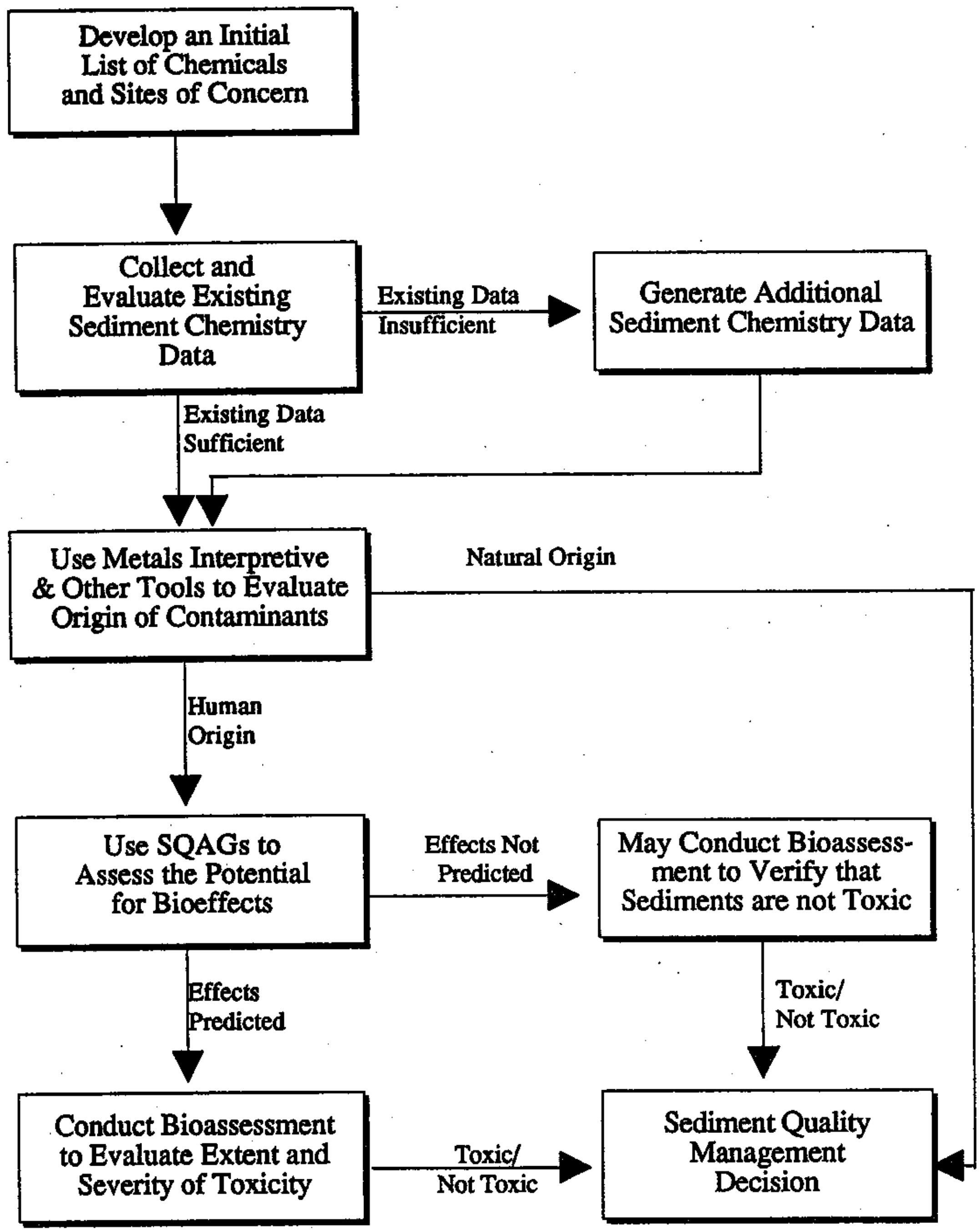
(v) Conduct Preliminary Assessment of the Potential for Biological Effects of Sediment-Associated Contaminants;

(vi) Conduct Biological Assessment of Sediment Quality; and,

(vii) Implement Management of Sediment Quality.

The recommended framework is designed to provide a consistent approach to assessing sediment quality in marine and estuarine areas. A similar approach could be used in freshwater ecosystems, once freshwater SQAGs become available. However, the framework is not intended to replace accepted sediment testing protocols, such as those developed for

Figure 1. Framework for conducting site-specific assessments of sediment quality conditions in Florida.



the ocean disposal of dredged material. Instead, it is intended to provide general guidance to support the sediment quality assessment process. Each component of the recommended framework is discussed in the following sections.

3.1 Collect Historical Land and Water Use Information

The first phase of a site-specific sediment quality assessment involves the collection and review of pertinent information on the site under consideration. Information is required on the types of industries and businesses that operate or have operated in the area, on the location of wastewater treatment plants, on land use patterns in upland areas, on stormwater drainage systems, on residential developments, and on other historic and ongoing activities within the area. These data provide a basis for identifying possible sources of contaminants to aquatic ecosystems. Information on the chemical composition of wastewater effluent discharges, the types of contaminants likely to be associated with non-point sources, and the physical/chemical properties (e.g., K_{ow}, K_{oc}, solubility, persistence, etc.) of those substances provides a basis for developing an initial list of chemical concerns at the site.

In addition to information on contaminant sources, information should also be collected that helps to define environmental management goals at the site (if these have not already been established). Environmental management goals in estuarine and marine systems may be based on protection of the ecosystem as a whole, maintenance of viable populations of sportfish species, protection of human health (e.g., swimmable and fishable), and/or a variety of other considerations (e.g., regional stormwater management, industrial development). As such, information on existing and future uses of the site provide a basis for making decisions regarding the nature and extent of the investigations that should be conducted at the site. Mudroch and McKnight (1991), Baudo and Muntau (1990) and MacDonald (1989) provide detailed descriptions of the information that should be collected and discuss how these data may be used to assess ambient environmental quality.

3.2 Collect and Evaluate Existing Sediment Chemistry Data

Collection and evaluation of existing sediment chemistry data are critical components of the site-specific sediment quality assessment process. In Florida, sediment chemistry and other relevant data are generated under various environmental programs and the data should be assembled to support a preliminary assessment of sediment quality at the site under consideration. It is essential that these data be fully evaluated to determine their applicability in the sediment quality assessment process. This evaluation should cover the overall quality of the data set and the degree to which the data are thought to represent current conditions at the entire site under consideration.

Concerns regarding data quality may be resolved by evaluating the quality assurance/quality control measures that were implemented during collection, transport, and analysis of sediment samples. A number of conventions have now been established which provide guidance on the field aspects of sediment sampling programs (ASTM 1994a; EPA and ACE 1991). While a diversity of analytical procedures have been developed to quantify concentrations of contaminants in sediments, a number of standard methods have been recommended (for example by EPA and ACE 1991; ASTM 1994a). However, it is essential that total digestion techniques (using strong acids, such as hydrofluoric acid) be applied to samples for metal analysis. Novel analytical procedures may be appropriate in certain circumstances and should be evaluated using the accuracy and precision data for the technique (i.e., the results of analyses performed on standard reference materials, and split and spiked sediment samples). Analytical detection limits are also highly relevant to assessing potential biological effects at the site. The suitability of the detection limits may be assessed by comparing them to the SQAGs (specifically, the TEL) developed for that substance.

In addition to reliable sediment chemistry data, assessment of sediment quality also requires information that adequately represents the contemporary environmental conditions at the site under consideration. Therefore, the age of the chemistry data is a central question with respect to determining the applicability of the data. Natural degradative processes in the environment and sedimentation can lead to reductions in the concentrations of sediment-associated organic contaminants over time (Mosello and Calderoni 1990). Major hydrological events (such as severe storms) may result in the transport of sediments, while industrial developments and/or regulatory activities may alter the sources and composition of contaminants released into the environment. Thus, it is important that assessments of sediment quality be undertaken with the most recent data available.

In addition to temporal variability, the chemistry of bed sediments is known to vary significantly on a spatial basis (FDEP 1994; Long *et al.* 1991; Mah *et al.* 1989). Therefore, any single sample is likely to represent only a small proportion of the geographic area in which it was collected. For this reason, data from a number of stations are required to provide a representative picture of sediment quality conditions at the site, with the actual number of stations required dependent on the size of the area under consideration, the concentrations of sediment-associated contaminants, and the variability of contaminant concentrations (including spatial variability in surficial sediments and at depth).

Another important factor to consider in evaluating the applicability of existing sediment quality data is the list of variables that were analyzed. It is important that the list of analytes reflects existing and historical contaminant sources from land and water use activities in the area. In harbors, for example, variables such as pentachlorophenol (which is used as a preservative for pilings), tributyltin (which is used in antifouling paints for ships), copper and zinc (which are used in antifouling paints for pleasure craft) should be measured. Similarly, highly elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) and lead are often associated with urban stormwater discharges. In agricultural areas, persistent pesticides and nutrients (including the toxic compounds of nitrogen) should be considered in sediment quality assessments. The SQAGs should be applied carefully when chemistry data are lacking on one or more substances that have a high potential for occurring in sediments.

If the results of the data evaluation process indicate that the sediment chemistry data are acceptable, it is possible to conduct a preliminary assessment of the potential for biological effects and an evaluation of the probable origin of sediment-associated contaminants. However, if the sediment chemistry data are considered to be of unacceptable quality or are not considered to adequately represent the site, additional sediment chemistry data may be required to complete the preliminary assessment.

3.3 Collect Supplemental Sediment Chemistry Data

The third stage in the sediment quality assessment process involves the generation of supplemental sediment chemistry data. Additional testing of sediments may be required when existing data are of insufficient quality or quantity to support the assessment of sediment quality at a site. The identification of chemical concerns conducted in Step 1 provides a defensible means of identifying a list of potential analytes for inclusion in the sediment quality monitoring program.

Sampling programs should be designed to delineate spatial variability (horizontal and vertical) in sediment contamination, and explicitly identify the quality assurance/quality control measures that will be implemented. The need to characterize temporal variability (time-series coring) also should be considered. Collection, handing, and storage of sediment samples should follow established protocols (e.g., ASTM 1994a). Analytical methods and detection limits should be appropriate for the substances under consideration. Implementation of a focused, well-designed monitoring program will ensure that the resultant sediment chemistry data will support a defensible sediment quality assessment.

3.4 Evaluate Natural vs. Anthropogenic Sources of Sediment-Associated Contaminants

Sediment chemistry data are essential for evaluating sediment quality conditions in Florida coastal waters. However, interpretation of environmental metals data is made difficult by the fact that absolute metal concentrations in coastal sediments are influenced by a variety of factors, including sediment mineralogy, grain size, organic content, and anthropogenic enrichment (Schropp and Windom 1988). This combination of factors results in metal levels that can vary over several orders of magnitude at **uncontaminated** sites in Florida (Schropp *et al.* 1990). Therefore, it is important to consider the natural background levels of sediment-associated metals when conducting sediment quality assessments.

In the past, determining whether estuarine and coastal sediments were anthropogenically-enriched with metals was a difficult process requiring comprehensive, site-specific assessments. However, the FDEP (Schropp and Windom 1988; Schropp *et al.* 1990) has developed a practical approach for assessing metals contamination in coastal sediments. This procedure relies on normalization of metal concentrations to a reference element. In the case of Florida, normalization of metal concentrations to concentrations of aluminum in estuarine sediments provided the most promising method of comparing metal levels on a regional basis. However, normalization using lithium and other reference elements has been used in other regions and may be applicable to Florida, as well (Loring 1991).

Florida Department of Environmental Protection's development of the metals interpretive tool was relatively straightforward. Briefly, data on sediment metal concentrations were collected from roughly 100 estuarine sites chosen for their remoteness from known or potential sources of metals contamination. Total metal concentrations (using "total digestion" procedures) were determined in these samples. Simple linear regressions of each of seven metals on aluminum were performed on log-transformed data and 95% prediction limits were calculated. Significant correlations were obtained for arsenic, cadmium, chromium, copper, lead, nickel, and zinc. The regression lines and prediction limits were then plotted. These plots form the technical basis for interpreting data on the concentrations of metals in sediments, such that anthropogenic enrichment would be suspected at sites with metal concentrations that exceeded the upper 95% prediction limit (for one or more substances). The application of this procedure using data from various areas (e.g., Tampa Bay, Schropp *et al.* 1989; Louisiana, Pardue *et al.* 1992) has supported the effectiveness and utility of this interpretive tool.

Mercury data were also collected from uncontaminated estuarine sediments; however, FDEP does not have confidence that mercury enrichment can be identified through its relationship with aluminum. To deal with mercury, the maximum mercury value in the "clean" data set was identified and is assumed to be typical of natural sediments. Anthropogenic enrichment of mercury concentrations is suspected when this maximum value is exceeded.

The metals interpretive tool provides an effective means of identifying sites that are anthropogenically enriched with metals. While no equivalent tool exists for evaluating the origin of many organic substances, a considerable number of organic contaminants are released into the environment only as a result of human activities. Therefore, the development of a comparable interpretive tool may not be as critical as it was for metals. Substances that fall into this category include chlorophenols (and related compounds), polychlorinated biphenyls (PCBs), pesticides, dioxins and furans, phthalates, and a host of other compounds. However, a variety of PAHs may occur in coastal sediments as a result of natural processes. While several methods have been proposed to establish the probable origin of this class of contaminants (such as calculating the ratios of the concentrations of some hydrocarbons or groups of hydrocarbons to distinguish between storm runoff, oil spills, and other sources), these techniques require further refinement before they can be used routinely in sediment quality assessments.

3.5 Conduct Preliminary Assessment of the Potential for Biological Effects of Sediment-Associated Contaminants

Sediment chemistry data alone do not provide an adequate basis for assessing the hazards posed by sediment-associated contaminants to aquatic organisms. Interpretive tools are also required to determine if sediment-associated contaminants are present at concentrations which could, potentially, impair the designated uses of the aquatic environment. In this respect, the SQAGs provide a scientifically defensible basis for evaluating the potential effects of sediment-associated contaminants on aquatic organisms.

In Florida, SQAGs are used to define three ranges of contaminant concentrations (MacDonald, 1994 Volume 1). The *probable effects* range is defined as the range of concentrations of a specific contaminant in sediment within which biological effects are usually or always observed (probable effects range ≥ PEL). Sediments with concentrations of contaminants within the probable effects range are considered to represent ***significant and immediate hazards*** to exposed organisms. Sites with concentrations of one or more contaminants that fall within the probable effects range should be considered to be the highest priority for implementing sediment quality management options. However, direct biological assessment is required at these sites to determine the nature and extent of effects that could be manifested. In the future, it may be possible to refine the assessment of the hazards associated with exceedances of PELs by considering both the number and magnitude of these exceedances.

The *possible effects* range is defined as the range of concentrations of a specific contaminant in sediment within which the expression of adverse biological effects is uncertain and is likely to be dependent on such factors as the bioavailability, which may influence the toxicity of the substance (TEL < possible effects range < PEL). Sediment-associated contaminants are considered to represent ***potential*** hazards to exposed organisms when concentrations fall within this range. Sediments with concentrations of contaminants within this range require further assessment to determine the biological significance of the contamination. In general, further assessment would be supported by a suite of biological tests designed to evaluate the biological significance of sediment-associated contaminants to key species of aquatic biota.

The *minimal effects* range is defined as the range of concentrations of a specific contaminant in sediment within which biological effects are rarely or never observed (no effects range ≤ TEL). Sediments with concentrations of contaminants within the no effects range are considered to be of ***acceptable quality***. In general, further investigations of sediment quality conditions would be considered to be of relatively low priority for sediments in which contaminant concentrations fall within the no effects range. However, biological testing may be required to validate the results of the preliminary assessment of the potential for adverse biological effects (particularly in sediments with low levels of TOC, AVS, and/or other variables that could influence the bioavailability of sediment-associated contaminants). In addition, biological testing would be warranted if the site is suspected to contain contaminants that were not measured or for which SQAGs were not available. For example, high levels of ammonia could trigger biological responses at sites nearby wastewater treatment plant outfalls, though the levels of other contaminants appear to be acceptable when compared with the SQAGs.

While numerical, effects-based sediment quality assessment guidelines provide essential information for evaluating the potential effects of sediment-associated metals, they should not be used alone to evaluate the quality of marine and estuarine sediments. Assessments of sediment quality also should include evaluation of the degree of anthropogenic enrichment. Using this approach, metals concentrations would be considered to be a serious concern when they exceed the biological effects-based guidelines and they are anthropogenically enriched.

The importance of using the effects-based guidelines and the metals interpretive tool together is demonstrated by evaluating Florida sediment chemistry data. In this example, data on levels of sediment-associated lead from two geochemically distinct systems, Biscayne Bay and Apalachicola Bay, are examined to illustrate the integrated sediment quality assessment framework. A summary of the available data (FDEP 1994) on the levels of sediment-associated lead in the vicinity of Miami is provided in Figure 2 (Biscayne Bay data are presented in order of increasing concentration and assigned sample numbers from 1 to 108). Evaluation of these data using the effects-based SQAGs suggest that approximately 19% of the samples fall within the probable effects range of concentrations (i.e., exceed the PEL of 112 mg/kg), while another 19% of the samples fall within the possible effects range (i.e., between the TEL of 30 mg/kg and the PEL). Therefore, comparison of sediment chemistry data with the numerical SQAGs suggests that there is a relatively high probability of observing adverse biological effects in the sediments collected from the Miami area. Further evaluation of these data using the metals interpretive tool (Figure 3) demonstrates that many sediments from this area are anthropogenically-enriched with lead, with roughly 90% of the samples exceeding the 95% prediction limits established for 'clean' sites. Concordance between the effects-based tool and the geochemically-based tool suggests that the Biscayne Bay area should be considered to be of relatively high priority for conducting further investigations to evaluate sediment toxicity.

In Apalachicola Bay, roughly 13% of the samples collected in the Florida coastal contaminants survey (FDEP 1994) had levels of lead that exceeded the TEL of 30 mg/kg (Figure 4; Apalachicola Bay data are presented in order of increasing concentration and assigned sample numbers from 1 to 29). Comparison of the ambient levels of lead in

Figure 2. Concentrations of lead in sediments in Biscayne Bay.

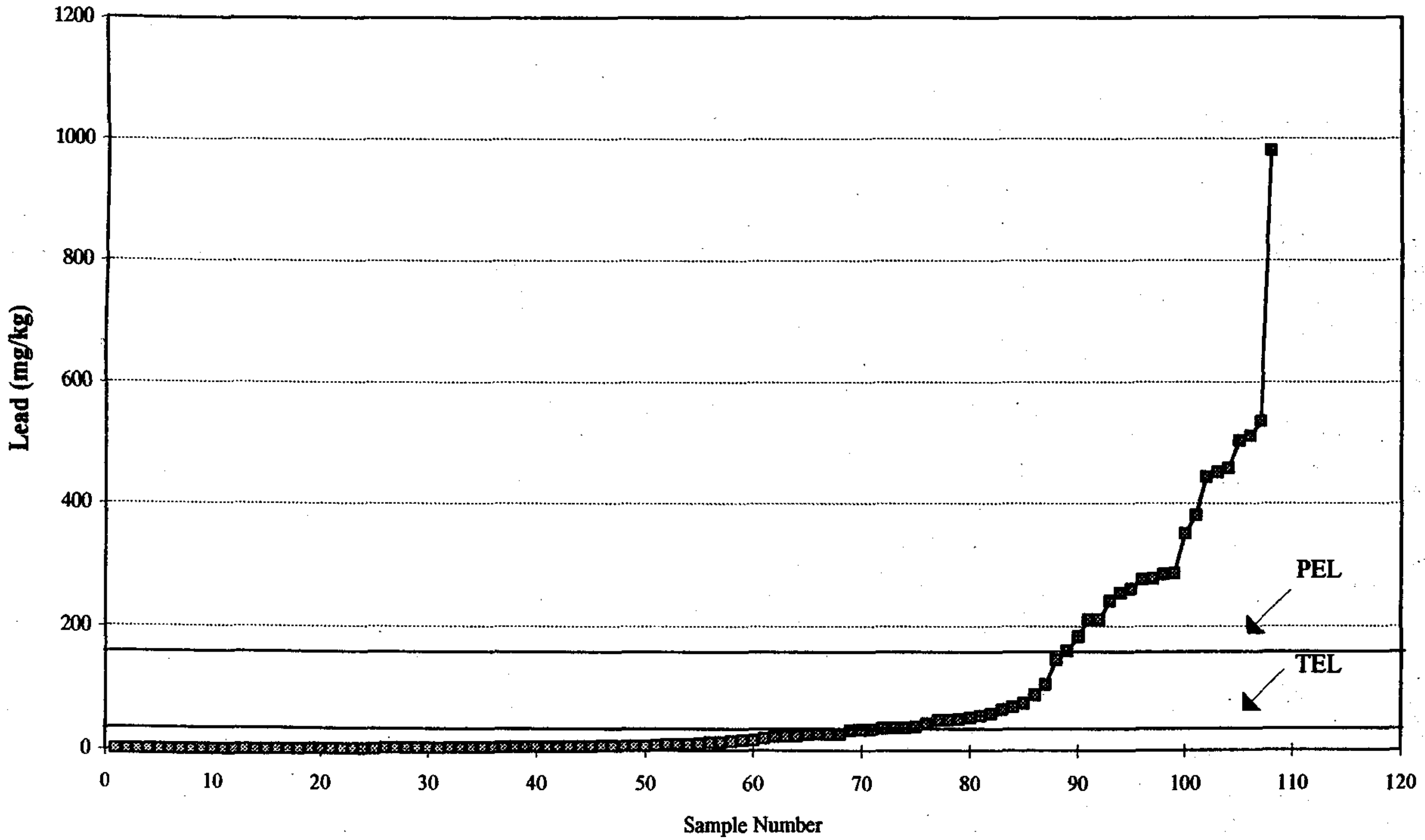


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Figure 3. Aluminum normalized concentrations of lead in Biscayne Bay sediments.

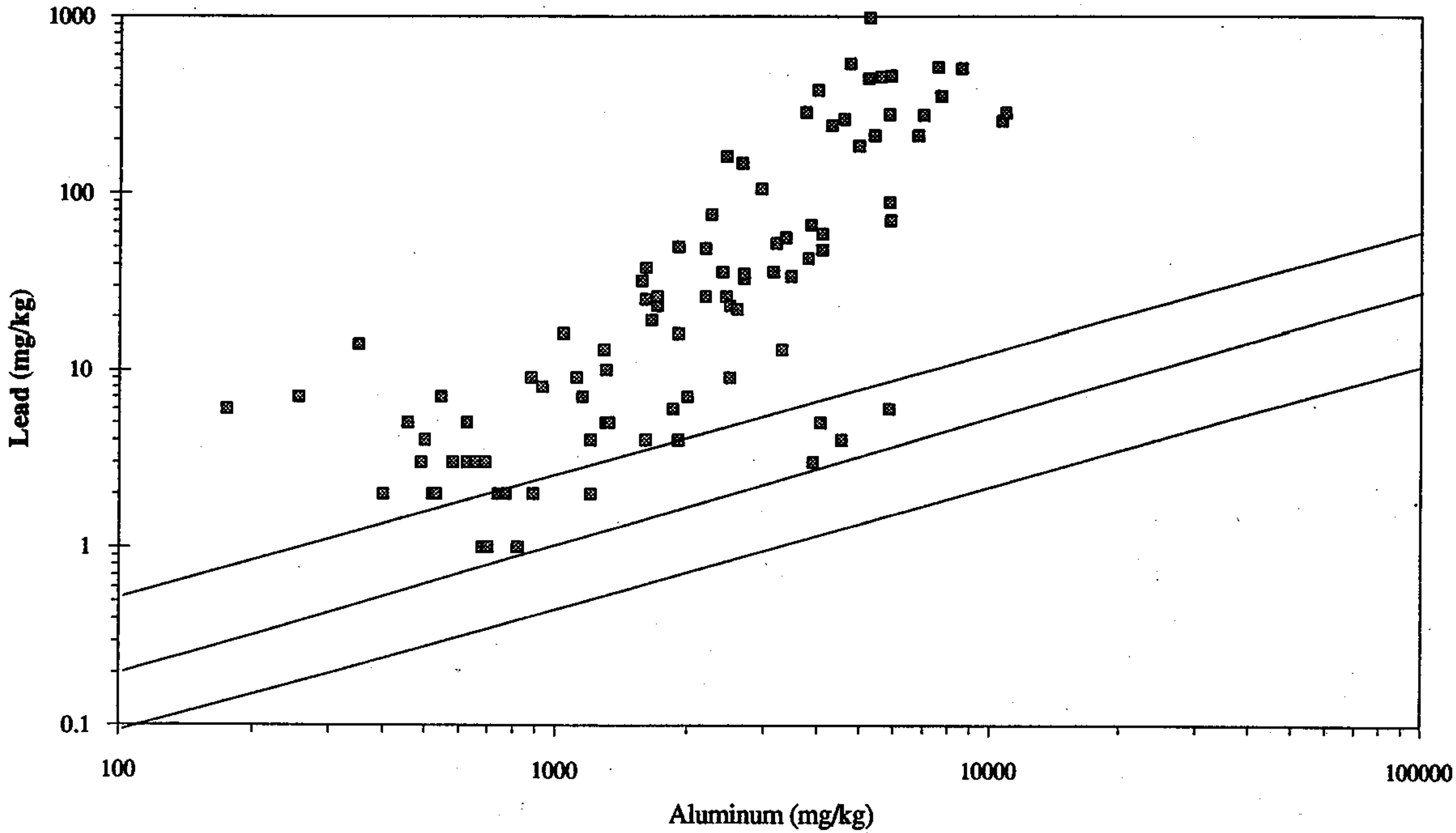
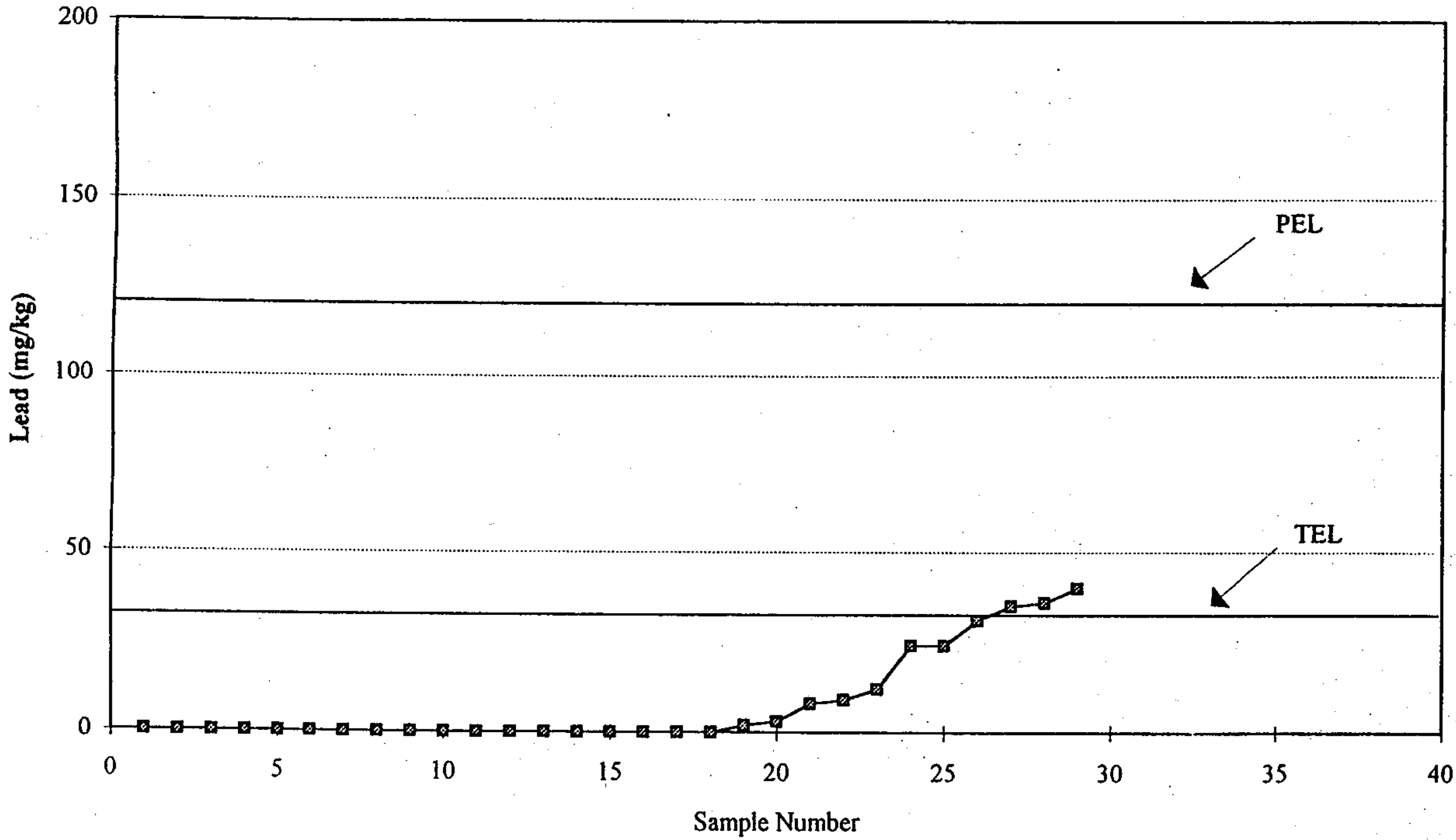


Figure 4. Concentratons of lead in sediments in Apalachicola Bay.



Apalachicola Bay with the SQAGs suggests that there is a possibility of observing adverse biological effects at several sites in this system. However, further evaluation of these data using the metals interpretive tool indicates that aluminum-normalized lead levels in Apalachicola Bay sediments are similar to those measured in 'clean' sediments in Florida (Figure 5). Therefore, while the effects-based tool predicts that adverse effects could, possibly, be observed at some sites due to elevated levels of lead, the metals interpretive tool clearly demonstrates that lead concentrations in Apalachicola Bay are naturally-occurring. As such, sediment-associated lead should not be considered to be a high priority for conducting further investigations to evaluate the extent of sediment toxicity. These examples emphasize the importance of using these assessment tools together to conduct reliable evaluations of sediment quality in Florida coastal waters.

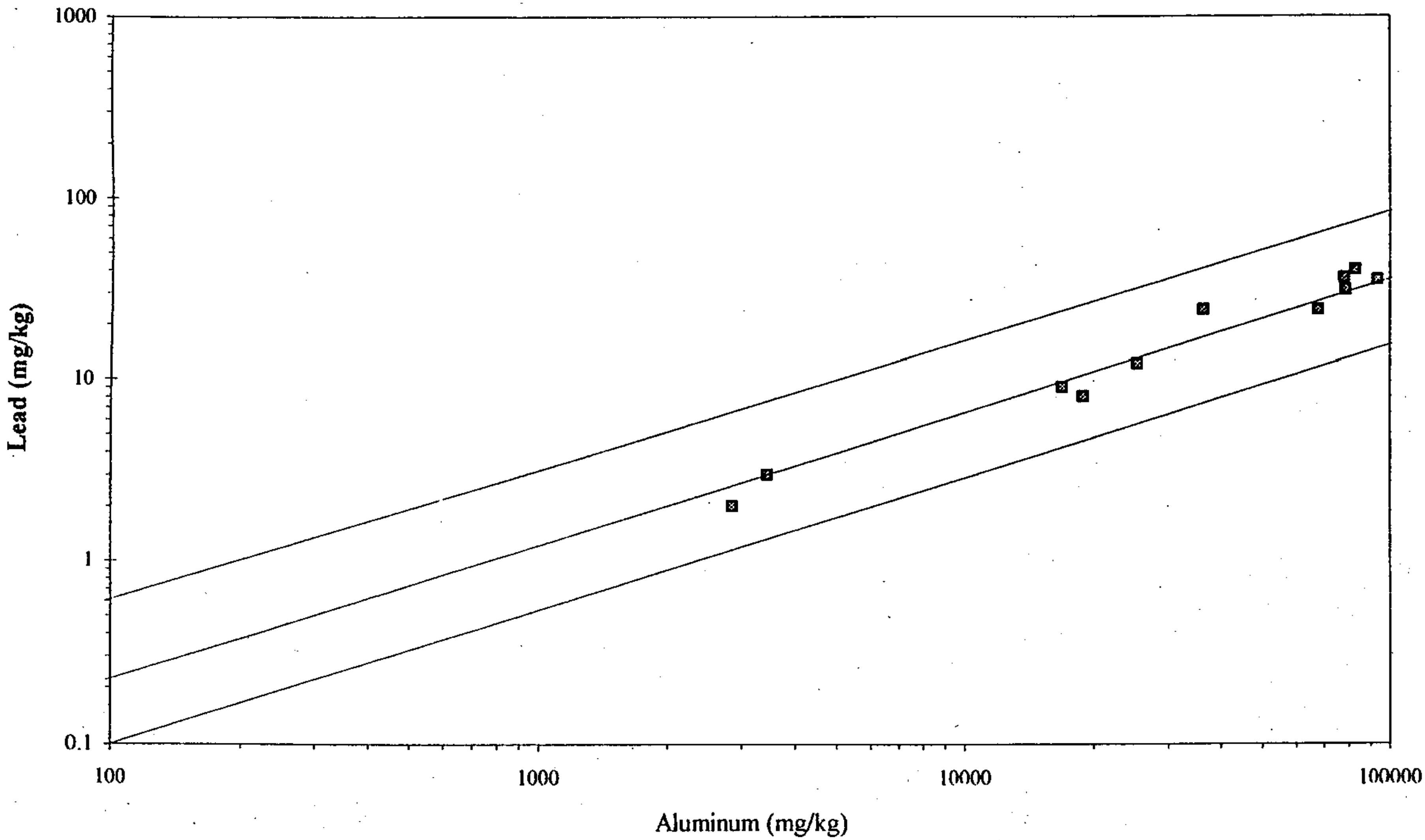
3.6 Conduct Biological Assessment of Sediment Quality

At present, the nature and extent of available information on the effects of sediment-associated contaminants is such that there is often significant uncertainty associated with predictions of the biological significance of elevated concentrations of contaminants in bed sediments (i.e., the SQAGs do not support the establishment of cause and effect relationships). Therefore, biological testing is required to provide reliable information regarding the toxicity of bed sediments (generally a suite of biological tests is required) and to confirm the results of the preliminary sediment quality assessment.

Biological testing is required to support three distinct aspects of the sediment quality assessment process in Florida. First, biological testing may be required to assess the toxicity of sediments at sites where the concentrations of one or more contaminants fall within the probable and possible effects ranges. Second, biological testing may be required to assess the toxicity of sediments likely to contain unmeasured substances. In addition, ancillary biological testing is required to determine if there are systematic differences between the toxicity (as affected by bioavailability and other factors) of a substance in sediments represented in the database compared to that in Florida sediments. In some cases, the results of this biological testing will indicate a need for site-specific SQAGs to assess the potential effects of sediment-associated contaminants.

A number of tests have been developed to evaluate the biological significance of sediment contamination. These tests may be as simple as short-term bioassays involving a single contaminant using a single species, or as complex as microcosm studies in which the long-term effects of mixtures of contaminants on ecosystem dynamics are investigated. In addition, tests may be designed to assess the toxicity of whole sediments (solid phase), suspended sediments, elutriates, sediment extracts, or pore water. The organisms that are routinely tested include microorganisms, algae, aquatic macrophytes, invertebrates, and fish.

Figure 5. Aluminum normalized concentrations of lead in Apalachicola Bay sediments.



Whole sediment bioassays and pore water tests are the most relevant for assessing the effects of contaminants that are associated with bottom sediments. The ASTM presently has developed and approved four whole sediment tests for assessing the toxicity of marine and estuarine sediments. These tests (which are ten days in duration) are designed to assess the acute toxicity of sediment-associated contaminants on five species of amphipods (*Rhepoxynius abronius, Eohaustorius estuarius, Ampelisca abdita, Grandidierella japonica* and *Leptocheirus plumulosus*; ASTM 1993). These bioassays may be modified to assess toxicity to other benthic invertebrate species that occur in estuarine and marine environments, including other amphipods, other crustaceans, polychaetes, and bivalves (ASTM 1994a). In addition, procedures for conducting sediment toxicity tests with polychaetes and echinoderms are currently under consideration by the ASTM (Ingersoll 1991), and should be approved this year (C. Ingersoll. National Biological Survey. Columbia, Missouri. Personal communication).

In addition to whole sediment toxicity tests, various procedures are available for assessing the potential for adverse effects on aquatic organisms due to the resuspension of sediments or partitioning of contaminants into water (i.e., using elutriates or pore water). Perhaps the most sensitive and frequently used of these is the bacterial luminescence test (Microtox; Burton and Stemmer 1988; Schiewe *et al.* 1985); however, the environmental relevance of this test is not fully established. Tests using algae, invertebrates, and fish also have been employed to assess the toxicity of the suspended and/or aqueous phases. While no standard methods have yet been approved by the ASTM, a document on the use of oyster and echinoderm embryos and larvae in sediment toxicity testing of marine sediments (including elutriates, pore water or whole sediment) is currently in preparation (Ingersoll 1991). These latter tests, which are often conducted on pore water samples, provide very sensitive tools for assessing sediment toxicity. In addition, formal procedures for conducting water column bioassays and bioaccumulation tests have been recommended by the EPA and ACE (1991) and Lee *et al.* (1989), and a document on sediment resuspension testing is under development by ASTM (1994b).

While requirements for biological tests differ between applications, sediment toxicity tests should follow the general protocols established and approved by the ASTM. These protocols may be modified to assess toxicity to resident species, over longer time periods (i.e., to address chronic toxicity), or for different endpoints; however, the basic principles of these protocols should be followed. When ASTM methods do not exist or do not apply, the procedures used should be carefully documented to ensure that the experimental design can be evaluated and repeated by independent investigators. In addition, it is important to utilize tests that have been used in similar applications.

Other types of biological information may also be used in the sediment quality assessment process. For example, comparison of biological indicators (such as the diversity and abundance of benthic invertebrate communities) at test sites and appropriate reference sites (i.e., sites with similar depth, salinity, particle size distribution, TOC) provides a means of assessing the relative toxicity of test sediments. Various statistical procedures may be used to help identify the contaminants that are associated with observed biological effects when adequate sediment chemistry data are available. In this respect, the PELs represent reliable tools for identifying the substances that have a high likelihood of being associated with the observed biological effects. In addition, spiked-sediment bioassays may be used to establish cause and effect relationships for specific substances or mixtures of contaminants. Furthermore, tests to evaluate the toxicity of pore water provide information which may be used to identify the toxic elements of contaminated sediments (i.e., using toxicity identification evaluation procedures; Ankley and Thomas 1992). Information on levels of contaminants in aquatic biota and on bioaccumulation may help determine the significance of contaminant levels in sediments relative to the protection of human health and the health of wildlife that consume aquatic organisms.

3.7 Implement Management of Sediment Quality

The ultimate objective of the sediment quality assessment process is to provide information that supports the management of environmental quality. The management decisions that are ultimately made will depend on various factors, including the nature and severity of the contamination, the potential for exposure of aquatic organisms, the management goals for the site, the availability of remediation technology, the costs associated with remediation, and public expectations. Integration of information on these factors will enable managers and others to make defensible decisions regarding remediation, abating existing pollution sources, preventing increased contaminant loadings, or simply monitoring trends in environmental contamination.

A number of sediment quality management decisions are possible, based on consideration of available information from the environmental assessment. At some sites, evaluation of the available information will indicate that no additional action is warranted. At other sites, monitoring for assessment of trends in sediment quality may be required. At sites that are seriously contaminated, some remedial action may be necessary to achieve environmental management goals. These remedial actions could include removal and treatment of toxic materials, isolation (or capping) of contaminated sediments, implementation of source control measures, or no action at all (i.e., permit natural degradative and sedimentation processes to mitigate contaminant effects). An overview of the techniques that are available for cleaning up contaminated sediments is presented by Sullivan and Bixby (1989).

Chapter 4

An Initial Assessment of the Potential for Biological Effects of Sediment-Associated Contaminants in Florida Coastal Waters

4.0 Introduction

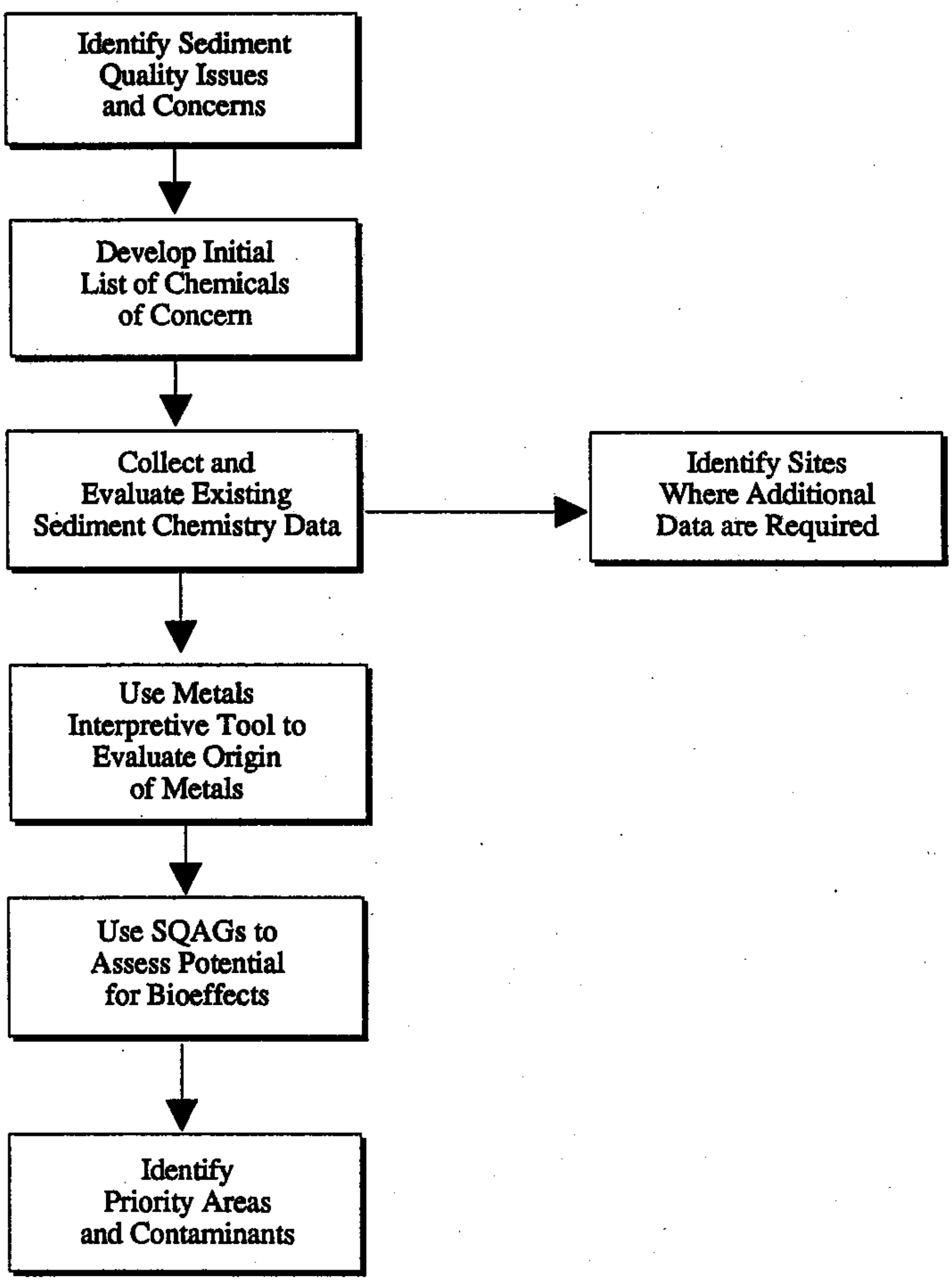
This Chapter presents an initial assessment of the potential for biological effects of sediment-associated contaminants, using Florida Department of Environmental Protection (FDEP) coastal sediment chemistry data and the sediment quality assessment guidelines (SQAGs) recommended in Volume 1 (MacDonald 1994). Although preliminary, this assessment helps focus sediment management efforts by identifying priority contaminants and priority sites with respect to the potential for adverse biological effects. The exercise also illustrates how an identification of sediment quality concerns conducted on a regional scale would help direct limited resources to yield the greatest environmental benefits.

This initial regional assessment of sediment quality consists of several parts. In Volume 1, regional sediment quality issues and concerns were identified by reviewing potential sources of contaminants in the state. Priority substances with respect to sediment contamination were subsequently identified by compiling relevant data from several sources. Next, numerical SQAGs were derived preferentially for preliminary substances of concern in Florida sediments. This chapter carries the derivation of SQAGs forward by compiling a database containing sediment chemistry data for Florida coastal waters, and comparing sediment chemistry data with the metals interpretive tool (Schropp and Windom 1988) and the SQAGs (Figure 6).

4.1 Identification of Regional Sediment Quality Issues and Concerns

In Florida, sediment quality issues and concerns are primarily associated with direct and non-point (diffuse) source discharges of contaminants from urban and suburban areas into coastal waters. These inputs include effluent discharges from wastewater treatment plants, stormwater runoff, and a variety of related sources. In addition, industrial facilities have the potential to release significant quantities of contaminants into estuarine and marine systems. Furthermore, intensive agricultural operations have the potential to contribute pesticides and fertilizers to aquatic ecosystems. Other possible sources of contaminants into Florida coastal

Figure 6. Framework for conducting preliminary regional sediment quality assessment of Florida coastal waters.



waters include leachates from landfills, dredging operations, and the operation of boat repair and moorage facilities. Each of these potential sources of contaminants was considered in identifying substances for this preliminary evaluation. A discussion of sediment quality issues and concerns, and anthropogenic influences in Florida is provided in MacDonald (1994), while a list of substances likely to be associated with coastal sediments is provided in Table 1.

4.2 Development of a Database on Sediment Chemistry in Florida

Over the past 10 years, the FDEP has conducted coastal sediment contaminant surveys in various regions throughout the state. This information has now been assembled into a database (the Florida coastal sediment contaminants database; FDEP 1994) in dBase IV™ format. This database contains information on approximately 700 stations located in estuarine and nearshore marine areas throughout Florida. While most of these stations are located in the vicinity of cities and their satellite communities, roughly 17% of the stations are located in pristine areas for the purpose of identifying natural background conditions.

There are over 11,000 miles of tidal shoreline in Florida, and the database is not representative of the full extent of the state's coastal conditions. The Florida coastal sediment contaminants database has focused on metals due to the prevalence of anthropogenic activities that generate metals-enriched wastes. The metals most commonly measured in the survey include aluminum, cadmium, chromium, copper, nickel, lead, mercury, and zinc. Typically, two samples have been collected and analyzed at each station. Organic substances are also represented in the database at a limited number of stations. In general, sampling for organic substances was conducted when land use activities suggested that there would be a high probability of detecting these substances in sediments.

4.3 Evaluate the Probable Origin of Sediment-Associated Metals

The metals interpretive tool (Schropp and Windom 1988; Schropp *et al.* 1989; Schropp *et al.* 1990) provides a reliable basis for evaluating the probable origin of sediment-associated metals. To identify the areas in which the concentrations of sediment-associated metals have been enriched anthropogenically, the metals interpretive tool was applied to the existing sediment chemistry data. In this evaluation, the preliminary areas of greatest concern were identified as those with the greatest frequency of metals concentrations that exceeded the 95% prediction limits. Similarly, the highest priority metals, with respect to anthropogenic enrichment were identified as those that frequently exceeded their respective 95% prediction limits. Pooled data for a number of sampling stations and sampling dates were used to evaluate the extent of anthropogenic metals enrichment within each geographic area. It was

Table 1. Preliminary identification of chemicals of concern in Florida coastal waters.

Substance	Reference/Rationale
Metals	
Arsenic	Long et al. (1991); FDEP (1994).
Cadmium	Long et al. (1991); FDEP (1994).
Chromium	Long and Morgan (1990); Long et al. (1991); FDEP (1994).
Copper	Used in aquatic herbicides; Long et al. (1991); Trefry et al. (1983); Leslie (1990); FDEP (1994).
Lead	Long and Morgan (1990); Long et al. (1991); FDEP (1994).
Mercury	Long and Morgan (1990); Long et al. (1991); FDEP (1994).
Nickel	Long et al. (1991); FDEP (1994).
Silver	Long and Morgan (1990); FDEP (1994).
Tributyltin	Used as an antifoulant on ships.
Zinc	Long and Morgan (1990); Long et al. (1991); FDEP (1994).
Polycyclic Aromatic Hydrocarbons (PAHs)	
Acenaphthene	Delfino et al. (1991); FDEP (1994).
Acenaphthylene	Delfino et al. (1991); FDEP (1994).
Anthracene	Long and Morgan (1990); Delfino et al. (1991); FDEP (1994).
Benz(a)anthracene	Long and Morgan (1990); Delfino et al. (1991); FDEP (1994).
Benzo(a)pyrene	Long and Morgan (1990); Delfino et al. (1991); FDEP (1994).
Chrysene	Long and Morgan (1990); Delfino et al. (1991); FDEP (1994).
Dibenzo(a,h)anthracene	Long and Morgan (1990); Delfino et al. (1991); FDEP (1994).
Fluorene	Long and Morgan (1990); Delfino et al. (1991); FDEP (1994).
Fluoranthene	FDEP (1994).
Napthalene	Long and Morgan (1990); Delfino et al. (1991); FDEP (1994).
2-methylnapthalene	Long and Morgan (1990).
Phenanthrene	Long and Morgan (1990); Delfino et al. (1991); FDEP (1994).
Pyrene	Long and Morgan (1990); Delfino et al. (1991); FDEP (1994).
Total PAHs	Long and Morgan (1990); Long et al. (1991); FDEP (1994).
Polychlorinated Biphenyls (PCBs)	
Total PCBs	Long and Morgan (1990); Long et al. (1991); Delfino et al. (1991); FDEP (1994).

Table 1. Preliminary identification of chemicals of concern in Florida coastal waters (continued).

Substance	Reference/Rationale
Pesticides	
Aldrin/Dieldrin	Long and Morgan (1990); Long et al. (1991); FDEP (1994).
Azinphos-methyl (guthion)	Organophosphorous insecticide (Kow > 10,000?)
Chlordane	Long and Morgan (1990); Long et al. (1991); FDEP (1994).
Chlorothalonil	Chlorophenyl fungicide (Kow = 20,000)
Chlorpyrifos	Organophosphorous insecticide (Kow > 50,000)
DDT and metabolites	Long and Morgan (1990); Long et al. (1991); FDEP (1994); Delfino et al. (1991).
Disulfoton	Organophosphorous insecticide (Kow > 10,000)
Endosulfan	Delfino et al. (1991); FDEP (1994).
Endrin	Organochlorine insecticide (Kow > 10,000?); FDEP (1994).
Heptachlor	Organochlorine insecticide (Kow > 10,000?); FDEP (1994).
Heptachlor epoxide	Organochlorine insecticide (Kow > 10,000?); FDEP (1994).
Lindane (gamma-BHC)	Organochlorine insecticide (Kow > 10,000?); FDEP (1994).
Mirex	Organochlorine insecticide (Kow > 10,000?); FDEP (1994).
Phorate	Organophosphorous insecticide (Kow > 10,000?).
Quintozene (PCNB)	Chlorophenyl fungicide (Kow = 10,000).
Toxaphene (alpha-BHC)	Organochlorine insecticide; FDEP (1994).
Trifluralin	Dinitroanaline herbicide (Kow > 200,000); FDEP (1994).

* Kow = Octanol-water partition coefficient which provides an indication of the hydrophobicity of a substance; Criteria for selection of pesticides: Kow > 5,000.

Chlorinated Organic Compounds	
2,3,7,8-T4CDD	Pulp and paper industry.
2,3,7,8-T4CDF	Pulp and paper industry
Pentachlorophenol	Delfino et al. (1991); FDEP (1994).
Phthalates	
Bis(2-ethylhexyl)phthalate	Delfino et al. (1991).
Dimethyl phthalate	Delfino et al. (1991).
Di-n-butylphthalate	Delfino et al. (1991).

not possible to evaluate enrichment of any of the organic contaminants measured in Florida coastal waters.

4.4 Derivation of Numerical Sediment Quality Assessment Guidelines

Effects-based SQAGs provide a basis for assessing the potential for biological effects associated with various concentrations of contaminants. In Florida, threshold (TELs) and probable effects levels (PELs) have been recommended for 34 substances or groups of substances (MacDonald 1994). These guidelines define three ranges of contaminant concentrations: a probable effects range; a possible effects range; and, a minimal effects range. The procedure used to derive these guidelines is presented in MacDonald (1994), while the uses of the SQAGs are described in Chapters 2 and 3 of this document.

4.4.1 Preliminary Areas of Concern

In the FDEP coastal contaminants database, measurements of metals levels were organized into 20 general geographic areas to facilitate this evaluation (Figure 7). While this database provides important information for evaluating sediment quality in Florida coastal waters, its broad applicability is limited by the number of samples that have been collected in certain areas. For example, fewer than ten sites have been sampled in the Jupiter, Ft. Lauderdale, and Florida Keys areas. Nonetheless, it is apparent that metals concentrations have been significantly enriched in many areas of the state.

On the Atlantic coast (Table 2), the highest frequency of exceedances of the 95% prediction limits for metals occurred in the vicinity of Miami. Cadmium, chromium, copper, lead, mercury and zinc were all anthropogenically-enriched at a large proportion of the sites sampled. Almost three-quarters of the sites had lead to aluminum enrichment ratios of greater than one, with ratios of greater than 100 observed at certain sites. Significant anthropogenic enrichment of metals was also apparent in the Jacksonville and West Palm Beach areas.

In the Gulf of Mexico (Table 3), coastal sediments in the vicinity of Tampa and Pensacola had the highest frequency of exceedances of the 95% prediction limits of the eight metals considered. The concentrations of cadmium, copper, chromium, lead, mercury, and zinc were all enriched in these areas. In Tampa Bay, more than a third of the sites had cadmium to aluminum enrichment ratios of greater than one. In Pensacola Bay, more than 20% of the sites sampled had zinc to aluminum enrichment ratios of greater than one, which indicates that a relatively high proportion of the sites have anthropogenically-enriched levels of zinc.

Figure 7. Florida Department of Environmental Protection coastal survey area map.

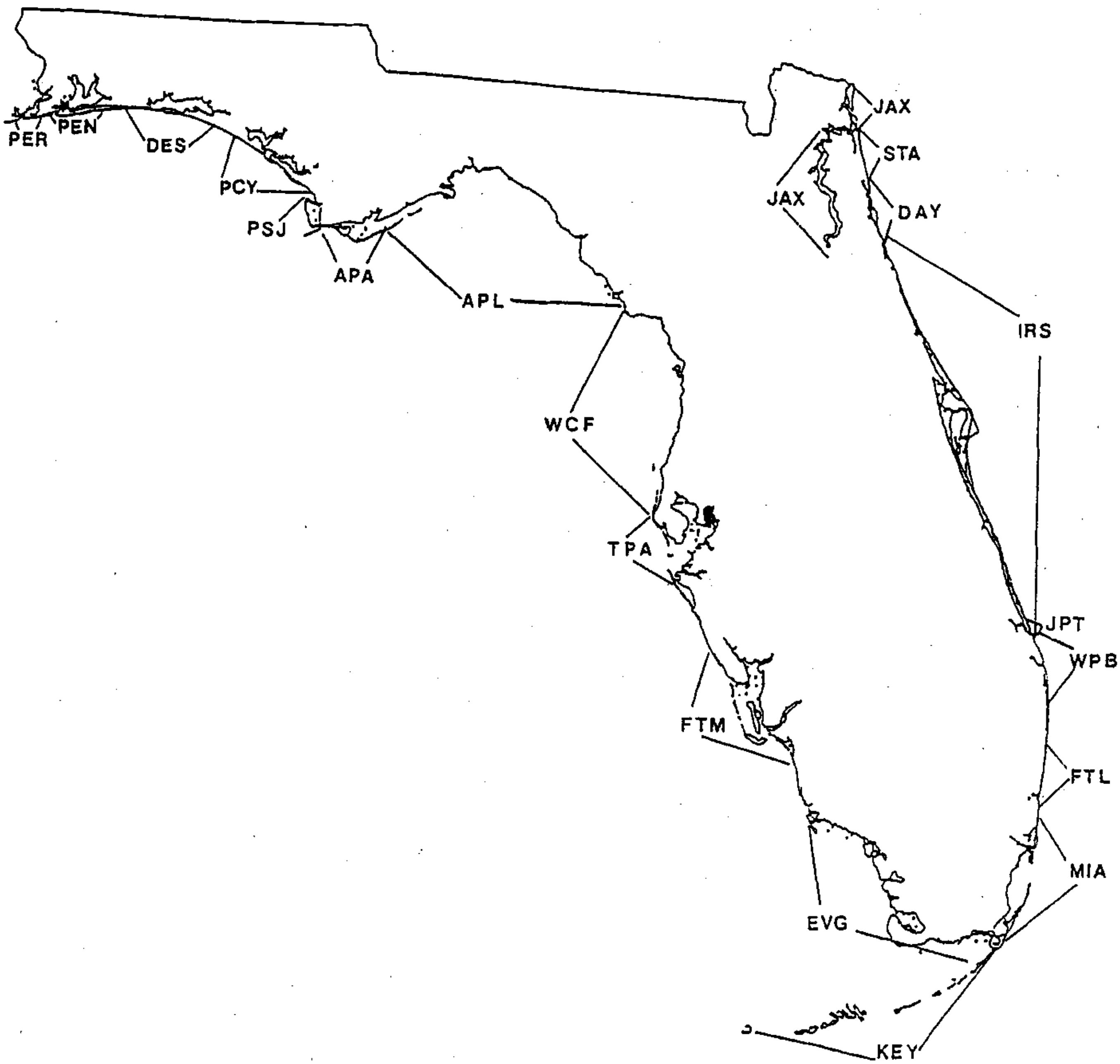


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Table 2. **Evaluation of anthropogenic-enrichment of metals levels for each Atlantic coast sampling area.**

Substance	Number of Exceedances of the 95% Prediction Limits									
	JAX	STA	DAY	IRS	JPT	WPB	FTL	MIA	KEY	Total
Metals										
Arsenic	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**4**
Cadmium	**15**	**0**	**4**	**8**	**0**	**2**	**0**	**48**	**1**	**78**
Chromium	**2**	**0**	**0**	**2**	**0**	**2**	**0**	**51**	**0**	**57**
Copper	**10**	**3**	**6**	**8**	**0**	**8**	**4**	**48**	**0**	**87**
Lead	**27**	**0**	**2**	**6**	**0**	**26**	**5**	**78**	**1**	**145**
Mercury	**25**	**1**	**0**	**9**	**0**	**6**	**2**	**55**	**2**	**100**
Nickel	**2**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**4**
Silver	-	-	-	-	-	-	-	-	-	**0**
Zinc	**27**	**0**	**0**	**6**	**0**	**23**	**5**	**20**	**2**	**83**
Number of Samples	68	37	31	86	7	27	5	110	4	558

Place names indicate the general coastal vicinity of sampling station locations.
JAX = Jacksonville; STA = St. Augustine; DAY = Daytona Beach; IRS = Indian River; JPT = Jupiter; WPB = West Palm Beach;
FTL = Ft. Lauderdale; MIA = Miami; KEY = Florida Keys.

Table 3. **Evaluation of anthropogenic-enrichment of metals levels for each Gulf coast sampling area.**

ubstance	Number of Exceedances of the 95% Prediction Limit											
	EVG	FTM	TPA	WCF	APL	APA	SJB	PCY	DES	PEN	PER	Total
Metals												
rsenic	0	0	1	1	0	0	0	0	0	1	0	3
admium	0	4	51	8	0	1	2	2	1	7	1	77
hromium	0	1	17	6	0	0	0	0	0	7	2	33
opper	0	3	14	11	0	0	1	1	1	4	0	35
ead	3	2	38	7	0	0	1	1	1	11	1	65
ercury	0	4	32	1	0	0	7	2	0	12	2	60
ickel	0	0	4	1	0	0	0	0	0	0	0	5
ilver	-	-	-	-	-	-	-	-	-	-	-	-
inc	0	3	31	6	0	1	1	1	1	18	3	65
umber of Samples	96	67	141	30	56	30	22	39	20	79	17	597

ace names indicate the general coastal vicinity of sampling station locations.
VG = Everglades; FTM = Ft. Mayers; TPA = Tampa Bay; WCF = West Central Florida; APL = Apalachee Bay; APA = Apalachichola Bay; STJ = St. Josephs Bay;
CY = Panama City; DES = Destin; PEN = Pensacola Bay; PER = Perido Bay.

9184

4.4.2 Preliminary Metals of Concern

The results of this evaluation indicate that anthropogenic-enrichment of metals levels occurs relatively frequently in Florida coastal sediments. Of the substances considered, lead was identified as the metal of greatest concern. Mercury to aluminum ratios of greater than one were observed at a total of 210 sites, with the majority of these sites located in the Atlantic coast (145 of 210). Somewhat lower frequencies of exceedance of the 95% prediction limits were observed for cadmium (155), mercury (160), and zinc (148). Once again, the highest frequency of metals enrichment was observed on the Atlantic coast. In contrast, the metals to aluminum ratios for arsenic and nickel rarely exceeded one, indicating that these metals represent minor concerns with respect to sediment contamination. Chromium and copper were enriched at 90 and 122 sites, respectively. For these two metals, the highest frequency of enrichment was observed on the Atlantic coast.

4.5 Assessment of the Potential for Biological Effects of Sediment-Associated Contaminants

The existing sediment chemistry data were used in conjunction with the recommended SQAGs to conduct an initial assessment of the potential for adverse biological effects in Florida coastal sediments. This assessment was conducted by screening the FDEP coastal sediment chemistry database (FDEP 1994) using the SQAGs. In this way, the sites with contaminant concentrations that exceeded the probable effects level and the threshold effects level, respectively, could be readily identified. The highest priority areas with respect to sediment contamination were identified as those with the greatest frequency of contaminant concentrations within the probable effects ranges. The highest priority substances with respect to sediment contamination were identified as those that frequently occurred at concentrations within the probable effects ranges. For metals, the areas and contaminants of greatest concern were those that had concentrations that were known to be anthropogenically enriched and that were likely to be associated with biological effects. Pooled data for a number of sampling stations and sampling dates were used to assess sediment quality within each geographic area.

4.5.1 Areas of Concern in Florida Coastal Waters

Chemical measurements in the FDEP database were organized into 20 general geographic areas in this initial assessment of sediment quality (Figure 7). Although evaluation of the database provides insight into sediment quality conditions at sites within these areas, this initial assessment is constrained by data limitations for some areas. For example, data on levels of metals were available for less than ten sites in the Jupiter, Ft. Lauderdale and

Florida Keys areas. Even more severe limitations on the data were apparent when PAHs, PCBs, pesticides and other organic contaminants were considered (see Tables 4-7). In spite of these limitations, it is apparent that sediment quality represents a significant environmental concern in a number of locations within the state.

On the Atlantic coast (Table 4), coastal sediments in the vicinity of Miami had the highest frequency of contaminant concentrations within the **probable** effects ranges. Copper, lead, mercury, silver zinc, phenanthrene, chrysene, pyrene and total PCBs were all present at concentrations that are considered to represent significant hazards to aquatic organisms. In addition, several PAHs were present at levels in excess of their respective PELs in the Jacksonville and Daytona Beach areas; these included benz(a)anthracene, fluoranthene, phenanthrene, and pyrene. Concentrations of several metals also fell within the probable effects range in the Jacksonville and Indian River areas.

All of the Atlantic coastal areas surveyed, with the exception of the Jupiter area, had concentrations of one or more contaminants that fell within the **possible** effects range (Table 5). The greatest number of exceedances were observed in the Miami area, reflecting both the degree of contamination and the total number of samples collected within the area. Metals appear to represent the greatest hazard to aquatic organisms on the Atlantic coast of Florida; however, PAHs and PCBs have also been detected at levels of concern in many areas. Elevated levels of two DDT degradation products (i.e., DDD and DDE) were recorded in the Ft. Lauderdale area. The total number of samples and the number of exceedances of the SQAGs for each area on the Atlantic coast are presented in Tables 4 and 5.

Coastal sediments in the Gulf of Mexico appeared to be somewhat less contaminated than sediments on the Atlantic coast of Florida (Table 6). The greatest frequency of exceedance within the **probable** effects range occurred in Tampa Bay, with arsenic, cadmium, copper, chromium, lead, and zinc being the principal contaminants of concern in this area. Several other sampling programs have indicated that PAHs and pesticides are present at levels of concern in Tampa Bay, however (Long and Morgan 1990; E. Long. NOAA. Seattle, Washington. Personal communication). Elevated levels of several metals (i.e., $\geq$ PEL) have also been observed in Pensacola Bay and the Panama City area. Pensacola Bay also had multiple exceedances of the SQAGs for several PAHs, including benz(a)anthracene, fluoranthene, and pyrene. While concentrations of organic contaminants rarely fell within the probable effects ranges along the Gulf coast, this region has been only infrequently sampled for this class of analytes.

All of the areas surveyed along the Gulf coast had concentrations of four or more contaminants that fell within the **possible** effects ranges (Table 7). The greatest number of observations within the possible effects ranges occurred in Tampa Bay; this reflects the level of sampling effort that has been directed at this area, as well as the level of contamination. The other main areas of concern in terms of metals contamination are Pensacola Bay, Panama City, Perdido Bay, and West Central Florida. Elevated levels of PAHs and PCBs were also observed in Pensacola Bay and Perdido Bay. Significantly more sampling effort is required

Table 4. Number of samples that fall within the probable effects range (i.e., >= PEL) of contaminant concentrations for each Atlantic coast sampling area.

Substance	Number of Observations Within the Probable Effects Range									
	JAX	STA	DAY	IRS	JPT	WPB	FTL	MIA	KEY	Total
Metals										
Arsenic	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**
Cadmium	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**
Chromium	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**0**	**4**
Copper	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14**	**0**	**14**
Lead	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**21**	**0**	**21**
Mercury	**1**	**0**	**0**	**4**	**0**	**1**	**1**	**29**	**0**	**36**
Nickel	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
Silver	**3**	**0**	**0**	**3**	**0**	**0**	**0**	**11**	**0**	**17**
Zinc	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**9**	**0**	**9**
Number of Samples	68	37	31	86	7	27	5	110	4	375
Polycyclic Aromatic Hydrocarbons (PAHs)										
Acenaphthene	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**10**
Acenaphthylene	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**2**
Anthracene	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**4**
Benz(a)anthracene	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**7**	**0**	**8**
Benzo(a)pyrene	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**9**
Chrysene	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15**	**0**	**15**
Dibenzo(a,h)anthracene	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**2**
Fluoranthene	**3**	**0**	**3**	**0**	**0**	**0**	**0**	**9**	**0**	**15**
Fluorene	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
2-methylnaphthalene	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Naphthalene	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**
Phenanthrene	**2**	**0**	**4**	**0**	**0**	**0**	**0**	**10**	**0**	**16**
Pyrene	**4**	**0**	**1**	**0**	**0**	**0**	**0**	**10**	**0**	**15**
Number of Samples	34	2	6	7	0	6	4	66	0	125

'able 4. Number of samples that fall within the probable effects range (i.e., >= PEL) of contaminant concentrations for each Atlantic coast sampling area (continued).

ubstance	Number of Observations Within the Probable Effects Range									
	JAX	STA	DAY	IRS	JPT	WPB	FTL	MIA	KEY	Total
Pesticides										
ldrin	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
zinophosmethyl (Guthion)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
hlordane	2	0	0	0	0	0	0	3	0	5
hlorthalonil	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
hlorpyrifos	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
p'-DDD	0	0	0	0	0	0	1	0	0	1
p'-DDE	0	0	0	0	0	0	0	0	0	0
p'-DDT	0	0	0	0	0	0	1	3	0	4
ieldrin	0	0	0	0	0	0	0	0	0	0
isulfoton	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ıdosulfan	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
eptachlor	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
eptachlor epoxide	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ndane (gamma-BHC)	0	0	0	0	0	0	0	0	0	0
ıorate	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ıintozene (PCNB)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
›xaphene (alpha-BHC)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ifluralin	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ımber of Samples	47	3	6	21	0	11	5	78	0	171
Polychlorinated Biphenyls (PCBs)										
›tal PCBs	0	0	0	0	0	0	0	7	0	7
ımber of Samples	47	3	6	21	0	11	5	78	0	171

i = no guideline; insufficient data to derive sediment assessment quality guidelines.
ce names indicate the general coastal vicinity of sampling station locations.
X = Jacksonville; STA = St. Augustine; DAY = Daytona Beach; IRS = Indian River; JPT = Jupiter; WPB = West Palm Beach; FTL = Ft. Lauderdale; A = Miami; KEY = Florida Keys.

Table 5. Number of samples that fall within the possible effects range (i.e., > TEL and < PEL) of contaminant concentrations for each Atlantic coast sampling area.

Substance	Number of Observations Within the Possible Effects Range									
	JAX	STA	DAY	IRS	JPT	WPB	FTL	MIA	KEY	Total
Metals										
Arsenic	**17**	**14**	**9**	**8**	**0**	**2**	**0**	**16**	**0**	**66**
Cadmium	**15**	**0**	**2**	**13**	**0**	**1**	**0**	**26**	**0**	**57**
Chromium	**7**	**8**	**1**	**14**	**0**	**0**	**0**	**31**	**0**	**61**
Copper	**27**	**9**	**12**	**23**	**0**	**1**	**2**	**23**	**0**	**97**
Lead	**22**	**0**	**1**	**12**	**0**	**2**	**2**	**19**	**0**	**58**
Mercury	**33**	**1**	**6**	**15**	**0**	**6**	**1**	**32**	**4**	**98**
Nickel	**7**	**5**	0	**7**	**0**	**1**	**0**	**1**	**0**	**21**
Silver	**2**	**0**	**0**	**2**	**0**	**0**	**0**	**6**	**0**	**10**
Zinc	**9**	**0**	**1**	**8**	**0**	**0**	**0**	**10**	**0**	**28**
Number of Samples	68	37	31	86	7	27	5	110	4	375
Polycyclic Aromatic Hydrocarbons (PAHs)										
Acenaphthene	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**
Acenaphthylene	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**
Anthracene	**6**	**0**	**0**	**0**	**0**	**1**	**2**	**4**	**0**	**13**
Benz(a)anthracene	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Benzo(a)pyrene	**4**	**0**	**0**	**0**	**0**	**3**	**1**	**9**	**0**	**17**
Chrysene	**7**	**0**	**0**	**0**	**0**	**0**	**1**	**6**	**0**	**14**
Dibenzo(a,h)anthracene	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Fluoranthene	**16**	**2**	**3**	**0**	**0**	**6**	**1**	**25**	**0**	**53**
Fluorene	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**3**
2-methylnaphthalene	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**
Naphthalene	**6**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**7**
Phenanthrene	**1**	**2**	**2**	**0**	**0**	**0**	**0**	**5**	**0**	**10**
Pyrene	**12**	**0**	**2**	**0**	**0**	**3**	**2**	**19**	**0**	**38**
Number of Samples	34	2	6	7	0	6	4	66	0	125

'able 5. Number of samples that fall within the possible effects range (i.e., > TEL and < PEL) of contaminant concentrations for each Atlantic coast sampling area (continued).

	Number of Observations Within the Possible Effects Range									
ıbstance	JAX	STA	DAY	IRS	JPT	WPB	FTL	MIA	KEY	Total
Pesticides										
ldrin	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
zinophosmethyl (Guthion)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
hlordane	0	0	0	0	0	0	0	0	0	0
hlorthalonil	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
hlorpyrifos	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
p'-DDD	0	0	0	0	0	0	2	0	0	2
p'-DDE	0	0	0	0	0	0	3	0	0	3
p'-DDT	0	0	0	0	0	0	0	0	0	0
ieldrin	0	0	0	0	0	0	0	0	0	0
isulfoton	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ıdosulfan	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
:ptachlor	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
:ptachlor epoxide	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ndane (gamma-BHC)	0	0	0	0	0	0	0	0	0	0
ıorate	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ıintozene (PCNB)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
›xaphene (alpha-BHC)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ifluralin	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ımber of Samples	47	3	6	21	0	11	5	78	0	171
Polychlorinated Biphenyls (PCBs)										
›tal PCBs	2	0	4	0	0	0	0	6	0	12
ımber of Samples	47	3	6	21	0	11	5	78	0	171

; = no guideline; insufficient data to derive sediment quality assessment guidelines.
ıce names indicate the general coastal vicinity of sampling station locations.
X = Jacksonville; STA = St. Augustine; DAY = Daytona Beach; IRS = Indian River; JPT = Jupiter; WPB = West Palm Beach; FTL = Ft. Lauderdale; A = Miami; KEY = Florida Keys.

Table 6. Number of samples that fall within the probable effects range (i.e., >= PEL) of contaminant concentrations for each Gulf coast sampling area.

Substance	Number of Observations Within the Probable Effects Range											
	EVG	FTM	TPA	WCF	APL	APA	SJB	PCY	DES	PEN	PER	Total
Metals												
Arsenic	0	0	9	1	0	1	0	0	0	1	0	12
Cadmium	0	0	2	0	0	0	0	0	0	1	0	3
Chromium	0	1	13	1	0	0	0	0	0	8	2	25
Copper	0	0	3	1	0	0	0	2	0	1	0	7
Lead	0	0	7	0	0	0	0	0	0	2	0	9
Mercury	0	0	6	1	0	0	1	1	0	4	0	13
Nickel	0	0	1	0	0	0	0	0	0	0	0	1
Silver	0	0	0	0	1	0	0	0	1	0	0	2
Zinc	0	0	4	0	0	0	0	0	0	4	0	8
Number of Samples	96	67	141	30	56	30	22	39	20	79	17	597
Polycyclic Aromatic Hydrocarbons (PAHs)												
Acenaphthene	0	0	0	0	0	0	0	0	0	1	1	2
Acenaphthylene	0	0	0	0	0	0	0	0	0	0	0	0
Anthracene	0	0	0	0	0	0	0	0	0	1	0	1
Benz(a)anthracene	0	0	0	0	0	0	0	0	0	5	0	5
Benzo(a)pyrene	0	0	0	0	0	0	0	0	0	2	1	3
Chrysene	0	0	0	0	0	0	0	0	0	0	0	0
Dibenzo(a,h)anthracene	0	0	0	0	0	0	0	0	0	0	0	0
Fluoranthene	0	0	0	0	0	0	0	0	0	3	0	3
Fluorene	0	0	0	0	0	0	0	0	0	0	0	0
2-methylnaphthalene	0	0	0	0	0	0	0	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0	0	0	0	0
Phenanthrene	0	0	0	0	0	0	0	0	0	2	0	2
Pyrene	0	0	0	0	0	0	0	0	1	7	2	10
Number of Samples	3	12	11	0	0	0	0	0	3	29	9	67

able 6. **Number of samples that fall within the probable effects range (i.e., >= PEL) of contaminant concentrations for each Gulf coast sampling area (continued).**

ubstance	Number of Observations Within the Probable Effects Range											
	EVG	FTM	TPA	WCF	APL	APA	SJB	PCY	DES	PEN	PER	Total
Pesticides												
ldrin	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
zinophosmethyl (Guthion)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
hlordane	0	0	0	0	0	0	0	0	0	1	0	1
hlorthalonil	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
hlorpyrifos	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
,p'-DDD	0	0	0	0	0	0	0	0	0	0	0	0
,p'-DDE	0	0	0	0	0	0	0	0	0	0	0	0
,p'-DDT	0	0	0	0	0	0	0	0	0	0	0	0
ieldrin	0	0	0	0	0	0	0	0	0	0	0	0
isulfoton	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ndosulfan	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
eptachlor	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
eptachlor epoxide	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
indane (gamma-BHC)	0	0	0	0	0	0	0	0	0	0	0	0
horate	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
uintozene (PCNB)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
oxaphene (alpha-BHC)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
rifluralin	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
umber of Samples	3	8	24	0	0	0	5	3	3	29	7	82
Polychlorinated Biphenyls (PCBs)												
otal PCBs	0	0	0	0	0	0	0	0	0	0	0	0
umber of Samples	3	8	24	0	0	0	5	3	3	29	7	82

G = no guideline; insufficient data to derive sediment quality assesment guidelines.

ace names indicate the general coastal vicinity of sampling station locations.

VG = Everglades; FTM = Ft. Mayers; TPA = Tampa Bay; WCF = West Central Florida; APL = Apalachee Bay; APA = Apalachichola Bay; STJ = St. Josephs Bay;
CY = Panama City; DES = Destin; PEN = Pensacola Bay; PER = Perido Bay.

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Table 7. Number of samples that fall within the possible effects range (i.e., > TEL and < PEL) of contaminant concentrations for each Gulf coast sampling area.

Substance	Number of Observations Within the Possible Effects Range											
	EVG	FTM	TPA	WCF	APL	APA	SJB	PCY	DES	PEN	PER	Total
Metals												
Arsenic	7	1	16	3	6	7	5	11	4	20	8	88
Cadmium	0	3	51	4	2	0	3	3	1	6	2	75
Chromium	1	1	35	8	2	5	7	10	4	20	2	95
Copper	1	3	33	10	0	5	5	4	3	16	3	83
Lead	0	2	26	1	0	4	3	5	3	9	2	55
Mercury	2	6	43	5	3	0	6	5	1	15	3	89
Nickel	1	0	20	2	0	6	5	7	2	4	2	49
Silver	0	0	14	0	0	0	0	6	1	0	0	21
Zinc	0	1	18	1	0	0	0	1	1	14	1	37
Total Number of Samples	96	67	141	30	56	30	22	39	20	79	17	597
Polycyclic Aromatic Hydrocarbons (PAHs)												
Acenaphthene	0	0	0	0	0	0	0	0	0	0	0	0
Acenaphthylene	0	0	0	0	0	0	0	0	0	0	0	0
Anthracene	0	0	0	0	0	0	0	0	0	4	0	4
Benz(a)anthracene	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a)pyrene	0	0	0	0	0	0	0	0	0	12	2	14
Chrysene	0	0	0	0	0	0	0	0	0	1	5	6
Dibenzo(a,h)anthracene	0	0	0	0	0	0	0	0	0	0	0	0
Fluoranthene	0	0	0	0	0	0	0	0	0	10	4	14
Fluorene	0	0	0	0	0	0	0	0	0	0	0	0
2-methylnaphthalene	0	0	0	0	0	0	0	0	0	0	0	0
Naphthalene	0	0	0	0	0	0	0	0	0	1	1	2
Phenanthrene	0	0	0	0	0	0	0	0	0	8	2	10
Pyrene	0	0	0	0	0	0	0	0	0	10	4	14
Total Number of Samples	3	12	11	0	0	0	0	0	3	29	9	67

able 7. Number of samples that fall within the possible effects range (i.e., > TEL and < PEL) of contaminant concentrations for each Gulf coast sampling area (continued).

ubstance	Number of Observations Within the Possible Effects Range											
	EVG	FTM	TPA	WCF	APL	APA	SJB	PCY	DES	PEN	PER	Total
Pesticides												
ldrin	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
zinophosmethyl (Guthion)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
hlordane	0	0	0	0	0	0	0	0	0	0	0	0
hlorthalonil	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
hlorpyrifos	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
,p'-DDD	0	0	0	0	0	0	0	0	0	0	0	0
,p'-DDE	0	0	0	0	0	0	0	0	0	0	0	0
,p'-DDT	0	0	0	0	0	0	0	0	0	2	0	2
ieldrin	0	0	0	0	0	0	0	0	0	0	0	0
isulfoton	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
ndosulfan	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
eptachlor	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
eptachlor epoxide	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
indane (gamma-BHC)	0	0	0	0	0	0	0	0	0	0	0	0
horate	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
uintozene (PCNB)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
oxaphene (alpha-BHC)	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
rifluralin	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG
otal Number of Samples	3	8	24	0	0	0	5	3	3	29	7	82
Polychlorinated Biphenyls (PCBs)												
otal PCBs	0	2	0	0	0	0	0	0	0	6	0	8
otal Number of Samples	3	8	24	0	0	0	5	3	3	29	7	82

3 = no guideline; insufficient data to derive sediment quality assessment guidelines.
ice names indicate the general coastal vicinity of sampling station locations.
/G = Everglades; FTM = Ft. Mayers; TPA = Tampa Bay; WCF = West Central Florida; APL = Apalachee Bay; APA = Apalachichola Bay; STJ = St. Josephs Bay;
:Y = Panama City; DES = Destin; PEN = Pensacola Bay; PER = Perido Bay.

to fully evaluate contamination of coastal sediments by organic substances in the Gulf of Mexico region of Florida. The total number of samples and the number of exceedances of the SQAGs for each area on the Gulf coast are presented in Tables 6 and 7.

4.5.2 Contaminants of Concern in Florida Coastal Waters

The contaminants of greatest concern in Florida coastal waters were identified by screening the data in the FDEP (1994) coastal sediment chemistry database with the SQAGs recommended by MacDonald (1994). For each substance, the percent of the total number of samples that had concentrations that fell within the probable (i.e., ≥ PEL) and possible (i.e., ≥ TEL and < PEL) effects ranges was calculated. Contaminants with concentrations that equalled or exceeded the PEL in many samples (i.e., 5%) were considered to be of greatest concern. The contaminants which had a high incidence (i.e., ≥ 10%) of concentrations within the possible effects range and one or more exceedance of the PEL were considered to be of somewhat lower priority (Table 8).

On the Atlantic coast, lead, mercury, acenaphthene, benz(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, phenanthrene, and pyrene were considered to be the highest priority contaminants. In general, the PAHs had the highest percent incidence of concentrations within the probable effects range. Arsenic, cadmium, chromium, copper, and anthracene were also considered to be contaminants of concern, albeit of lower priority than the substances listed above.

Elevated levels of toxic substances were somewhat less common on the Gulf coast of Florida than on the Atlantic coast. Only two substances had a high incidence of concentrations within the probable effects range, benz(a)anthracene and pyrene. The lower priority contaminants of concern included arsenic, cadmium, chromium, copper, mercury, chrysene, fluoranthene, phenanthrene, and total PCBs. It was not possible to evaluate the relative importance of the 17 preliminary contaminants of concern (see MacDonald 1994) for which SQAGs were not available.

4.6 Summary

The initial assessment of the potential for observing adverse biological effects has been conducted to identify areas and contaminants of concern in Florida coastal sediments. The results of this evaluation suggest that the areas in the vicinity of Miami, Jacksonville, Tampa, and Pensacola should be considered to be the highest priority for conducting further investigations, including bioassessments. As surveys have recently been completed in Tampa Bay and Pensacola Bay, the highest priority areas for new studies are Biscayne Bay and the St. Johns River. Overall, benzo(a)pyrene and pyrene are considered to be the highest priority

Table 8. Percent of sediment quality samples with contaminant concentrations that exceed the sediment quality assessment guidelines.

Substance	Atlantic Coast		Gulf Coast	
	>= PEL (%)	>=TEL; <PEL (%)	>= PEL (%)	>=TEL; <PEL (%)
Metals				
Arsenic	0.8	17.6	2	14.7
Cadmium	0.5	15.2	0.5	12.6
Chromium	1	16.3	4.2	15.9
Copper	3.7	25.9	1.1	13.9
Lead	5.6	15.5	1.5	9.2
Mercury	9.6	26.1	2.2	14.9
Nickel	0.3	5.6	0.2	8.2
Silver	4.5	2.7	0.3	3.5
Zinc	2.4	7.5	1.3	6.2
Polycyclic Aromatic Hydrocarbons (PAHs)				
Acenaphthene	8	2.4	3	0
Acenaphthylene	1.6	0.8	0	0
Anthracene	3.2	10.4	1.5	6
Benz(a)anthracene	6.4	0	8.9	0
Benzo(a)pyrene	7.2	13.6	4.5	20.9
Chrysene	12	11.2	0	23.9
Dibenzo(a,h)anthracene	1.6	0	0	0
Fluoranthene	12	42.4	4.5	20.9
Fluorene	1.6	2.4	0	0
2-methylnaphthalene	0	0.8	0	0
Naphthalene	1.6	5.6	0	3
Phenanthrene	12.8	8	3	14.9
Pyrene	12	30.4	14.9	20.9

Table 8. Percent of sediment quality samples with contaminant concentrations that exceed the sediment quality assessment guidelines (continued).

Substance	Atlantic Coast >= PEL (%)	Atlantic Coast >=TEL; <PEL (%)	Gulf Coast >= PEL (%)	Gulf Coast >=TEL; <PEL (%)
Pesticides				
Chlordane	2.9	0	1.3	0
p,p'-DDD	0.6	1.2	0	0
p,p'-DDE	0	1.8	0	0
p,p'-DDT	2.3	0	0	2.5
Total DDE	0	0	0	0
Lindane (gamma-BHC)				
Polychlorinated Biphenyls (PCBs)				
Total PCBs	4.1	8.2	0	10

PEL = Probable Effect Level; TEL = Threshold Effect Level contaminants; however, lead, mercury, acenaphthene, benz(a)anthracene, chrysene, fluoranthene, and phenanthrene are important on the Atlantic coast. Interestingly, the levels of arsenic at several sites exceed the PELs, yet are not anthropogenically-enriched.

While this initial assessment of sediment quality provides an indication of the potential for biological effects of sediment-associated contaminants, these results should not be used, by themselves, to make management decisions regarding sediment quality. Several limitations of this assessment are identified to emphasize this point. The sediment chemistry database used in this assessment has broad coverage; however, the data on many analytes are limited. As such, several of the constituents that are likely to be found in Florida sediments were not measured in the FDEP surveys. Much of the data on levels of organic contaminants is relatively old (greater than 5 years old) and, therefore, of questionable value with respect to reflecting present conditions. In addition, the extent to which the available data accurately reflect the spatial variability in sediment quality conditions is largely unknown. For these reasons, comparable data collected by others such as the EPA Environmental Monitoring and Assessment Program (EMAP), Delfino *et al.* (1991), and by NOAA (NSTP) should be evaluated to provide a more comprehensive assessment of sediment quality.

For metals, the results of the assessment of the potential for biological effects must be considered in light of the evaluation of the probable origin of these substances. In general, there was a high degree of agreement between the evaluations conducted using the SQAGs and the metals interpretive tool. Significant anthropogenic-enrichment was observed in association with exceedance of the PELs for most chemicals and at most sites. Therefore, the results of the evaluation of areas of concern and contaminants of concern conducted using the PELs can be considered to be reliable. However, poor concordance between the two evaluations was observed for arsenic. Only two of the 15 sites with arsenic concentrations greater than the PEL were anthropogenically enriched. Therefore, arsenic should not be considered as a contaminant of high concern in Florida. In addition, high background levels of several metals in West Central Florida and nearby Panama City are indicated by the exceedances of PELs, but not the 95% prediction limits. Therefore, these areas should not be considered to be high priority areas of concern, based on metal concentrations alone.

Chapter 5

Recommendations

5.1 Recommendations

The following recommendations are offered to assist the FDEP in identifying priorities for supporting the application of the SQAGs. General recommendations for improving the technical soundness of the SQAGs are identified in Volume 1 (MacDonald 1994).

5.1.1 Applications of the Sediment Quality Assessment Guidelines

The recommended SQAGs represent powerful tools for assessing sediment quality in a number of applications in Florida. However, further guidance is required to define the role of the SQAGs in several, high priority applications. Specifically, a detailed Users Manual is required to describe how the SQAGs should be used in various state programs. In addition, guidance is needed on the derivation of site-specific sediment quality remediation objectives (i.e., target cleanup levels) at contaminated sites. Furthermore, procedures for conducting ecological risk assessments at sites with contaminated sediments should be developed. Lastly, seminars or workshops to provide assistance to SQAG users should be conducted to ensure that these management tools are used appropriately in Florida.

5.1.2 Site-Specific Assessment of Sediment Quality

The recommended approach for assessing sediment quality in Florida is based on the identification of three ranges of contaminant concentrations: the minimal effects range; the possible effects range; and, the probable effects range. This approach was selected to explicitly account for uncertainties associated with evaluating the available data linking contaminant concentrations with adverse biological effects. When contaminant concentrations fall within the probable effects range at a particular site, there is a high probability that adverse biological effects will be observed. These sites should be given highest priority for further investigations.

Effects-based SQAGs should not be used alone to make contaminated sediment management decisions. Ancillary tools, such as the FDEP metals interpretive tool (Schropp and Windom 1988), should be used to determine the probable origin of sediment-associated contaminants. In addition, uncertainty regarding the potential for biological effects of sediment-associated contaminants at specific locations should be addressed by implementing appropriate biological investigations. These tools, when used together, will provide an efficient and effective basis for making contaminated sediment management decisions.

5.1.3 Regional Assessment of Sediment Quality

The initial assessment of Florida coastal sediments provides a basis for identifying priority areas and contaminants for consideration in further investigations. However, the initial assessment is considered to be preliminary because it is based on data generated in FDEP coastal contaminants surveys, which have several limitations. First, insufficient data were available to conduct a reliable assessment in many areas of the state. Second, only limited data are available on levels of organic contaminants in most areas of Florida. Third, much of the available data on levels of metals and organic contaminants are several years old and may not accurately reflect present conditions. Nonetheless, this assessment emphasizes the urgent need to conduct further investigations, including biological tests, in the vicinity of Miami. Additional surveys may also be needed in the Jacksonville and West Palm Beach areas to assess sediment quality and evaluate the predictability of the SQAGs.

A list of priority contaminants in coastal sediments was developed from existing sediment quality data and information on land and water use patterns in Florida. However, insufficient information currently exists to determine the distribution of many of these contaminants in Florida sediments. Therefore, an expanded suite of analytes (to reflect contaminant inputs) should be incorporated into site-specific sediment quality monitoring programs. Such programs should be expanded to include the persistent pesticides that are used or have been used in an area, as well as the specific industrial chemicals that are present in wastewater effluents.

As mentioned elsewhere in this document, SQAGs alone are not adequate to reliably predict biological effects in contaminated sediments. At some sites, unmeasured contaminants may represent significant concerns with respect to evaluating potential biological effects. This is especially true when available sediment chemistry data do not adequately reflect the likely sources of contaminants. In these situations, additional chemical and biological testing may be required to resolve uncertainties over the potential for biological effects. In addition, further field studies are required to evaluate the applicability of the SQAGs for arsenic, which are exceeded in a number of sites that are not anthropogenically-enriched.

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Approach to the Assessment of Sediment Quality in Florida Coastal Waters

Volume 2 - Application of the Sediment Quality Assessment Guidelines

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Chapter 1

Introduction

Public awareness of the quality of coastal waters has been raised in recent years as a result of the information that has been disseminated on these systems. For example, Bolton *et al.* (1985) reported that environmental contamination in freshwater, estuarine, and marine ecosystems was widespread throughout North America. More recent data, collected by the National Oceanic and Atmospheric Administration (NOAA) National Status and Trends Program (NSTP), indicates that levels of contaminants, in general, have begun to decrease in coastal waters (O'Connor 1990). Nonetheless, many coastal waters continue to receive discharges of contaminants from non-point and point sources, resulting in elevated and biologically significant concentrations of many contaminants in urbanized estuaries throughout the United States.

Traditionally, the management of aquatic resources in coastal waters focused primarily on water quality. However, the importance of sediments in determining the fate and effects of a wide variety of contaminants has become more apparent in recent years (Long and Morgan 1990). In addition to providing a habitat for many organisms, sediments are important because many toxic substances found only in trace amounts in water may accumulate to elevated levels in them. As such, sediments serve both as reservoirs and as potential sources of contaminants to the water column. As well as their potential to degrade surface water quality, sediment-associated contaminants have the potential to affect benthic and other sediment-associated organisms directly (Chapman 1989). Therefore, sediment quality data provide essential information for evaluating ambient environmental quality conditions in aquatic ecosystems.

Over the past 10 years, Florida Department of Environmental Protection (FDEP) and others have collected a substantial quantity of information on the chemical composition of Florida coastal sediments. Preliminary assessment of these data indicates that numerous areas in Florida are contaminated by metals (such as lead, silver, and mercury) and organic substances (such as polycyclic aromatic hydrocarbons and pesticides). However, sediment chemistry data alone do not provide an adequate basis for identifying or managing potential sediment quality problems in the state. Biologically-based **sediment quality assessment guidelines** (SQAGs) also are required to interpret the significance of sediment chemistry data.

1.1 Purpose of the Report

The purpose of this report is to recommend a scientifically defensible framework for assessing the biological significance of sediment-associated contaminants. Numerical SQAGs are integral to this framework, providing the basis for assessing ***potential*** effects of sediment-associated contaminants. A variety of approaches for deriving sediment quality assessment values were reviewed to identify those that would be applicable to Florida coastal conditions. The results of this review indicate that each approach has deficiencies which limit its direct application in Florida. For this reason, an integrated strategy for deriving numerical SQAGs is recommended for the state of Florida. The recommended strategy is designed to provide relevant assessment tools in the near-term and allows for refining these guidelines as additional data become available.

Using the recommended approach, numerical SQAGs were developed for assessing sediment quality in Florida coastal waters. These guidelines were derived using information from numerous investigations of coastal sediment quality conducted in North America and are based on a weight of evidence that links contaminant concentrations with adverse biological effects. In this respect, the guidelines are a cost-effective response to a practical need for assessment tools. However, these guidelines are should be revised or refined depending on the results of field validation and other related studies conducted in Florida and elsewhere in North America. These guidelines should be used in conjunction with other interpretive tools to conduct comprehensive and reliable assessments.

1.2 Description of the Recommended Approach for Deriving Numerical Sediment Quality Assessment Guidelines

The recommended approach for deriving numerical SQAGs is described in Chapter 4. This approach is considered to be the most practical for use in Florida because:

- It can be implemented in the near-term;
- It can be implemented using existing data;
- It provides a ***weight of evidence*** from numerous biological effects-based approaches for determining associations between chemical quality and biological effects;
- It provides assessment tools or guidelines that define ***ranges of contaminant concentrations*** that can be used to evaluate sediment quality data. Specifically, these guidelines define ranges of concentrations that are usually or always, frequently, and rarely or

never associated with adverse biological effects. These ranges are considered to be more practical than single values for assessing sediment quality in the diverse conditions found along Florida's extensive coast;

- It provides summaries of the data that were used to derive the assessment guidelines. These summaries are useful for evaluating the biological significance of contaminant concentrations within these ranges; and,

- It has long-term applicability in Florida since it can be verified and refined with additional data, particularly with data from the southeast.

A detailed discussion of the strengths of this approach is provided in Section 5.4.

Sediment quality assessment guidelines derived using the recommended approach should be refined as new information becomes available. Several limitations and precautions in using this approach are identified as follows:

- The approach is designed to determine the <u>potential</u> for sediment-associated contaminants to induce biological effects. Direct cause and effect relationships should not be inferred when comparing chemical data to the recommended guidelines;

- The SQAGs are applicable to marine and estuarine waters only; they are not applicable to freshwater systems;

- The SQAGs are not expressed in terms of the factors that are thought to control the bioavailability of sediment-associated contaminants [i.e., total organic carbon (TOC) for non-polar organics and acid volatile sulfide (AVS) for divalent metals];

- The data that have been used to derive the SQAGs consist primarily of the results of acute toxicity studies. This reflects the general lack of data on the chronic responses of aquatic organisms to contaminants that are associated with sediments;

- The recommended guidelines should be used in conjunction with other assessment tools and protocols, such as the FDEP metals interpretive tool (Schropp and Windom 1988) and the Green Book (EPA and ACE 1991) to provide comprehensive evaluations of sediment quality; and,

- The recommended guidelines were developed using information from a variety of North American coastal locations. It is uncertain if these data are representative of the wide range of sediment types that are present in Florida. For this reason, caution should be exercised in utilizing these guidelines, particularly in carbonate-dominated sediments.

A discussion of these limitations and considerations is provided in Section 5.4.

1.3 Applications of the Recommended Sediment Quality Assessment Guidelines

The recommended sediment quality assessment strategy is intended to provide a consistent basis for evaluating sediment quality in Florida. While the SQAGs represent an integral element of this strategy, they should be used in conjunction with other assessment tools to efficiently and cost-effectively evaluate ambient sediment quality conditions. The SQAGs may be used to:

- Interpret the results of sediment quality monitoring data. In this context, SQAGs may be used to assess the adverse biological effects that could, potentially, be associated with levels of sediment-associated contaminants;

- Support the design of sediment quality monitoring programs. In this context, SQAGs may be used to evaluate existing sediment chemistry data, and rank areas of concern and chemicals of concern in terms of their potential to be associated with adverse biological effects. As such, monitoring priorities may be more clearly and effectively identified;

- Identify the need for site-specific investigations to support regulatory decisions, including source control and other remedial measures. In this context, SQAGs may be used to evaluate existing data and to determine if additional testing (e.g., sediment toxicity bioassays, etc.) is needed to support regulatory decisions;

- Evaluate the hazards associated with increased levels of contaminants at specific sites. In this context, SQAGs may be used as early-warning tools to identify the need for regulatory action before contaminant levels become problematic;

- Support a preliminary assessment of the applicability of the sediment quality criteria currently under development by EPA. In this context, the SQAGs may be used to assess the level of protection afforded to aquatic organisms by these criteria; and,

- Facilitate multi-jurisdictional agreements on sediment quality issues and concerns. In this context, SQAGs may be used to establish site-specific sediment quality objectives that will help define the responsibilities of affected agencies and other parties in preventing and remediating sediment contamination.

These guidelines were established to provide a consistent basis for evaluating sediment quality in Florida. However, these guidelines have certain limitations on their application. The SQAGs:

- Should not be used in lieu of water quality criteria. However, these guidelines may be used to evaluate the effectiveness of regulatory programs and to identify the need for more stringent regulations;

- Should not be used to define uniform values for sediment quality on a statewide basis (i.e., they should not be used as sediment quality criteria). Ambient environmental conditions may influence the applicability of these guidelines at specific locations;

- Should not be used as criteria for the disposal of dredged material and should not be used to replace formal assessment protocols established for the disposal of dredged material (EPA and ACE 1991); and,

- Should not be used directly as numerical clean-up levels at severely contaminated sites (e.g., Superfund sites).

There are a number of initiatives that are underway or under development in Florida and elsewhere in the United States that will provide relevant data for revising and refining these guidelines. These initiatives include spiked sediment bioassays, field surveys of sediment toxicity, and the development of sediment quality criteria that explicitly consider the bioavailability of sediment-associated contaminants. In the long-term, refinement of the guidelines should be pursued to ensure their broader applicability and utility within the state.

Chapter 2

Florida's Coast: A National Treasure

2.0 Introduction

Of all the states and provinces in continental North America, Florida is the most intimately linked with the sea. The entire state lies within the coastal plain, with a maximum elevation of about 120 meters above sea level, and no part of the state is more than 100 km from the Atlantic Ocean or the Gulf of Mexico (Webb 1990). With the exception of Alaska, Florida has the longest coastline of any state in the United States, with open estuaries and tidal wetlands that cover vast areas (Livingston 1990). These unique characteristics shape Florida's environmental identity and underscore the importance of employing relevant tools in coastal protection decision-making processes.

The State of Florida relies on its coastal waters to provide a variety of economic and social benefits to state residents and visitors, alike. Coastal ecosystems in Florida (including marine, near-shore, and estuarine environments) support a variety of sport and commercial fisheries which contribute significantly to the state's economy. Indeed, Florida ranks as one of the leading commercial fishing states in terms of the value of its annual fish catch, with shrimp, lobsters, and scallops being the most important fisheries. Marine environments within the state provide essential transportation links, support a variety of water-dependent facilities, and offer an array of recreational opportunities that attract millions of visitors to the state each year.

2.1 Physical Features of Florida's Coast

Florida has one of the most extensive coastlines in the United States. The marine coastline in the state spans almost 2,200 km, with a tidal shoreline that covers over 13,000 km (NOAA 1975). Florida's coastal systems are unique due to a combination of climatological and physiographic features which occur no where else. Livingston (1990) suggested that essentially all of the inshore marine habitats in the state could be classified as estuarine, primarily due to the prevalent influence of upland runoff in these areas. The Florida coastline is characterized by a variety of major embayments, marsh and mangrove systems that directly front the sea, and by numerous, partially enclosed, brackish water basins (Comp and Seaman 1985). A diversity of natural habitats are found within these areas, including seagrass beds, tidal flats, tidal marshes, soft sediments, hard substrates, shellfish beds, and a variety of transitional zones (Livingston 1990).

The Atlantic coast of Florida, from the St. Mary's River to Biscayne Bay (560 km), is characterized by a high energy shoreline with long stretches of continuous barrier islands (Comp and Seaman 1985). This region has few direct sources of freshwater inflow to the ocean and is marked by an extensive system of high salinity lagoons. The major estuaries on the Atlantic coast are the St. Johns River and Indian River estuaries and Biscayne Bay. Collectively, these estuaries cover a water surface area of almost 2,000 square kilometers.

Excluding the Florida Keys, the Gulf of Mexico coast of Florida extends some 1,350 km from Florida Bay to Perdido Bay. In general, estuaries along the west coast are located behind low energy barrier islands or at the mouths of rivers that discharge into salt marshes or mangrove-fringed bays (Comp and Seaman 1985). NOAA (1990) identified a total of fourteen major estuaries along Florida's Gulf coast, covering an estuarine water surface area of more than 5,000 square kilometers.

Coastal and estuarine sediments of Florida span a significant geochemical range, from silica- and aluminum-rich sediments of northeastern and northwestern Florida to carbonate-rich sediments of south Florida and the Florida Keys. The geochemistry of estuarine sediments in northern and central Florida reflects the siliceous, aluminous composition of presently eroding uplands of the southeastern United States. In contrast, the calcium carbonate-rich coastal sediments of Florida Bay and the Florida Keys are formed as the remains of diverse marine flora and fauna slowly accumulate in these estuarine waters. The remains of marine plants and animals create virtually all of the sediment volume in this part of Florida, with a minor terrestrial sediment input from riverine and salt marsh systems such as the Everglades.

2.2 Biological Features of Florida's Coast

The brackish water habitats that ring the Florida mainland are vital to the state's natural plant and animal communities. Florida's coastal environments are comprised of myriad salt marshes, mangrove forests, and open water communities that support a diverse array of aquatic and terrestrial organisms (Comp and Seaman 1985).

The salt marshes of Florida, which cover approximately 170,000 ha of land, are coastal ecosystems with communities of non-woody, salt-tolerant plants occupying intertidal zones that are occasionally or periodically inundated with salt water (Montague and Wiegert 1990). These areas provide such beneficial features as sediment stabilization, storm protection, aesthetic values, and wildlife habitat. The rate of primary productivity in salt marshes is among the highest of the world's ecosystems. This productivity forms the basis of aquatic and terrestrial food webs that include many unique and economically important plant and animal species.

Executive Summary

Florida sediment chemical measurements indicate that contaminants are present in elevated levels in a number of coastal areas. However, this information alone is not sufficient to indicate potential biological harm associated with chemical levels. A cost-effective approach for screening chemical levels is needed to estimate potential biological effects. This report was prepared to provide the Florida Department of Environmental Protection with guidance on the development of effects-based sediment quality assessment guidelines (SQAGs) for Florida coastal waters. A variety of approaches for deriving numerical SQAGs were reviewed and evaluated in light of Florida's unique requirements for SQAGs. The results of this evaluation indicated that an approach recommended by Long and Morgan (1990; National Oceanic and Atmospheric Administration) would provide a practical near-term basis for deriving SQAGs. Using this approach, preliminary SQAGs for 34 priority substances in Florida coastal waters were derived and evaluated. These SQAGs are intended to assist sediment quality assessment applications, such as identifying priority areas for non-point source management actions, designing wetland restoration projects, and monitoring trends in environmental contamination. They are not intended to be used as sediment quality criteria. A preliminary evaluation of the SQAGs is included in the report to provide practitioners with further guidance on using these management tools. While this evaluation indicates that the preliminary guidelines are broadly applicable in the southeast, care should be exercised in applying the SQAGs elsewhere in North America. The report also includes recommendations on improving sediment quality assessments. These revised SQAGs replace guidelines initially recommended to the Florida Department of Environmental Protection.

In Florida, natural resource conservation and protection is a high priority environmental management goal. Realizing this goal requires protecting and restoring living resources and their habitats in estuarine, nearshore, and marine ecosystems. In the last decade, there has been a significant increase in the level of understanding and public recognition of the important role that sediments play in maintaining coastal ecosystems. In addition to providing important habitats for aquatic organisms, sediments play a critical role in determining the fate and effects of environmental contaminants. Hence, sediment quality issues and concerns are becoming more prominent in managing natural resources.

Recent Florida sediment chemical measurements indicate that various contaminants are present at elevated levels in a number of coastal areas. While these chemical data provide essential information on the nature and areal extent of contamination, they do not provide a direct measurement of adverse biological effects or indicate the potential for such effects. Biological effects-based sediment quality assessment guidelines (SQAGs) are also required to evaluate the potential for biological effects associated with sediment-sorbed contaminants and to provide assistance in managing coastal resources.

To identify an appropriate procedure for deriving SQAGs, the major approaches used in other jurisdictions to derive sediment quality guidelines were reviewed and evaluated in the context of Florida's requirements for sediment quality assessment values. The results of this analysis indicated that the National Oceanic and Atmospheric Administration (NOAA) National Status and Trends Approach (NSTPA; Long and Morgan 1990) would provide a basis for addressing

Florida's immediate need for reliable and cost-effective SQAGs. A strategy was recommended to derive preliminary numerical SQAGs which support the near-term requirements for assessing sediment quality. This strategy allows for immediate assessment of sediment quality. A critical evaluation of this procedure suggested that, while this approach has limitations that could influence the applicability of the guidelines, it was a sound near-term strategy for deriving scientifically defensible preliminary assessment guidelines for Florida coastal waters.

Using the recommended strategy, data derived from a wide variety of methods and approaches were assembled and evaluated to derive preliminary SQAGs for 34 priority contaminants in Florida coastal waters. However, insufficient data were available to derive guidelines for another 14 substances that are known or are suspected to contaminate Florida coastal sediments. The numerical SQAGs define three ranges of concentrations for each of the 34 contaminants: a probable effects range; a possible effects range; and, a minimal effects range. These ranges of contaminant concentrations were considered to be more effective assessment tools than single numerical guideline values.

An evaluation was conducted to determine the reliability, comparability, and predictability of the SQAGs. While the results of this evaluation suggest that the guidelines will be broadly applicable, local environmental conditions may influence their applicability. In addition, the information upon which the SQAGs are based is dominated by data collected in the southeast. For these reasons, the guidelines should be applied with care and in concert with other assessment tools to conduct comprehensive sediment quality assessments.

The preliminary guidelines were established to provide yardsticks for evaluating sediment quality in Florida. These guidelines are intended to be used as one tool in a toolbox of companion interpretive approaches (such as the Department of Environmental Protection's metals interpretive tool and various bioassessment techniques) for screening sediment chemistry data and establishing priorities with respect to sediment quality management. They should not be used in lieu of water quality criteria, nor should they be used as sediment quality criteria. The SQAGs do not supersede formal regulatory assessment protocols, such as those implemented under the federal Marine Protection, Research, and Sanctuaries Act.

Recommendations

In addition to the guidelines themselves, there are several recommendations for follow-up actions contained in this report. The major recommendations are as follows:

- Recent results of Florida sediment toxicity studies should be used to increase the number of substances covered by the SQAGs and strengthen their applicability and defensibility.

- The preliminary SQAGs developed in the present study and Florida Department of Environmental Protection's previously developed guidelines for interpreting sediment metal concentrations provide a basis for evaluating sediment quality conditions in Florida coastal ecosystems. No such tools exist for use in freshwater ecosystems, and effects-based SQAGs should be developed to evaluate the biological significance of contaminated sediments in freshwater systems. In addition, the Florida Department of Environmental Protection's approach for assessing sediment metal contamination in coastal waterbodies should be validated and modified as necessary for use in freshwater ecosystems.

- In the southeast, various independent and loosely-related initiatives are directed at evaluating and managing contaminated sediments. Development of a regional intergovernmental strategy for contaminated sediment assessment and management would improve the effectiveness of these programs and encourage greater local support in preventing sediment contamination and restoring coastal resources. Therefore, a cooperative regional strategy should be developed by the U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, U.S. Geological Survey, Florida Department of Environmental Protection, and other affected agencies to identify priority sediment management, monitoring, and regulatory objectives, and the cooperative efforts required to achieve them.

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Estuaries are dominant features along the Florida coastline. Estuaries are among the most productive natural systems and their role in sustaining the health and abundance of marine fishes, shellfish, and wildlife has long been recognized (NOAA 1990). The importance of estuarine habitats for marine fishes and invertebrates is emphasized by the fact that up to 97.5% of the total commercial fisheries catch in the Gulf of Mexico is comprised of species that are dependant on estuaries during some portion of their life cycle (Comp and Seaman 1985). The Gulf of Mexico coastline supports one of the most productive fisheries in the world, with shrimp, oysters, lobsters, scallops, clams, and menhaden being the most important commercial species. While the Atlantic coast fishery is somewhat less important than Gulf coast fisheries, substantial quantities of shrimp, crab, clams, and menhaden are harvested on an annual basis.

In addition to diverse and abundant fisheries, Florida's coastal areas support a wide variety of plant and animal species. Wetland habitats are utilized by numerous species of wading birds, waterfowl, raptors, and a variety of mammalian species. All of these organisms are dependent, to a greater or lesser extent, on the productivity of Florida's coastal waters. In turn, the aquatic organisms that support the impressive communities of higher organisms are dependent on coastal sediments to provide feeding, spawning, and rearing habitats.

2.3 Anthropogenic Influences on Florida's Coast

Environmental management and pollution control issues affecting Florida's coast differ from those affecting coastal areas in other portions of the United States. While there are many common issues, land uses in Florida differ significantly from those in other states. In the northeastern and northwestern portions of the United States coastal ecosystems are influenced by myriad point sources of pollution, primarily from municipal and industrial sources. For example, Hudson River/Raritan Bay (New York) and Chesapeake Bay (Virginia/Delaware) contain more point sources of pollution than any other estuarine areas in the nation (NOAA 1990). Similarly, areas like Puget Sound (Washington) and San Francisco Bay (California) are highly industrialized, with large quantities of effluents discharged into receiving water systems (NOAA 1990). In addition, these systems are often adjacent to older, highly populated cities, which exacerbates the stresses on coastal waters.

Florida ranks fourth among states in terms of population, with nearly 13 million persons in 1990 (USDC 1990). This population was expected to increase by nearly 4% by the year 1992 (USDC 1990). Most of the population of the state currently resides near the coast and population densities in these areas are predicted to increase by over 30% in the next 20 years (Culliton *et al.* 1990). As indicated by FDEP coastal contaminants surveys, non-point discharges are the major sources of contaminants to coastal waterbodies. If population and land use trends continue, inputs of contaminants to coastal waters due to the deposition of atmospheric pollutants and stormwater runoff from urban and suburban areas are likely to escalate. Likewise, the capacity of municipal wastewater treatment plants will have to increase to accommodate the needs of the burgeoning population. Coastal waters may be used as receiving water systems for many of these point and non-point source discharges.

Manufacturing has traditionally played a smaller role in the Florida economy than in the economy of other states (Fernald 1981). For this reason, Florida's coastal waters are not severely influenced by industrial effluents. Nonetheless, Farrow (1990) indicated that 615 billion gallons of industrial effluent were released into Florida's coastal waters in 1982. The sources of these effluents included the pesticides, organic chemicals and plastics industries, and a variety of other discharges. Of these, the pulp and paper industry may be of particular importance in certain areas of Florida due to its discharges of toxic and bioaccumulative substances into coastal waters (Farrow 1989).

Florida is second (after North Carolina) among southeastern states with respect to the economic value of its agricultural production (Fernald 1981) and is renowned for its production of citrus fruits. While Florida has an excellent climate for the culture of agricultural products, it is dominated by sandy soils with relatively low fertility (Ewel 1990). As such, maintenance of high rates of productivity necessitates the application of large quantities of fertilizers and pesticides. The combination of high irrigation rates, high soil porosity, and low organic content in the soil enhances the potential for the mobilization of many agricultural chemicals. Overland or subsurface transport of many of these substances could ultimately lead to the contamination of coastal waters.

While municipal, industrial and agricultural sources probably represent the major inputs of contaminants to coastal ecosystems, other sources of contamination in Florida's coastal waters may include leachates from landfill sites, dredge and fill activities, and the operation of ships and pleasure craft. Together, anthropogenic influences in estuarine and nearshore marine environments represent a potential hazard to the health and integrity of coastal ecosystems. Ongoing monitoring of environmental conditions provides a means of assessing the nature and extent of environmental contamination and a basis for managing the valuable resources that currently exist in Florida's coastal ecosystems.

2.4 Sediment Quality Issues and Concerns

Natural resource protection is one of the most important goals in managing Florida's coastal waters. These resources include wetlands, floodplains, estuaries, beaches, dunes, barrier islands, coral reefs, and fish and wildlife. Habitats that support the production of fish and wildlife are of fundamental importance and have been identified as natural resources that require special consideration for protection and enhancement (Comp and Seaman 1985).

Maintenance and enhancement of the diversity and abundance of biological resources in coastal ecosystems in Florida requires an integrated approach to environmental management. Implementing an integrated environmental management system is dependent on the development of a comprehensive understanding of the fate and effects of environmental contaminants. While many contaminants are released into the aqueous component of coastal ecosystems, not all of these substances dissolve easily in water. For instance, hydrophobic substances tend to adhere (or adsorb) to particulate matter that becomes deposited on the bottom. This tendency for many toxic substances to form associations with sediments can result in elevated concentrations of certain contaminants in bed sediments. Elevated levels of sediment-associated contaminants may represent hazards to ecosystem integrity by affecting aquatic organisms directly or by limiting the use of those resources by human consumers.

Sediments contaminated with toxic substances have been found in coastal areas throughout the world. Bolton *et al.* (1985) reported that metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and DDT were chemicals of major concern at a number of marine and estuarine sites in America. A more recent evaluation, using data collected in the National Status and Trends Program (NSTP), has confirmed that bed sediments at sites within the Hudson-Raritan estuary, Boston Harbor, Long Island Sound, and San Francisco Bay are highly contaminated with an assortment of toxic substances (Long and Morgan 1990).

While concerns over contaminated coastal sediments in the United States have been focused primarily in the northeast and on the west coast, the results of recent studies are beginning to indicate that sites in the southeast have also been affected by anthropogenic activities. For example, Long and Morgan (1990) reported that sites in St. Andrews Bay were highly contaminated with pesticides, metals, PCBs, and PAHs (i.e., levels of contaminants in sediment equalled or exceeded the concentrations that were frequently or always associated with toxic effects). These contaminants have also been detected at levels of concern at sites in the vicinity of Miami, Jacksonville, Daytona Beach, Tampa Bay and Pensacola Bay (MacDonald 1994; Long *et al.* 1991).

Sediment-associated contaminants have been connected with a wide range of impacts on the plants and animals that live within and upon bed sediments. Acute and, in some cases, chronic toxicity of sediment-associated contaminants to algae, invertebrates, fish, and other organisms have been measured in laboratory toxicity tests. Field surveys have identified more subtle effects of environmental contaminants, such as the development of tumors and other abnormalities in bottom feeding fish (Goyette *et al.* 1988; Malins *et al.* 1985). In addition, many of these substances can accumulate in fish and shellfish tissues. At elevated levels, these contaminants represent hazards to sensitive wildlife species that rely on these organisms for food. Furthermore, bioaccumulation may result in impairments to human uses of coastal ecosystems. In many areas of North America, health departments have advised residents to limit their consumption of seafood. For example, the Florida Department of Health and Rehabilitative Service and the Florida Department of Agriculture and Consumer Services

(Mercury Technical Committee 1991) have issued a health advisory on consumption of shark meat based on mercury levels in samples of sharks obtained in retail markets. In addition, observations of elevated mercury levels in Florida freshwater fish have resulted in the issuance of health advisories that recommended avoidance of fish consumption in specified state waterbodies.

2.5 Sediment Quality: An Indicator of Ecosystem Health

While evaluations of sediment quality are often used to address site-specific management needs, sediment quality is also used as a sensitive indicator of overall environmental quality. Sediments influence the environmental fate of many toxic and bioaccumulative substances in aquatic ecosystems. As such, sediments integrate contaminant inputs over time and may also represent long-term sources of contamination. In addition to the physical and chemical relationships between sediments and contaminants, sediments are of fundamental importance to benthic communities in terms of providing suitable habitats for essential biological processes (such as, spawning, incubation, rearing, etc.). Therefore, sediments provide an essential link between chemical and biological processes. By developing an understanding of this link, environmental scientists are developing assessment tools and conducting monitoring programs that enable them to make rapid and accurate evaluations of the state of the environment and the health of aquatic ecosystems.

Chapter 3

An Evaluation of Existing Approaches to Developing Numerical Sediment Quality Guidelines

3.0 Introduction

A variety of approaches have been devised to formulate sediment quality guidelines (SQGs). These approaches have been reviewed and summarized by Chapman (1989), Persaud *et al.* (1989), Beak Consultants. Ltd. (1987; 1988), EPA (1989a; 1992), Sediment Criteria Subcommittee (1989; 1990), and MacDonald *et al.* (1992). The discussion on the major approaches to the development of SQGs has been abstracted from these documents to provide a basis for recommending an appropriate procedure for Florida. The major approaches to developing SQGs are:

(i) Sediment Background Approach (SBA);
(ii) Spiked-Sediment Bioassay Approach (SSBA);
(iii) Equilibrium Partitioning Approach (EqPA);
(iv) Tissue Residue Approach (TRA);
(v) Screening Level Concentration Approach (SLCA);
(vi) Sediment Quality Triad Approach (SQTA);
(vii) Apparent Effects Threshold Approach (AETA); and,
(viii) Weight of Evidence Approach (WEA).

Discussions on each of the approaches has been divided into four main sections, including a brief description of the methodology, the major advantages and limitations of the approach, and the current uses of the approach. All of the approaches identified are directly applicable for deriving numerical SQGs. However, there are other procedures which are focused on site-specific assessment of sediment quality [e.g., the International Joint Commission sediment assessment strategy (IJC 1988), benthic community structure assessments, etc.]. These latter procedures are described by the EPA (1989a; 1992) and MacDonald *et al.* (1992).

3.1 Sediment Background Approach (SBA)

In this approach, sediment contaminant concentrations at a site (or a sedimentary stratum) that is being assessed are compared to the concentrations of those contaminants at sites that are considered to be representative of background (natural) conditions. Alternatively, historical records for a specific site or, more appropriately, data from sediment core profiles may be used to define background levels of specific contaminants. Using this approach, a site would be considered to be contaminated if the concentration of one or more contaminants exceeds the mean background concentration by a significant margin (e.g., two standard deviations or more). Application of this approach requires special care in choosing the location of sampling stations, in sample preparation, in sample analysis methodology, and in quality assurance/quality control (QA/QC).

The major advantage of this approach lies in its simplicity. It relies on measurements that can be made easily in most analytical laboratories, it provides a simple means of comparing monitoring program results with the guidelines (i.e., it yields chemical concentration values), it is specific to conditions at the site, it does not have extensive data requirements, and it does not require toxicity testing.

The major limitation of this approach is that no direct biological effects or bioavailability data are used for deriving guidelines. In addition, this approach only applies to major and trace elements, for which natural background concentrations can be identified from sediment core samples. The background concentrations of anthropogenically-derived organic contaminants should be zero, although it is well established that detectable concentrations of many of these contaminants occur due to the long range transport of atmospheric pollutants. Moreover, a variety of hydrocarbons may occur naturally in sediments that are affected by seepages from oil-bearing formations. While SQGs may be established at contemporary background levels, it is not clear whether or not these guidelines would be sufficiently protective of aquatic biota.

This approach has been used successfully at a number of locations in the United States and elsewhere in the world. In the Great Lakes, this approach was used by EPA Region V to develop a classification system for harbors (SAIC 1991) and to assess the applicability of SQGs for evaluating open-water disposal of dredged materials (Persaud and Wilkins 1976; Mudroch *et al.* 1986; 1988). Similarly, this approach has been used by the United States Geological Survey, EPA Region VI, Texas Water Quality Board, Virginia Water Control Board, Illinois Environmental Protection Agency, and several other agencies to establish informal guidelines for determining whether sediment contaminant concentrations exceed 'normal' levels (SAIC 1991).

Background levels of naturally-occurring substances vary significantly between areas. For this reason, SQGs developed using this approach specifically apply only to the areas that were considered in their development. However, the FDEP (Schropp *et al.* 1990) and others (e.g., Loring 1991) have developed unique applications of the SBA which improve its overall reliability. These applications rely on normalization of metals levels to the concentration of a reference element, such as aluminum or lithium. Statistical analysis of data from numerous uncontaminated sites provides a means of establishing background levels of metals under a variety of conditions and, as such, a basis for identifying sites with anthropogenically-enriched levels of metals. The SBA alone is not sufficient for formulation of toxicity-based SQG values, but data on background concentrations of specific contaminants provides critical information for assessing the applicability of SQGs developed using other approaches and for formulating site-specific sediment quality objectives.

3.2 Spiked-Sediment Bioassay Approach (SSBA)

The SSBA to generating SQGs relies on empirically generated information on the responses of test organisms to specific contaminant challenges, generally under laboratory conditions. In this procedure, clean sediments are spiked with known concentrations of contaminants (individually or in mixtures) to establish definitive cause and effect relationships between chemical concentrations and biological responses (i.e., mortality, reductions in growth or reproduction, physiological changes, etc.). The SSBA has been used successfully with various types of sediments, generally for single contaminants or relatively simple mixtures of contaminants (e.g., Cairns *et al.* 1984; McLeese and Metcalfe 1980; Swartz *et al.* 1985; 1988; 1989). Typically, numerical SQGs are derived by applying a safety factor to the lowest observed effect level from a study on the most sensitive species (MacDonald and Smith 1991); however, a variety of other specific procedures may be employed.

The major advantage of this method is that it is suitable for all classes of chemicals and most types of sediments. In addition, it has the capability to produce precise dose-response data pertaining to toxic chemicals. It can also account for factors that are thought to control the bioavailability of these substances, such as total organic carbon (TOC) and acid volatile sulphide (AVS; EPA 1990). As such, guidelines derived using spiked-sediment bioassay data should be highly defensible.

The major disadvantage associated with the implementation of this method for deriving SQGs is that spiked-sediment bioassays have only been conducted on a few species of aquatic biota and with only a limited number of substances (i.e., cadmium, copper, a few pesticides, and several PAHs). Therefore, the existing database would support the derivation of numerical SQGs for only a few contaminants. Significant expansion of this database (i.e., to include the range of substances that are expected to occur in coastal sediments) will require substantial resources and these are not likely to be available to state agencies. In addition, uncertainties associated with spiking procedures, equilibration periods, and factors controlling the bioavailability of the substances may limit the interpretation of the results of spiked-sediment bioassays.

In addition to their potential role in deriving numerical SQGs, data developed using this approach are fundamental for evaluating the applicability of guidelines that have been developed using other approaches. For example, Environment Canada has recently developed a formal protocol for developing SQGs and data from spiked-sediment bioassays play an important role in this process (Smith and MacDonald 1994). Likewise, Hansen *et al.* (1993e) used spiked-sediment bioassay data to evaluate the applicability of the sediment quality criteria that have been developed for fluoranthene. Similarly, Outridge *et al.* (1992) used data from spiked-sediment bioassays to evaluate the applicability of SQGs for cadmium derived using the weight of evidence approach (Smith and MacDonald 1994).

3.3 Equilibrium Partitioning Approach (EqPA)

The water-sediment EqPA has been one of the most studied and evaluated approaches used to develop SQGs (primarily for non-polar hydrophobic organic chemicals) in the United States (Pavlou and Weston 1983; Bolton *et al.* 1985; Kadeg *et al.* 1986; Pavlou 1987; Di Toro *et al.* 1991). This approach is based on the assumption that the distribution of contaminants among different compartments in the sediment matrix (i.e., sediment solids and interstitial water) is predictable based on their physical and chemical properties. It also assumes that continuous equilibrium exchange between sediment and interstitial water occurs. This approach has been supported by the results of sediment toxicity tests, which indicate that positive correlations exist between the biological effects observed and the concentrations of non-polar organic contaminants measured in the interstitial water.

In the EqPA, water quality criteria developed for the protection of marine organisms are used as the basis of the SQGs [termed sediment quality criteria (SQC) by the EPA] derivation process. As such, the water quality criteria formulated for the protection of water column species are assumed to be applicable to benthic organisms (Di Toro *et al.* 1991). Sediment quality guidelines are calculated using the appropriate water quality criteria (usually the marine final chronic values) in conjunction with the sediment/water partition coefficients for the specific contaminants. The calculation procedure for non-ionic organic contaminants is as follows:

$$\mathbf{SQG} = \mathbf{Kp} \cdot \mathbf{FCV}$$

where:

SQG = Sediment quality guideline (in μg/kg);
Kp = Partition coefficient for the chemical (in L/kg); and,
FCV = Final chronic value (in μg/L).

Currently, this procedure is considered to be appropriate for deriving SQGs for non-ionic organic substances, such as PAHs, polychlorinated benzenes, biphenyls, dioxins, and furans, and many pesticides (EPA 1991). To date, EPA has developed SQGs for five substances, including fluoranthene, acenaphthene, phenanthrene, endrin, and dieldrin (Hansen *et al.* 1993a, b, c, d, e). For these substances, TOC normalization may provide a basis for predicting toxicity to aquatic organisms (Swartz *et al.* 1990). In addition, the role of AVS in determining the bioavailability of metals is also under investigation (Di Toro *et al.* 1989), and efforts are currently under way to establish normalization procedures for metals as well (Di Toro *et al.* 1992). Di Toro *et al.* (1991) have also noted that porewater dissolved organic carbon (DOC) levels may influence the bioavailability of hydrophobic compounds; however, the nature of this relationship has not been fully established.

One of the principal advantages of this approach is that it is applicable to a wide variety of aquatic systems because it considers the site-specific environmental variables that are thought to control the bioavailability of sediment-associated contaminants (i.e., TOC and AVS). In addition, this approach is practical for implementation with a broad suite of substances because it requires only existing water quality criteria and contaminant sediment/water partition coefficients to support the derivation of SQGs. Confidence in the validity of this approach is further enhanced because the EqP theory upon which this approach is based is well developed, it has already been used in various regulatory and remedial action applications, and it provides a consistent basis for identifying the severity of sediment contamination (EPA 1989a).

However, there are a number of limitations to this approach which may restrict its applicability for deriving numerical SQGs. Specifically, SQGs developed using the EqPA do not explicitly address possible synergistic, antagonistic or additive effects of contaminants. In addition, the technical basis for developing SQGs for metals is still under development. Furthermore, the interim SQGs for non-ionic chemicals apply only to sediments that have significant organic carbon contents ($\geq$ 0.5 percent), yet the relationship between toxicity of fluoranthene and TOC levels has only been quantitatively established at low levels of TOC (i.e., < 0.5%; Swartz *et al.* 1990).

Another disadvantage of the EqPA is related to the limited number of reliable partition coefficients available for many priority contaminants. For example, the 95% confidence interval associated with the K_{oc} of endrin spans more than two orders of magnitude (EPA 1991). This variability in the estimate of the partition coefficient generates considerable uncertainty in any SQGs derived using these data. Furthermore, *in situ* sediments are seldom, if ever, at equilibrium and are likely to achieve steady state conditions only rarely. Several other limitations of the approach were identified by Di Toro *et al.* (1991), all of which are considered to restrict the application of SQGs developed using the EqPA (Sediment Criteria Subcommittee 1989).

In spite of its limitations, the EqPA has been selected by the EPA as a primary basis for deriving SQGs and the EPA has expended considerable effort in the development of the technical basis of the approach (Di Toro *et al.* 1991). While the initial review by the Science Advisory Board (SAB) was not very positive (Sediment Criteria Subcommittee 1989), the subsequent review commended EPA for its progress towards reducing the uncertainties associated with the approach (Sediment Quality Subcommittee 1992). However, the SAB recommended that SQGs derived using the EqPA should be field validated to reduce uncertainty, expressed as ranges to facilitate sediment assessments, and further tested to improve the method. This approach has been used primarily in the United States, however, the applicability of the approach for deriving SQGs has also been evaluated by several other jurisdictions [i.e., Canada (MacDonald *et al.* 1992), Ontario (Persaud *et al.* 1990) and the Netherlands (Van Der Kooij *et al.* 1991)].

3.4 Tissue Residue Approach (TRA)

The TRA (which is also known as the biota-water-sediment equilibrium partitioning approach) involves the establishment of tolerable sediment concentrations for individual chemicals or classes of chemicals by determining the chemical concentrations in sediments that are predicted or observed to result in acceptable tissue residues. This process necessitates the development of relationships between concentrations of contaminants in sediments and contaminant residue levels in aquatic biota. In addition, relationships between contaminant residues in aquatic biota and adverse effects on consumers of these species must be established. Several methods are available to derive guidelines for levels of contaminants in the edible tissues of aquatic biota (see MacDonald 1991; Walker and MacDonald 1993).

The principal advantage of this approach lies in its simplicity. Sediment quality guidelines may be derived directly from tissue residue guidelines for the protection of human health or wildlife consumers of aquatic biota, if acceptable sediment to biota bioaccumulation factors (BAFs) are available. The other main advantage of this approach is that it explicitly considers the potential for bioaccumulation of persistent toxic substances.

The chief disadvantage of this approach, apart from those cited for the EqPA, is that tissue residue guidelines for the protection of wildlife have not been developed and residue-based dose-response relationships have not been established for most contaminants (EPA 1989a; 1992). Therefore, SQGs would generally be developed from tissue residue guidelines applicable to the protection of human health. While guidelines, so developed, would adequately address human health concerns, other components of the ecosystem may not be adequately protected (e.g., marine mammals with high daily consumption rates of aquatic organisms). Recently, a protocol for deriving numerical tissue residue guidelines for the protection of wildlife has been developed (Walker and MacDonald 1993) and tissue residue guidelines for dioxins and furans have been derived (MacDonald 1993). Subsequently, SQGs for the protection of wildlife were formulated for these substances (MacDonald 1993).

This approach has been used on several occasions to develop water quality guidelines for the protection of human health (most notably for DDT, Hg, and PCBs). In addition, sediment contamination limits for 2,3,7,8 tetrachlorodibenzo-*p*-dioxin (T_4CDD) have been established for Lake Ontario on the basis of fish tissue residues (Endicott *et al.* 1989; Cook *et al.* 1989). Using a risk assessment approach, EPA (1993) has also derived SQGs for mammalian and avian wildlife species for this substance. The applicability of this approach for deriving SQGs is supported by data which demonstrate that declines in DDT residues in fish and birds (since its use was banned) are strongly correlated with declining concentrations of this substance in surficial sediments in the Great Lakes and Southern California Bight. As such, this approach is a logical companion for the effects-based approaches to deriving SQGs.

3.5 Screening Level Concentration Approach (SLCA)

The SLCA (Neff *et al.* 1986) is a biological effects-based approach that is applicable to the development of SQGs for the protection of benthic organisms. This approach uses matching biological and chemistry data collected in field surveys to calculate a screening level concentration (SLC). The SLC is an estimate of the highest concentration of a contaminant that can be tolerated by a pre-defined proportion of benthic infaunal species.

The SLC is determined through the use of a database that contains information on the concentration of specific contaminants in sediments and on the occurrence of benthic organisms in the same sediments. First, for each benthic organism for which adequate data are available a species screening level concentration (SSLC) is calculated. The SSLC is determined by plotting the frequency distribution of the contaminant concentrations over all of the sites at which the species occurs (information from at least ten sites is required to calculate a SSLC). The 90th percentile of this distribution is taken as the SSLC for the species being investigated. The SSLCs for all of the species, for which adequate data are available, are compiled as a frequency distribution to determine the concentration that 95% of the species can tolerate (i.e., the 5th percentile of the distribution). This concentration is termed the screening level concentration of the contaminant.

The advantages of the SLCA include its versatility and reliance on information which is generally available. It can be used to develop guidelines for virtually any contaminant for which analytical methods are available and SLCs are based on effects on organisms that are resident in marine environments. Therefore, SLCs can be adapted to local conditions by including only data on resident species.

The SLCA relies on several assumptions that may limit its applicability for SQG derivation. First, this approach assumes that the distribution of benthic organisms is related primarily to the levels of the contaminant measured in the sediments. The effects of other factors, including unmeasured contaminants, habitat composition (i.e., grain size, water current velocity, salinity gradient, etc.), and interspecific interactions are not explicitly considered. However, some of these may be accounted for in the data analysis. Second, the approach assumes that adverse biological effects of a contaminant are manifested only by the absence of species from a particular site. Information on dose/response relationships, which may be assembled using data on population levels or sublethal effects, are largely ignored. Furthermore, the SLCA assumes that the available database includes concentrations of the contaminant over the full range of tolerance of the species.

Another major limitation of the SLCA is that it is not possible to establish a direct cause/effect relationship between any one contaminant and the benthic biota. Since single contaminants are rarely present in field situations, observed effects (presence or absences of biota) are usually dependant on the entire mixture of chemicals. Therefore, SLCs are based on *associations* between chemical concentrations and biological effects. In addition, sampling procedures may selectively bias the results of the analysis (e.g., dredge sampling may be biased towards sessile species).

Additional limitations of the SLCA are largely related to the magnitude of its information requirements. Calculation of a SLC requires information on contaminant concentrations in sediments from at least ten sites (some scientists suggest that twenty is more appropriate; e.g., Chapman 1989) and on the distribution of at least twenty species. For many contaminants, these data may not be available. Therefore, development of SQGs could require the design and implementation of a potentially costly data collection program. The SLC calculated for a particular contaminant is highly dependent on the quality and quantity of data available. Assessment of the database is difficult without *a priori* information on the sensitivities of affected species. Therefore, it is difficult to determine how much confidence can be placed on the resultant SLC.

Neff *et al.* (1986) originally developed the SLCA to derive numerical SQGs for non-polar organic contaminants in freshwater and marine sediments in the United States. The values for marine sediments were subsequently recalculated using a database that had been further verified to eliminate questionable data (Neff *et al.* 1987). While this approach appeared promising during its developmental stages, it has not been used to any significant extent in recent years. However, Ontario (Persaud *et al.* 1990) has developed a procedure for deriving numerical SQGs that relies on the strengths of this approach (i.e., lowest effect and severe effect levels are derived). Using this procedure, Ontario has developed provincial SQGs for 10 metals (Jaagumagi 1990a), PCBs, and 9 organochlorine pesticides (Jaagumagi 1990b).

3.6 Sediment Quality Triad Approach (SQTA)

The SQTA was originally developed to support site-specific assessments of sediment quality (Long and Chapman 1985; Long 1989). However, the information collected in support of the SQTA has also been used as a basis for developing SQGs (Chapman 1986). The SQTA is based on correspondences between three measures: sediment chemistry, sediment bioassays, and *in situ* biological effects. Data on sediment chemistry and other (physical) characteristics are collected to assess the level of contamination at a particular site and to document other factors that could influence the distribution and abundance of benthic species. The results of sediment bioassays provide information that may be used to evaluate the toxicity of the contaminants that are present in bed sediments. Measures of *in situ* biological effects, such as benthic infaunal community structure and histopathological abnormalities in benthic fish species, provide information on alterations of resident communities that may be related to sediment chemistry. Integration of these three components provides comprehensive information which may be used to evaluate and rank the priority of the areas that have been surveyed. Also, they can be used to formulate site-specific sediment quality objectives; however, SQGs are not developed that would be applicable on a regional or national basis.

The major advantage of the SQTA is that it integrates the data generated from the three separate measurements and, thereby, facilitates the separation of natural variability in biotic characteristics from variability due to the toxic effects of contaminants. For example, variability in benthic community composition may be due to the presence of contaminants in sediments or it may be related to differences in other aspects of habitat quality (i.e., grain size, depth, etc.). The triad approach provides a basis for distinguishing between these effects; however, it cannot be used to establish cause and effect relationships. Other advantages of this approach are that it may be used for any measured contaminant, it may incorporate information on both acute and chronic effects, and it does not require information on specific processes governing interactions between organisms and toxic contaminants. Integrating the three data types provides a weight of evidence approach to guidelines development.

The major limitations of the SQTA are as follows (Chapman 1989): statistical criteria have not been developed for use with the triad; rigorous criteria for determining single indices for each of the separate measurements have not been developed; a large database is required; it is generally used to develop guidelines for single chemicals, and as such the results can be strongly influenced by the presence of unmeasured toxic contaminants that may or may not co-vary with the measured chemicals; sample collection, analysis, and interpretation is labor-intensive and costly; and, the choice of a reference site is often made without adequate information on how degraded the site may be. In addition, the SQTA does not explicitly consider the bioavailability of sediment-associated contaminants. Further, the SQTA mainly considers data from acute toxicity bioassays and, therefore, sub-acute and chronic effects may not be identified.

The SQTA was not initially intended to be a method for developing SQGs. Rather, the procedure was designed to be a practical tool to support site-specific sediment quality assessments. In assessments, the SQTA has been used to identify priority areas for remedial action, to determine the size of areas that require remedial action, to verify the quality of reference sites, to determine contaminant concentrations that are always associated with effects on aquatic biota, and to describe ecological relationships between the characteristics of bottom sediments and biota that may be at risk (EPA 1989a). The SQTA has been used primarily in Puget Sound, but it has also been used in the Great Lakes, in Vancouver Harbour, in San Francisco Bay, and in the Gulf of Mexico (Chapman 1992).

3.7 Apparent Effects Threshold Approach (AETA)

The AETA for developing SQGs was developed by Tetra Tech Inc. (1986) for use in the Puget Sound area of Washington State. The AETA is based on relationships between measured concentrations of contaminants in sediments and observed biological effects, mainly on benthic organisms. The goal of this procedure is to define the concentration of a contaminant in sediment above which significant ($p \leq 0.05$) biological effects are ***always*** observed. These biological effects include, but are not limited to, toxicity to benthic and/or water column species (as measured using sediment toxicity bioassays), changes in the abundance of benthic invertebrate species, and changes in benthic invertebrate community structure.

The AETA is similar in many ways to the SLCA, since both rely on matching biological effects and sediment chemistry data. However, the AETA is more appropriate for the development of SQGs than the SLCA because it considers more diverse and sensitive measures of biological effects. The AET values are based on dry-weight-normalized contaminant concentrations for metals and either dry-weight or TOC normalized concentrations for organic substances (Barrick *et al.* 1988; Washington Department of Ecology 1990).

One of the principle advantages of the AETA is its capability to employ a wide variety of observations of biological effects from field surveys and the results of laboratory sediment toxicity bioassays. As such, AETs may be derived for each of the areas, species, and biological effects under consideration in an investigation. Like the SLCA, it can be used to develop guidelines for virtually any contaminant for which analytical methods are available. In Puget Sound, AETs were demonstrated to be relevant and precise tools for predicting biological effects associated with elevated levels of sediment-associated contaminants (Puget Sound Estuary Program 1988).

One of the major limitations of the AETA is its requirement for detailed site-specific information that relate concentrations of sediment-associated sediments to specific biological effects. This detailed database is currently available only for Puget Sound, some areas in California, several locations along the Atlantic coast, and the Great Lakes. Implementation of this approach in other areas, where these data are not available, would require an extensive data collection program.

Like the other approaches that rely on the analysis of matched sediment chemistry and biological effects data, the AETA does not provide definitive cause and effects relationships. Evaluation of the data is based on establishing associations between contaminant concentrations and biological effects. This characteristic of the approach results in uncertainty in the resultant SQGs.

Another disadvantage of the AETA is that there is a substantial risk of under-protection of biological resources if the AET is used directly as the SQG. The principle reason for this is that the AET defines the concentration of a contaminant above which biological effects are always observed. Unlike the other approaches to the development of SQGs, AETs can only *increase or remain the same* as new information is added to the database. This limitation may be minimized by defining AETs for each species tested and endpoint measured.

In addition to the potential to be under-protective, AETs may also be overly-protective of aquatic resources (i.e., overly restrictive) under some circumstances. This situation may occur when the substance under consideration consistently co-varies with other substances which are actually responsible for the observed effect. This situation is most likely to occur when AETs are generated using data from a specific geographic area in which the substance under consideration is present at each of the sites tested (e.g., DDT in Puget Sound).

This approach has been used extensively in Washington State by the Puget Sound Dredged Disposal Analysis Program for evaluating sediments that were to be dredged and disposed of by ocean dumping. In addition, AETs have been used to assess the effects of disposing of contaminated sediments at dump sites in that area (Puget Sound Dredged Disposal Analysis 1989). Recently, the Washington Department of Ecology (1990) established marine sediment management standards using the AETA. These legally-enforceable standards are designed to establish long-term goals for sediment quality, to manage discharges of toxic substances into coastal waters, and to provide a basis for identifying contaminated sites and appropriate cleanup levels.

Following a comprehensive evaluation, the SAB (Sediment Criteria Subcommittee 1989) indicated that the AETA is appropriate for deriving site-specific SQGs, such as the Puget Sound AETs. However, the SAB also recommended that the AETA should not be used to develop general, nationally applicable SQGs.

3.8 Weight of Evidence Approach (WEA)

The WEA for deriving SQGs (Long and Morgan 1990) was originally developed to provide informal tools to evaluate coastal sediment chemistry data collected under the National Status and Trends Program (NSTP, NOAA). Long and Morgan (1990) compiled a database containing information generated by the three groups of approaches to the establishment of effects-based SQGs: the EqPA, the spiked-sediment toxicity approach, and various approaches that rely on the evaluation of matching sediment chemistry and biological effects data [i.e., co-occurrence approaches (AET, SLC, SQT)]. All of the information in the database was weighted equally, regardless of the method that was used to develop it.

Candidate data sets are screened to evaluate their applicability for incorporation into the database. This screening procedure is designed to evaluate the overall applicability of the data set (i.e., presence of matching sediment chemistry and biological effects data), the methods that were used, the type and magnitude of the end-point measured, and the degree of concordance between the chemical and biological data. Data which shows no concordance between chemical and biological variables is incorporated into the database, but not used in the statistical evaluation of the information (Long 1992).

The data which meets all screening criteria is incorporated into the database. Individual entries consists of the concentration of the contaminant, the type of biological response measured (usually specifying the location of the test as well), and an indication of whether or not there was concordance between the observed effect and the concentrations of a specific chemical (i.e., no effect, no or small gradient, no concordance, or a "hit", which indicated that an effect was measured). Data from non-toxic or unaffected samples are assumed to represent background conditions. Data points are identified for which a biological effect was observed in association with elevated chemical concentrations. These latter data points are sorted in ascending order of concentrations and the lower 10th and 50th percentile concentrations for each compound is determined. The effects range-low (ER-L; 10th percentile value) is considered to represent a lower threshold value, above which adverse effects on sensitive life stages and/or species began. The effects range-median (ER-M; 50th percentile value) is considered to represent a second threshold value, above which adverse effects on most species were frequently or always observed. These two parameters, ER-L and ER-M, are then used as informal SQGs (Long and MacDonald 1992).

One of the most important advantages of this approach is that it provides a weight of evidence from the available information for assessing sediment quality. In addition, it provides a framework for assessing sediment quality by organizing and summarizing data that relate concentrations of sediment-associated contaminants to specific biological effects. The other main advantages of this approach are that it can be applied with existing data (no additional field work or laboratory investigations are required), all of the available data generated in North America using the various approaches described above were compiled, and the database is expandable to encompass data collected in other jurisdictions. Further, the reliability (or degree of confidence) of each value can be determined by evaluating the agreement among the available data (Long *et al.* In press). Lastly, the approach facilitates the identification of ranges of contaminant concentrations which provide a means of determining the probability of observing adverse biological effects at a given contaminant concentration.

The main limitation of this approach concerns the quality and compatibility of the available data. In many cases, the data were generated using different analytical procedures in numerous laboratories and considered many species, endpoints, and locations across North America. For this reason, information on a wide variety of sediment types (i.e., with different particle sizes and concentrations of substances that could influence bioavailability) were combined, and this may have resulted in unknown biases. This amalgamation of the data may have resulted in the interpretation of responses as being attributable to a single contaminant when, in fact, synergistic and/or additive effects were actually driving the response. For substances for which only a moderate amount of data exists, or only acute toxicity data are represented (as is the case for many chemicals), it is possible that inappropriate guidelines could be derived. Furthermore, the compilation and evaluation of the data was very labor-intensive and required sound knowledge of sediment chemistry and biology.

The database evaluated in Long and Morgan (1990) consists of information generated at numerous locations around the United States. The authors felt that the degree of confidence in the ER-L and ER-M values should be considered moderate for metals and PCBs, and low for pesticides and PAHs. They felt that, although the compiled database was fairly extensive, much more data was needed to support or refute this approach for all groups of chemicals, for individual analytes within the groups, and for all types of sediments. Nonetheless, the informal guidelines have been used in numerous applications, ranging from contaminated site assessment to litigation.

3.9 Summary

A total of eight approaches for deriving numerical SQGs were investigated to identify an appropriate procedure for providing immediate guidance in Florida. The strengths and limitations of each of these approaches are summarized in Table 1. This summary indicates that no single approach is likely to support deriving SQGs under all circumstances. Therefore, each of these approaches are further evaluated to assess the degree to which they responded to Florida's requirements for sediment quality assessment guidelines (SQAGs). The results of this evaluation were used to develop a strategy for deriving numerical SQAGs for Florida coastal waters (Chapter 4).

Table 1. Summary of the strengths and limitations of approaches for deriving numerical sediment quality assessment guidelines.

Approach	Strengths	Limitations
SBA	• Sufficent data are generally available.	• Not based on biological effects.
SSBA	• Based on biological effects. • Suitable for all classes of chemicals and most types of sediments. • Supports cause and effect evaluations.	• Sufficient data are not generally available. • Implementation costs are high. • Spiking procedures are not yet standardized.
EqPA	• Based on biological effects. • Suitable for all classes of chemicals and most types of sediments. • Bioavailability is considered. • EPA will support research to validate this approach. • Supports cause and effect evaluations.	• Few sediment quality criteria are currently available. • Water quality criteria are not available for some substances. • In situ sediments are rarely at equilibrium.
TRA	• Simple to apply. • Bioaccumulation is considered. • A protocol for the derivation of TRGs is available.	• Tissue residue guidelines for wildlife are not yet available. • In situ sediments are rarely at equilibrium.
SLCA	• Based on biological effects. • Sufficient data are generally available. • Suitable for all classes of chemicals and most types of sediments.	• Not possible to establish cause and effect relationships. • Large database is required. • End point used is insensitive. • Bioavailability is not considered.

Table 1. **Summary of the strengths and limitations of approaches for deriving numerical sediment quality assessment guidelines. (continued).**

Approach	Strengths	Limitations
SQTA	• Based on biological effects. • Chemistry, bioassay and in situ biological effects are integrated. • Provides a weight of evidence.	• Difficult to derive numerical SQAGs. • Labour intensive and expensive. • Statistical criteria for evaluating TRIAD have not been established. • Extensive site-specific database is required. • Not possible to establish cause and effect relationships. • Bioavailability is not considered.
AETA	• Based on biological effects. • All types of biological data are considered. • Suitable for all classes of chemicals and most types of sediments.	• Extensive site-specific database is required. • Not possible to establish cause and effect relationships. • Risk of under- or over- protection of resource. • Not applicable to the derivation of broadly applicable SQAGs. • Bioavailability is not considered.
WEA	• Based on biological effects. • All types of biological data are considered. • Suitable for all classes of chemicals and most types of sediments. • Provides a weight of evidence. • Provides data summaries for evaluating sediment quality. • May be implemented with existing data.	• Large database is required. • Not possible to establish cause and effect relationships. • Amalgamation of data from multiple sources could result in unknown biases in the database. • Bioavailability is not considered.

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Chapter 4

A Recommended Approach for Deriving and Validating Effects-Based Sediment Quality Assessment Guidelines in Florida

4.0 Introduction

This chapter completes the evaluation of approaches for developing SQAGs conducted in Chapter 3 and provides an overview of, and rationale for, the recommended strategy for deriving and validating numerical SQAGs for Florida coastal waters. As indicated in Chapter 3, no effects-based SQAGs exist which apply directly to conditions in Florida. While effects-based SQAGs have been developed for specific parts of the country (e.g., in Puget Sound using apparent effects threshold approach; AETA), the EPA Science Advisory Board (SAB) has cautioned against using these guidelines outside the areas for which they were developed (Sediment Criteria Subcommittee 1989). The SAB has also questioned the validity of the sediment quality criteria that are currently under development by EPA (i.e., using the equilibrium partitioning approach; EqPA), although a more recent review is less critical (Sediment Quality Subcommittee 1992). These evaluations by the SAB suggest that the SQAGs that are under development in other jurisdictions are not likely to address Florida's immediate requirements for sediment assessment tools.

4.1 Considerations for Recommending a Strategy for Deriving Sediment Quality Assessment Guidelines for Florida Coastal Waters

A total of eight approaches for deriving numerical SQAGs were identified and reviewed in Chapter 3. However, selection of an appropriate procedure for deriving guidelines for Florida coastal waters necessitates further evaluation of each of the approaches in light of the state's specific needs. In this chapter, criteria are provided to evaluate candidate approaches and select a relevant strategy for deriving guidelines (Table 2). The primary considerations in the selection of the recommended strategy were related to practicality, cost-effectiveness, scientific defensibility, and broad applicability to the assessment of sediment quality. Each of these factors are discussed below.

Practicality is one of the central considerations with respect to the development of SQAGs. Numerical SQAGs must be functional (i.e., easy to use) and understandable if they are to be

Table 2. Evaluation of approaches for deriving sediment quality assessment guidelines.

Evaluation Criteria	SBA	SSTA	EqPA	TRA	SLCA	SQTA	AETA	WEA
Practicality								
Supports development of numerical SQAGs?	Y	Y	Y	Y	Y	Y	Y	Y
Feasible to implement in the near term?	Y	N	Y/N	Y/N	Y/N	N	N	Y
Cost Effectiveness								
Expensive to implement?	N	Y	N	Y	Y	Y	Y	N
Requires generation of new data?	N	Y	N	Y	Y	Y	Y	N
Scientific Defensibility								
Considers bioavailability?	N	Y	Y	Y	N	N	Y/N	Y/N
Provides cause and effect relationships?	N	Y	Y	N	Y/N	Y/N	Y/N	Y/N
Based on biological effects data?	N	Y	Y	Y	Y	Y	Y	Y
Considers data from South East?	Y	N	N	N	N	N	N	Y
Provides weight of evidence?	N	N	N	N	N	Y	Y	Y
Support definition of ranges of concentrations rather than absolute assessment values	N	N	Y/N	N	N	N	N	Y
Considers mixtures of contaminants?	N	N	N	N	Y	Y	Y	Y
Requires field validation?	Y	Y	Y	Y	Y	Y	Y	Y
Considers site-specific conditions?	Y	Y/N	Y/N	N	N	Y	Y	N
Applicable to all classes of chemicals?	Y	N	Y/N	Y	Y	Y	Y	Y
Applicability								
Supports monitoring programs?	Y/N	Y	Y	Y	Y	Y	Y	Y
Supports problem identification?	Y/N	Y	Y	Y/N	Y	Y	Y	Y
Supports regulatory programs?	N	Y	Y/N	N	Y/N	Y/N	Y	Y/N
Overall assessment	*	***	***	**	**	***	***	****

* = poor; ** = fair; *** = good; **** = excellent

useful for assessing environmental quality. In addition, the immediate need for these assessment tools necessitates selection of an approach that can be implemented in the near term.

In Florida, limited agency resources make collection of a significant quantity of additional data improbable. Therefore, the approach that is recommended must support the development of numerical SQAGs with data that are currently available. In addition, it must be amenable to re-evaluation of the SQAGs as new data become available.

For SQAGs to be effective in Florida, they must be effects-based (i.e., consider biological effects) and scientifically defensible. Key evaluation criteria for assessing the various approaches include their potential to consider the factors that control the bioavailability of sediment-associated contaminants, to establish cause and effect relationships, and to apply to priority classes of chemicals and mixtures of contaminants that are expected to occur in Florida. They must be compatible with other interpretive tools, such as the metals interpretive tool that has already been developed by the Florida Department of Environmental Protection (FDEP). Furthermore, it is desirable for candidate approaches to be able to explicitly consider data from Florida and elsewhere in the southeastern United States and provide a means of accounting for site-specific environmental conditions.

Due to the uncertainty associated with the candidate approaches, it would be advantageous if the guidelines supported the identification of ranges of contaminant concentrations which are predicted to be associated with specific biological effects (as was recommended by the SAB; Sediment Quality Subcommittee 1992). That is, the guidelines should identify ranges of contaminant concentrations that have high, moderate, and low probabilities of being associated with adverse biological effects. The guidelines should also be supported by a weight of evidence provided by the available data.

To be applicable to Florida, SQAGs must address the needs of the agencies that are charged with managing environmental quality. For example, SQAGs should be relevant to designing, implementing, and evaluating environmental monitoring programs by helping identify contaminants that are likely to be associated with adverse biological effects. This would help determine the need for further investigations at sites with concentrations of specific contaminants that exceed the SQAGs. Guidelines should also support the identification of areas that are most in need of remediation; however, they would not necessarily be used to establish clean-up levels. Furthermore, guidelines should contribute to regulatory programs by helping to evaluate source control measures and the need for further biological and chemical testing to support regulatory decisions.

4.2 Recommended Strategy for Deriving Numerical Sediment Quality Assessment Guidelines for Florida Coastal Waters

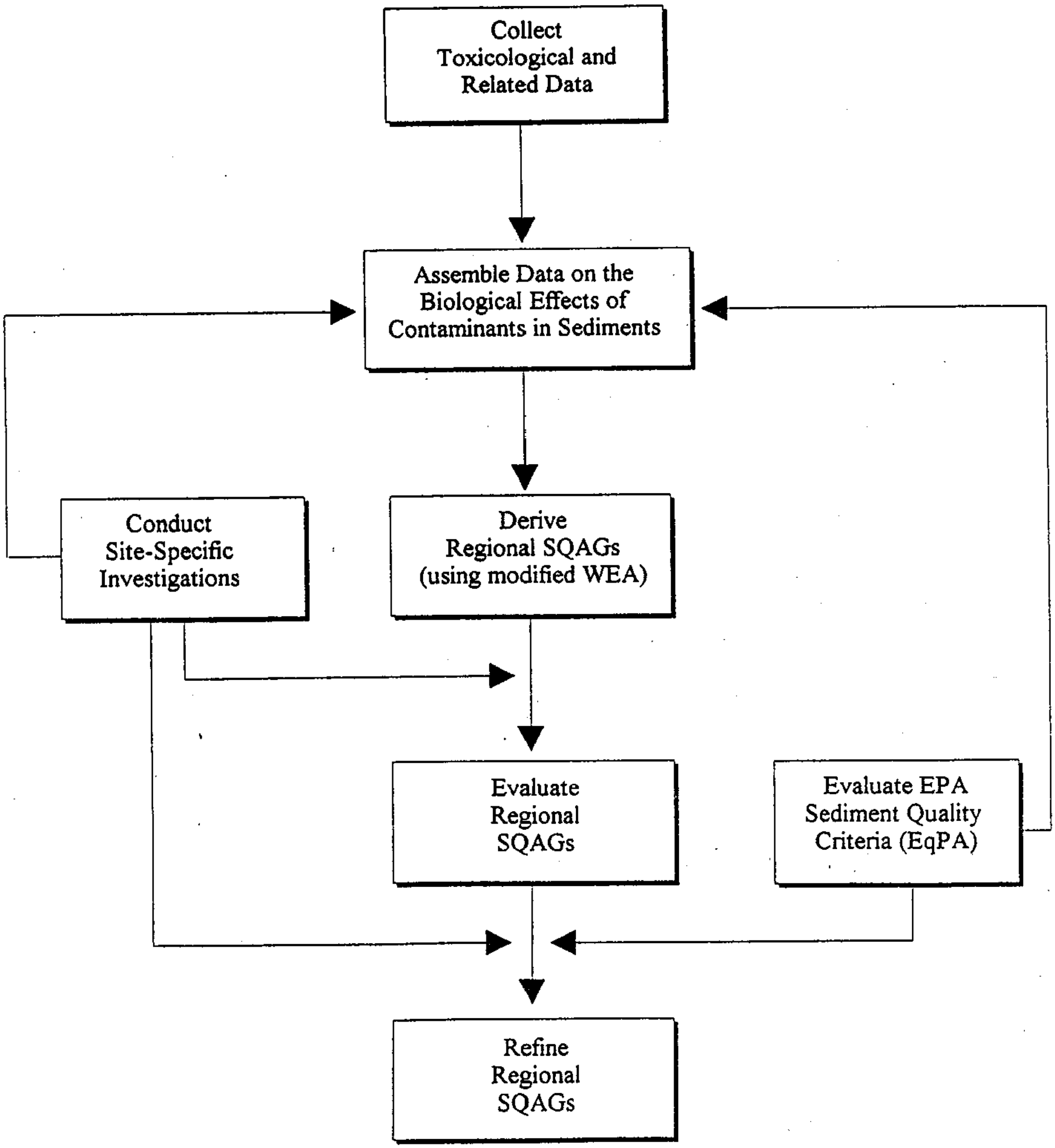
Ideally, SQAGs should be developed from detailed dose-response data which describe the acute and chronic toxicity of individual contaminants and chemical mixtures to sensitive life stages of resident species of aquatic organisms. These data should be generated in controlled laboratory studies, in which the influences of important environmental variables (such as TOC, AVS, salinity, and others) are identified and quantified and compared to the values predicted by appropriate models (e.g., EqP models). Finally, the results of these studies should be validated in field trials to ensure that any guidelines derived from these data are applicable to a broad range of locations.

Unfortunately, insufficient data are available to support deriving numerical SQAGs using the ideal approach. Currently, only a limited number of controlled laboratory studies (i.e., spiked-sediment bioassays) have been conducted to assess the effects of sediment-associated contaminants on estuarine and marine organisms (Long and Morgan 1990). However, in spite of this limitation, other types of data are routinely collected which contribute to our understanding of the toxic effects of these contaminants. Specifically, whole sediment toxicity tests have been conducted to assess the biological significance of concentrations of contaminants in sediments collected from numerous geographic locations. These toxicity tests include those performed on benthic organisms (bivalve mollusks, shrimp, amphipods, polychaetes, nematodes, chironomids and other arthropods, etc.) and on pelagic organisms [*Daphnia*, oyster larvae, luminescent bacteria (Microtox), etc.]. Furthermore, numerous field studies have been conducted to assess the diversity and abundance of benthic infaunal species (bivalve mollusks, arthropods, amphipods, etc.) and epibenthic organisms (echinoderms, crustaceans, etc.). For many of these studies, matching data on the concentrations of contaminants in these sediments have been collected. Studies which report matching sediment chemistry and biological effects data are highly relevant to the SQAGs derivation process.

In recommending a suitable strategy for deriving SQAGs, it is important to recognize the limitations of the existing information for evaluating the potential biological effects of sediment-associated contaminants. In addition, the strategy must address the immediate requirement for defensible SQAGs and the long-term requirement for increased reliability and applicability of these guidelines (i.e., guidelines that account for the environmental characteristics influencing the bioavailability of sediment-associated contaminants).

Evaluation of each of the approaches for deriving SQAGs in the context of the requirements for Florida (as expressed in Section 4.1) indicates that no single approach is likely to satisfy all of the immediate and long-term requirements for SQAGs (Table 2). For this reason, a strategy is recommended that places a priority on the immediate need for defensible SQAGs, while providing a framework for the revision or refinement of these values as data become available (Figure 1).

Figure 1. An overview of the recommended process for deriving numerical sediment quality assessment guidelines in Florida.



The weight of evidence approach (WEA; Long and Morgan 1990; Long 1992) provides a pragmatic means of generating scientifically defensible guidelines using data which are currently available. As such, this approach facilitates the immediate generation of SQAGs. However, several modifications (described in Chapter 5) to this approach are recommended to increase the applicability of the WEA to Florida. These modifications increase the quantity and suitability of data used to evaluate the biological significance of sediment-associated contaminants (i.e., to incorporate data from Florida, other southeastern areas, and elsewhere in North America). In addition, the arithmetic procedure for deriving the guidelines has been refined to consider data from relatively uncontaminated areas. A detailed description and evaluation of the modified WEA for deriving SQAGs is provided in Chapter 5.

Chapter 5

Derivation of Numerical Sediment Quality Assessment Guidelines for Florida Coastal Waters Using the Weight of Evidence Approach

5.0 Introduction

The National Oceanic and Atmospheric Administration (NOAA) National Status and Trends Program (NSTP) weight of evidence approach (WEA; Long and Morgan 1990) is chosen as a basis for developing sediment quality assessment guidelines (SQAGs) for Florida coastal waters. This approach relies on the collection, evaluation, collation and analysis of data from a wide variety of sources in North America to establish relationships between concentrations of sediment-associated contaminants and their potential for adverse biological effects. A modified version of the WEA is recommended for deriving numerical SQAGs.

5.1 Modification of the Original Weight of Evidence Approach for Deriving Florida Sediment Quality Assessment Guidelines

A modified version of the WEA is recommended to derive preliminary SQAGs due to its practicality for developing guidelines, its limited requirement for additional resources, its overall scientific defensibility, and its applicability to all aspects of sediment quality assessment. This approach is closely related to the original WEA, however, the modifications increase the relevance of the resultant guidelines to Florida coastal sediments. Specifically, the modifications to this approach increase the level of internal consistency in the database (by establishing additional screening criteria), verify and expand the information contained in the original NSTP database, and use all of the information in the database to derive SQAGs (in contrast, only data which had concordance between sediment chemistry and biological effects were used to derive the original NSTP guidelines). In addition, user access to the information from individual studies has been improved by providing expanded data tables (see Volumes 3 and 4).

5.1.1 Procedures and Criteria for Screening Candidate Data Sets

The modified WEA integrates a diverse assortment of data to derive numerical SQAGs. As such, data from spiked-sediment bioassays, sediment toxicity bioassays, and assessments of benthic invertebrate community characteristics were merged, along with the sediment quality assessment values developed in other jurisdictions (e.g., Puget Sound AETs, SQCs derived using the EqPA, etc.) into a single database. These data were fully evaluated prior to inclusion to assure internal consistency in the database.

The screening procedures used to support the development of this database were designed to ensure that only high quality data was used to derive SQAGs for Florida. The screening criteria used to evaluate spiked-sediment bioassay data and other matching sediment chemistry and biological effects data (i.e., co-occurrence data) are described in Appendix 1. These screening criteria were established to evaluate the acceptability of the experimental designs, test protocols, analytical methods, and statistical procedures used in each study. To ensure internal consistency in the database, only those studies that met these screening criteria were considered appropriate for inclusion. The sediment quality assessment values that have been derived by other jurisdictions were either incorporated directly into the database (if the concentrations of contaminants were originally expressed on a dry weight basis) or converted to concentrations expressed on a dry weight basis at 1% total organic carbon (TOC; if the assessment values were originally expressed on a TOC basis). Conversion of contaminant levels to dry weight concentrations at 1% TOC rendered these data consistent with the other information included in the database (which had an average TOC of 1.2 +/- 1.8%).

5.1.2 Expansion of the National Status and Trends Program Database

One of the principal limitations of the original NSTP database on the biological effects of sediment-associated contaminants, with respect to deriving SQAGs for Florida, is its bias toward data derived from studies in the northeastern and western coastal areas of the United States. At the time the original database was assembled, few data were included on the biological effects of sediment-associated contaminants from sites located in the southeastern United States. Therefore, collection of acceptable data from Florida and other areas in the southeast was a priority in the present study.

To address the need for additional information on the biological effects of sediment-associated contaminants in general, and from sites in the southeastern United States in particular, a major initiative was undertaken to expand the original NSTP database. The first stage of the database expansion involved identifying and retrieving candidate data sets from sites in the southeastern United States. To this end, investigators in the field of sediment quality assessment located in the Gulf coast and southern Atlantic coast states were contacted and asked to identify studies they had conducted or participated in which contained matching sediment chemistry and biological effects data. Data sets were requested if the descriptions of these studies indicated that the data were likely to be acceptable. Contacts in the southeast included representatives from United States Environmental Protection Agency, United States Army Corps of Engineers, Florida Department of Environmental Protection, National Biological Survey, United States Fish and Wildlife Service, National Marine Fisheries Service, various academic institutions, and regionally-based consulting firms.

Significant effort was also expended to obtain additional data from other locations in the United States and Canada. In addition to the agencies identified above, contacts were made at Washington Department of Ecology, Oregon Department of Environmental Quality, California State Water Resources Control Board, Maryland Department of Environment, Port Authority of New York and New Jersey, Environment Canada, Public Works Canada, and the National Oceanic and Atmospheric Administration. Each of the 350 members of the ASTM Subcommittee E47.03 on Sediment Toxicology was contacted to obtain relevant data. Furthermore, a total of 12 bibliographic databases were searched electronically to obtain information that was published in the primary scientific literature.

Over the course of this study, more than 700 publications was retrieved and evaluated to determine their suitability for use in the derivation of SQAGs. More than 120 of these publications were used to verify and expand the original NSTP database. Roughly 35% of the publications used in the present study were from studies conducted in the southeastern and Gulf of Mexico regions of the United States (i.e., North and South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Texas).

Each of the data sets obtained during the course of the study were reviewed and evaluated using the screening procedures outlined in Appendix 1. Acceptable data sets were subsequently analyzed and information pertaining to the potential biological effects of sediment-associated contaminants was integrated into the database. Following input into the database, every data entry (including each of the original NSTP database entries) was examined and verified against the original data source. This quality assurance procedure was designed to ensure that the database would meet Florida's requirements for consistently high quality data. This comprehensive, high quality sediment toxicity database provides a basis for deriving SQAGs for priority substances in Florida.

5.2 Derivation of Numerical Sediment Quality Assessment Guidelines

The expanded NSTP database consists of information from three types of studies, including equilibrium partitioning (EqP) modelling, laboratory spiked-sediment bioassays, and field investigations of sediment toxicity and benthic community composition. Equilibrium partitioning concentrations, if expressed in units of organic carbon, were converted to units of dry weight assuming a TOC concentration of 1%. Data from spiked-sediment bioassays were incorporated into the database directly. Field-collected data were treated with a variety of methods. Apparent effects thresholds (AET) and national screening level concentrations (SLC), both of which were based on evaluations of large, merged data sets, were entered directly into the NSTP database. Raw data from other individual surveys were evaluated using co-occurrence analyses (COA), using one of two procedures (Long 1992). If the authors of the reports identified samples that were statistically significantly different from the other groups of samples or from controls, then the mean chemical concentrations in the statistical groups were compared. If no such comparisons were reported, the frequency distributions of the biological data and the mean concentrations in subjectively determined groups of samples were compared (e.g., relatively highly toxic versus least toxic). Data entries were prepared for each endpoint measured in the study (e.g., survival, growth, reproduction, etc.), so that multiple entries for a single geographic area are common in the database.

The expanded NSTP database is a comprehensive source of information on the potential effects of sediment-associated contaminants. Each record in the database contains detailed information on the location of the study, species affected, endpoint measured, particle size distribution, factors that could affect bioavailability of the contaminants (such as TOC and acid volatile sulfides; AVS), and concentrations of the contaminants. Importantly, each entry in the database was assigned an 'effects/no effects' descriptor, based on the degree of concordance between the concentration of the chemical and the endpoint measured in the investigation. Those entries in which the chemical concentrations were considered to be associated with the biological effect measured were designated with an asterisk or "hit" (*; see Volumes 3 and 4). The descriptors, 'no gradient (NG), small gradient (SG), no concordance (NC), or no effect (NE)', were assigned when either the chemical concentrations were not strongly associated with the biological effect measured or no adverse effects were observed (see below). The data on each substance were then sorted, in ascending order of concentration, to create two separate data sets, which incorporated the entries associated with biological effects and the entries associated with no observed biological effects, respectively.

The 'effects data set' (EDS) was comprised primarily of information from COA in which specific adverse biological effects (as indicated from the results of sediment toxicity bioassays or benthic invertebrate community assessments) were observed at some of the sites sampled. However, results of the COA were only included in the EDS if concordance between the concentration of the chemical analyte and the observed biological response was apparent. In this respect, a contaminant was considered to be associated with the observed toxic response if the mean concentration at the sites at which significant biological effects were observed was a factor of two or more greater than the mean concentration at the sites at which no biological effects were observed (this criterion was adopted directly from Long and Morgan 1990). Data obtained from other types of studies (i.e., spiked-sediment bioassays) and sediment quality assessment values (i.e., from the SLCA, EqPA, SQTA, etc.) were also included in the EDS.

A separate data set was also established, the 'no effects data set' (NEDS), to include the balance of the assembled data. Data on the concentrations of specific substances that were not associated with adverse effects provides important information for defining the relationships between contaminant challenges and biotic responses. For this reason, it was considered appropriate to include the no effects data set in the guidelines derivation process. Several types of information were included in this data set. In general, these entries consisted of data from bioassays in which exposure of aquatic organisms to test sediments did not result in significant biological effects (i.e., no effect). In addition, the descriptors, 'no gradient, small gradient, or no concordance,' were assigned when no differences in the concentration of a particular chemical were reported between stations, the mean chemical concentrations between groups of samples differed by less than a factor of two, or there was no concordance between the severity of the effect and the chemical concentration, respectively. Data from field surveys of benthic invertebrate community indices were designated in a similar manner. Indeterminate AET values were reported in the data tables (MacDonald *et al.* 1994) but were not included to derive the SQAGs.

Both the effects and the no effects data sets were used to derive numerical sediment quality assessment guidelines for Florida coastal waters, using the steps presented in Figure 2. The arithmetic procedures used in the guidelines derivation process were designed to define three distinct ranges of contaminant concentrations; a minimal effects range, a possible effects range, and a probable effects range. A conceptual representation of the three ranges of contaminant concentrations defined by the guidelines is provided in Figure 3. This figure illustrates the concept that the probability of observing adverse biological effects increases with increasing contaminant concentration.

The range of sediment contaminant concentrations that are not likely to be associated with adverse biological effects on aquatic organisms (i.e., the minimal effects range) was defined using a two step process. First, a threshold effects level (TEL) was calculated. The TEL represents the upper limit of the range of sediment contaminant concentrations dominated by no effects data entries (i.e., the minimal effects range). Within this range, concentrations of sediment-associated contaminants are not considered to represent significant hazards to aquatic organisms. The TEL was calculated as follows:

$$\mathbf{TEL} = \sqrt{\mathbf{EDS\text{-}L} \cdot \mathbf{NEDS\text{-}M}}$$

where:

TEL	=	Threshold effect level;
EDS-L	=	15th percentile concentration in the effects data set; and,
NEDS-M	=	50th percentile concentration in the no effects data set.

Figure 2. An overview of the modified NSTPA for deriving numerical sediment quality assessment guidelines in Florida.

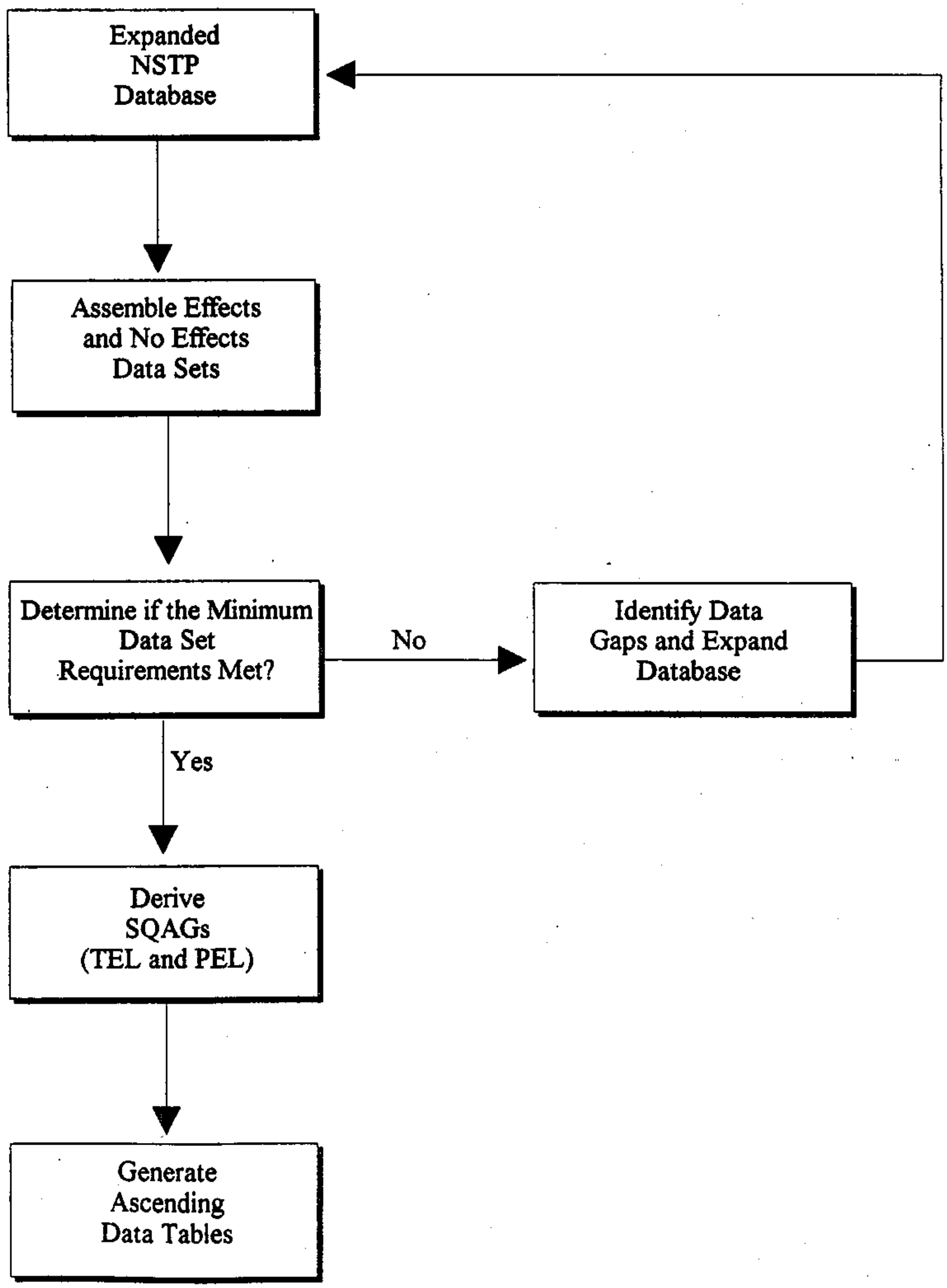
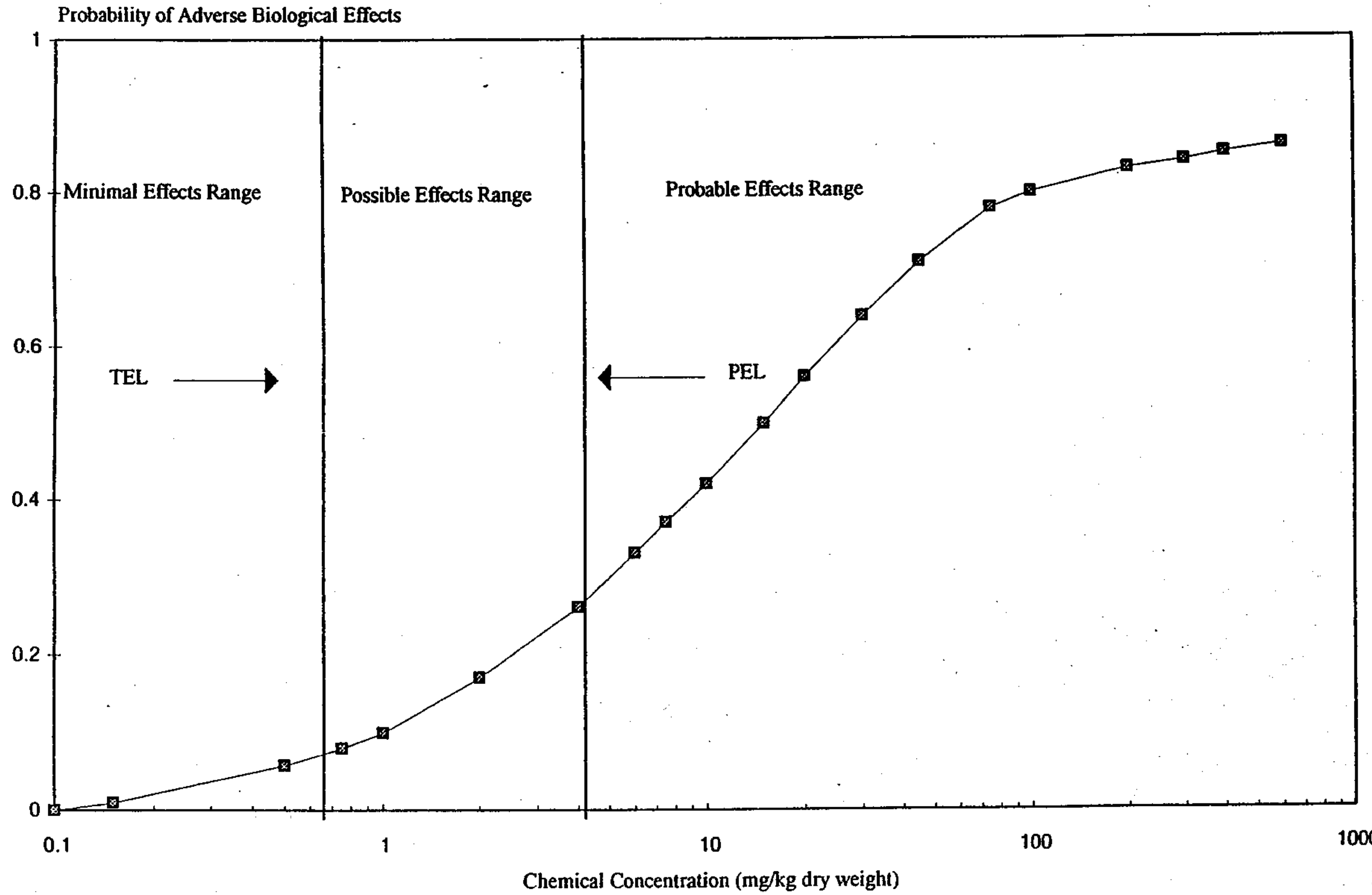


Figure 3. Conceptual example of sediment quality assessment guidelines for cadmium.



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The geometric mean, rather than the arithmetic mean, of EDS-L and NEDS-M is calculated because these data are not, necessarily, normally distributed (Sokal and Rohlf 1981; see Appendix 1 for an example of this calculation).

A probable effects level (PEL) was calculated to define the lower limit of the range of contaminant concentrations that are usually or always associated with adverse biological effects (i.e., the lower limit of the probable effects range). The procedure utilized to calculate the PEL is designed to define a range of concentrations that is dominated by entries from the EDS. Within the probable effects range, concentrations of sediment-associated contaminants are considered to represent significant and immediate hazards to aquatic organisms. The PEL was calculated as follows:

$$\textbf{PEL} = \sqrt{\textbf{EDS-M} \cdot \textbf{NEDS-H}}$$

where:

PEL	=	Probable effect level;
EDS-M	=	50th percentile concentration in the effects data set; and,
NEDS-H	=	85th percentile concentration in the no effects data set.

The range of concentrations that could, potentially, be associated with biological effects (i.e., the possible effects range) is delineated by the TEL (lower limit) and the PEL (upper limit). Within this range of concentrations, adverse biological effects are possible; however, it is difficult to predict the occurrence, nature, and/or severity of these effects. Site-specific conditions at sites with contaminant concentrations within this range are likely to control the expression of toxic effects. When contaminant concentrations fall within this range, further investigation is recommended to determine if sediment-associated contaminants represent significant hazards to aquatic organisms. Such investigations would focus first on the determination of the probable origin of the contaminant (i.e., through the use of the metals interpretive tool; Schropp *et al.* 1989), and then on the toxicity of *in situ* sediments (i.e., using bioassessment techniques), as required. See Volume 2 for further guidance on applying the SQAGs. ***It should be noted that guidelines, developed using the recommended procedures, do not address the potential for bioaccumulation of persistent toxic chemicals and potential adverse effects on higher trophic levels of the food web.***

5.3 Rationale for Establishing the Procedure for Deriving the Guidelines

Several arithmetic and statistical procedures were considered for deriving numerical guidelines from the expanded NSTP database. One of the statistical procedures that was considered involved the determination of guideline values based on the percent incidence of effects associated with increasing contaminant concentrations, which could be determined directly from the database. For example, Long *et al.* (In press) suggested that the ER-M for a specific substance would be considered reliable if there is a relatively high incidence of effects above that concentration (i.e., > 75% hits). Therefore, the percent incidence of effects was considered for deriving the SQAGs, as well. While this option was initially attractive, an evaluation of the relative distribution of the effects and no effects data entries indicated that its implementation would be challenging. Specifically, calculations using the data available on several substances (cadmium and chromium) revealed that, for example, a 75% incidence of adverse effects occurs within concentration ranges that could be delineated by several different guideline values. For this reason, it was decided that an arithmetic procedure that could be applied more consistently to each chemical should be established. While numerous arithmetic procedures are possible, the methods utilized by Long and Morgan (1990) appeared to be the most promising.

Long and Morgan (1990) used the 10th (ER-L) and 50th (ER-M) percentile values in the effects data set to establish informal guidelines for evaluating sediment chemistry data collected under the NSTP. This method was similar to the procedure used by Klapow and Lewis (1979) to establish marine water quality standards in California. Klapow and Lewis (1979) reasoned that the use of percentiles of aquatic toxicity data minimized the influence of single (potentially outlier) data points on the resultant assessment values. For this reason, a percentile-based procedure was selected to support the derivation of SQAGs for Florida coastal waters.

Environmental quality guidelines are, typically, derived from the LC_{50}s, EC_{50}s, or lowest observed effect levels that are determined from acute and chronic bioassays (Stephan *et al.* 1985; CCME 1991). In addition to this type of information, the expanded NSTP database also includes data from studies in which exposure of organisms to sediments did not result in significant biological effects. The CCREM (1987) recognized the value of using additional information for deriving water quality guidelines (WQGs) for irrigation and livestock watering. In this case, WQGs were derived by applying a safety factor to the geometric mean of the lowest and no observed effects levels that are obtained from acceptable toxicological studies. Likewise, lowest and no observed effect concentrations from tests conducted on contaminant-spiked or amended soils have been employed to derive soil quality criteria for the protection of agricultural, residential, and other land uses (CCME 1993). Furthermore, Kenaga (1982) recommended the use of acute to chronic ratios (ACRs) for estimating long-term no effect concentrations of environmental contaminants in water from median lethal or effective endpoints. In this context, chronic no observed effect levels are used in conjunction with LC_{50}s or EC_{50}s to calculate the ACRs. Therefore, it was considered appropriate to modify the original procedure from Long and Morgan (1990) to facilitate incorporation of both the effects and the no effects data into the guidelines derivation process.

A variety of arithmetic procedures, which rely on calculations of specific percentiles of the effects and no effects data distributions, could be used to derive SQAGs. To develop a screening tool, the Florida Department of Environmental Protection identified the need to develop two guideline values, which would define ranges of concentrations that would infrequently, sometimes, and frequently be associated with adverse effects. First, a low incidence of adverse effects was required in the minimal effects range. This objective could be achieved by determining chemical concentrations falling within the low end of the effects range (i.e., effects data set) and the middle of the no effects range (i.e., no effects data set). Subsequently, the mean of these values would establish a threshold effects level for each chemical. The geometric mean of these two values should be calculated because the two data distributions are not likely to be normally distributed. Using similar logic, the upper guideline value could be derived using a procedure that would establish a probable effects range that has a high incidence of adverse effects. This objective could be met by determining chemical concentrations falling within the middle of the effects range and the upper end of the no effects range. Likewise, the geometric mean of these values could be calculated to establish a probable effects level.

A sequential testing approach was used to determine which percentile values should be used to derive the numerical SQAGs. For example, the 5th, 10th, 15th, and 20th percentiles of the effects data set, in conjunction with the 50th percentile of the no effects data set, were all used to derive candidate TEL values for several indicator substances (cadmium, copper, fluoranthene, and phenanthrene). Several procedures for deriving the PEL were also proposed and tested in a similar manner. Subsequently, each of the candidate procedures was evaluated to determine which technique would be most appropriate for use in Florida.

The incidence of effects within each of the ranges of contaminant concentrations provides a powerful tool for evaluating the reliability of SQAGs (Long *et al.* In press). Therefore, the percent incidences of adverse effects within the minimal and probable effects ranges were calculated for each of the TELs and PELs, respectively, derived using the candidate procedures. The TELs were considered to be reliable if the incidence of adverse effects was less than 10% within the minimal effects range, while an incidence of adverse effects of 65% or more within the probable effects range was considered indicative of reliable PELs. Only those procedures that satisfied the criteria for reliability were further considered.

Next, the remaining procedures were evaluated in terms of their overall applicability. In this respect, candidate procedures were considered to be broadly applicable if they supported the derivation of guidelines that could be used to effectively screen sediment chemistry data at a large number of sites. That is, the guidelines would be most useful if they defined only a limited range of contaminant concentrations between the TEL and PEL. By tightening the possible effects range (i.e., reducing the range of uncertainty), the guidelines could be used to clasify a larger number of samples in terms of their potential toxicity. Of all the procedures tested, the methods described in section 5.2 appeared to provide the most reliable and appropriate means of deriving SQAGs for Florida coastal waters.

There is a great deal of variability in the quantity of information available for each chemical, ranging from less than twenty data entries for 2,3,7,8-T_4CDD to several hundred data entries for cadmium. Due to the uncertainty associated with the evaluation of matching sediment chemistry and biological effects data, minimum data requirements were established to ensure that any guidelines developed were supported by the weight of evidence. To adhere to this principle, SQAGs were derived only for those contaminants which had at least 20 entries in both the effects and no effects data sets.

The number of data entries required to support the derivation of preliminary SQAGs was established based on the results of sequential calculations of guidelines for a total of four substances (cadmium, chromium, fluoranthene, and PCBs) using data sets of various sizes. Using the guideline derivation procedure described above, guidelines were sequentially calculated using randomly selected data sets of various sizes (ranging from 2 to 30 data entries). This procedure was repeated 10 times for each chemical to support the calculation of the mean guideline value and its standard deviation for each data set size. The results of this investigation indicated that the estimate of the guideline value stabilized when the data set contained 15 to 20 entries. The variability in this estimate was not significantly reduced over the range of 20 to 30 entries. Therefore, it was concluded that at least 20 entries from each data set were required to support the derivation of SQAGs.

5.4 Strengths and Limitations of the Recommended Approach for Developing Sediment Quality Assessment Guidelines

The following discussion provides a general critique of the recommended approach for deriving SQAGs in the context of Florida's requirements.

5.4.1 Strengths of the Approach

The WEA is characterized by a number of attributes that make it an attractive choice for deriving SQAGs for Florida coastal waters. First, the approach is supported by a comprehensive database on the biological effects of sediment-associated contaminants. Interpretation of the information contained in the expanded NSTP database provides relevant tools for evaluating the potential for biological effects at various contaminant concentrations. Such interpretations are supported by detailed summaries of a large volume of data linking contaminant concentrations to biological effects (MacDonald *et al.* 1994). In this way, the WEA provides an effective basis for evaluating the degree of confidence that should be placed on the resultant guidelines. Confidence in these data is enhanced by the rigorous screening procedures that were used to evaluate candidate data sets.

Unlike other approaches to the development of SQAGs, the WEA does not attempt to establish absolute sediment quality assessment values. Instead, the approach delineates ranges of contaminant concentrations that are probably, possibly, and not likely to be associated with adverse biological effects. This approach explicitly recognizes the uncertainty associated with the prediction of biological effects from chemical concentration data, thereby enhancing the defensibility of the guidelines for identifying priority conditions with respect to contaminated sediments.

One of the more important attributes of the WEA is its overall practicality. The expanded NSTP database supports the derivation of numerical SQAGs for a variety of chemical substances. Many of these chemicals are known to occur in Florida's coastal sediments at elevated levels. Sediment quality assessment guidelines are required to support assessments of the potential for biological effects in these sediments. In addition, by considering matching sediment chemistry and biological effects data from studies conducted in the field, the influence of mixtures of chemicals in sediments is incorporated in the resultant SQAGs. Furthermore, the information in the expanded NSTP database is highly relevant to the guidelines derivation process because it applies to a wide range of biological organisms and endpoints, and incorporates a large number of direct measurements on organisms that are normally associated with bed sediments. The database also includes a significant quantity of data from studies conducted in the southeastern United States (including Florida). These attributes are likely to give the SQAGs derived using the WEA broad applicability. As such, there is a high probability that these guidelines will be appropriate for implementation in Florida.

In addition to the other advantages of the approach, the procedure recommended for calculating SQAGs considers both the EDS and NEDS for each chemical constituent. And, in contrast to the AETA, this procedure does not rely heavily on individual data points. Therefore, outliers do not carry much weight in the overall guidelines derivation process. Integration of the effects and no effects data sets into a single data set allows preparation of ascending data tables for each contaminant. These data tables provide detailed information on specific biological responses that have been observed at various concentrations of the contaminant and, in themselves, can contribute significantly to sediment assessments. As such, these data tables are useful tools for evaluating the potential biological significance of contaminant concentrations that fall within the three ranges described above (i.e., no effects, possible effects, and probable effects ranges). Many reviewers of the original NSTP document (Long and Morgan 1990) indicated that the data tables (with contaminant concentrations arranged in ascending order) were extremely useful tools for evaluating sediment quality data from specific sites (E. Long, NOAA, Seattle, Washington. Personal communication).

In addition to supporting the derivation of numerical SQAGs, the expanded NSTP database provides a basis for evaluating the guidelines. In this respect, it is possible to use the database to calculate the distribution of effects and no effects entries within each range of contaminant concentrations (i.e., the minimal effects, possible effects, and probable effects ranges). These distributions describe the percent incidence of effects (i.e., number of biological effects entries divided by the total number of entries times 100) within each range of concentrations and, as such, provide an estimate of the probability of observing adverse biological effects when the concentration of a contaminant falls within a specific range of concentrations (Long *et al.* In press). For example, if the incidence of effects within the probable effects range for cadmium was 68%, then there is a high likelihood that adverse biological effects would be observed at sites with concentrations of cadmium equalling or exceeding the PEL. This feature of the approach provides environmental managers a measure of confidence for ranking the relative priority of contaminated sediments. This tool can also be used within a risk assessment framework for assessing contaminated sediments.

Lastly, the WEA has been extensively reviewed by experts from across North America. Over 1000 copies of the original publication (Long and Morgan 1990) have been distributed to date. In addition, it has recently been peer reviewed and published in a primary journal (Long 1992; Long et al. In press). Further, it has been described and evaluated in the *Sediment Classification Methods Compendium* (EPA 1992). Since its development in 1990, this approach has received positive evaluations from a wide variety of user groups and has been adopted directly and/or modified for implementation by both California (Lorenzato and Wilson 1991) and Canada (Smith and MacDonald 1993) as part of their guidelines derivation process. These favourable assessments emphasize the importance and utility of this procedure for deriving numerical SQAGs.

5.4.2 Limitations of the Approach

In spite of the obvious benefits associated with the WEA for deriving SQAGs, a number of limitations are also evident which could restrict application of these guidelines in Florida. The most serious of these shortcomings is associated with the limitations on the data that describe the bioavailability of sediment-associated contaminants. Ancillary data on grain size, levels of TOC, and concentrations of AVS were not provided in a large number of the reports reviewed. As such, it is not currently possible to express the guidelines in terms of the factors that could influence the bioavailability of these contaminants. While reliance on ranges of concentrations instead of absolute values and consideration of the no effect data set serves to minimize this limitation, a potential for under- or over-protection of aquatic resources exists if guidelines are implemented that do not consider the bioavailability of sediment-associated contaminants.

The Florida Department of Environmental Protection (FDEP) recognizes the importance of accounting for the bioavailability of sediment-associated contaminants and is participating with NOAA in bio-effects studies to help address this issue. In addition, FDEP has developed a companion tool for use with the biological effects-based guidelines. The metals interpretive tool is based on normalizing metal levels to concentrations of aluminum in sediment, and provides a means of assessing the probable origin of sediment-associated metals (Schropp and Windom 1988; Schropp *et al.* 1989; Schropp *et al.* 1990). This tool emphasizes the importance of 'normalizers' in the interpretation of sediment chemistry data and provides a practical tool that compliments the effects-based guidelines. A detailed discussion on how these tools may be used together to assess sediment quality is provided in Volume 2.

It is anticipated that the bioavailability of sediment-associated contaminants will be one of the principal issues addressed in refining the preliminary guidelines. Currently, there is little comprehensive information with which to reliably predict the bioavailability of sediment-associated contaminants. Nonetheless, EPA has developed sediment quality criteria for five non-polar organic substances that are expressed on an OC-normalized basis. Data from other studies conducted in Florida and elsewhere may provide more relevant information for determining the factors that influence bioavailability in Florida coastal sediments.

Another limitation of the WEA is that it does not fully support the quantitative evaluation of *cause and effect* relationships between contaminant concentrations and biological responses. Although information from spiked-sediment bioassays and EqP models is included in the expanded NSTP database, the recommended approach is considered to predict *associations* between contaminant concentrations and biological responses only. A wide variety of factors other than concentrations of the contaminant under consideration could have influenced the actual response observed in any given investigation. For example, Jones-Lee and Lee (1993) identified ammonia as a factor that could potentially affect the toxicity of aquatic sediments. More recent results from more intensive monitoring in areas such as Tampa Bay and Los Angeles Harbor indicate that unionized ammonia levels in porewater were rarely in the range that would be associated with biological effects (Long Unpublished data). Nonetheless, variables such as ammonia, hydrogen sulfide, and dissolved oxygen, have the potential to affect benthic organisms and should be evaluated in site-specific assessments of sediment quality. In the WEA, the assembly of extensive information from numerous estuarine and marine sites in North America into a single database serves to minimize the impacts of unmeasured contaminants on the guidelines; however, there is still an undefined level of uncertainty associated with the application of the SQAGs at specific sites.

Application of the recommended approach may also be restricted by other limitations on the available information. Currently, limited data are available on the chronic toxicity of sediment-associated contaminants to marine and estuarine organisms. However, information on the responses of *in situ* benthic invertebrate communities to contaminant challenges partially mitigates this limitation on the database. In addition, only limited data are available on some potentially important sediment contaminants in Florida (including a variety of pesticides, dioxins and furans, etc.).

The results of this preliminary evaluation indicate that SQAGs developed using the recommended procedure are likely to be appropriate tools for conducting assessments of sediment quality in Florida. However, care should be exercised in applying these guidelines. In particular, these guidelines may not be directly applicable to sediments with atypical levels of the factors that may influence the bioavailability of contaminants (e.g., very high or very low levels of TOC). Detailed discussions on the application of SQAGs in regional and site-specific sediment quality assessments are provided in Volume 2. In addition, a more thorough evaluation of the SQAGs comparability, reliability, and predictability is presented in Chapter 7.

Chapter 6

Numerical Sediment Quality Assessment Guidelines for Florida Coastal Waters

6.0 Introduction

State water quality criteria are one of the major management tools for protecting designated uses of coastal ecosystems, including maintenance of acceptable conditions for living resources. While state water quality criteria provide effective tools for managing water quality, they provide little guidance for managing sediment quality. Therefore, numerical sediment quality assessment guidelines (SQAGs) are required to help address concerns relative to contamination of coastal ecosystems with substances that tend to be associated with bed sediments. In particular, there is a need for SQAGs that apply to substances that are known or suspected to be present in Florida coastal sediments.

This Chapter presents the numerical SQAGs that have been developed for assessing sediment quality in Florida coastal waters. In total, threshold effect levels (TELs) and probable effects levels (PELs) have been derived for 34 substances or groups of substances. In addition, an indication of the subjective degree of confidence that should be placed on the SQAGs is provided. The detailed evaluation of these guidelines is presented in Chapter 7.

6.1 Identification of Priority Contaminants in Florida Coastal Waters

Generally, Florida's coast has not been subjected to extensive industrial developments. Therefore, the types of persistent, bioaccumulative, and highly toxic contaminants that are known to occur elsewhere in the United States are not likely to be distributed widely in its coastal areas. Nonetheless, various land uses and other coastal activities in the state have contributed significant quantities of environmental contaminants into coastal waters; therefore, sediments in the vicinity of major point and non-point sources may be severely contaminated. Concerns relative to the contamination of coastal ecosystems fall into four general categories: urban stormwater runoff; agricultural runoff; domestic wastewater; and, industrial wastewater (Hand *et al.* 1990). Consideration of each of these potential sources of environmental contaminants provides a basis for identifying chemical concerns in the Florida coastal zone.

It would be virtually impossible to develop SQAGs for every substance that could, potentially, be released into Florida coastal waters. For this reason, the evaluation of chemical concerns in Florida coastal systems is focused on identifying priority substances that are known to be released in significant quantities into receiving water systems and to form associations with sediments (Table 3). These substances are considered to be of highest priority with respect to developing numerical SQAGs applicable to Florida's coast.

Stormwater runoff and associated contaminants are of particular concern in Florida. While nutrients and sediments are the most prevalent pollutants in urban stormwater, metals, PAHs, and other toxic substances may also be transported into receiving water systems by runoff from urban areas. Due to the substantial population growth in recent years and the proximity of urban developments to the coast, urban stormwater represents a major source of contaminants into coastal ecosystems in Florida. Florida Department of Environmental Protection (FDEP 1994), Long and Morgan (1990), Delfino *et al.* (1991), and Long *et al.* (1991) provided lists of metals, PAHs, and other substances that have been detected at elevated levels in Florida coastal sediments (i.e., at levels that exceed the effects range low, ER-Ls, reported by Long and Morgan 1990). These substances are reflected in the preliminary evaluation of chemical concerns in Florida coastal ecosystems (Volume 2).

High yields of agricultural products in Florida require the use of substantial quantities of fertilizers and pesticides. However, poorly managed runoff from agricultural areas has the potential to severely affect receiving water systems. The principal contaminants associated with agricultural runoff include nutrients, suspended solids, herbicides, insecticides, and other pesticides. While agricultural runoff is known to have impacts on lakes, rivers, and canals in the immediate vicinity of agricultural operations, contaminants may also be transported into coastal waters. The high-use pesticides with significant potential to contaminate sediments in Florida's coastal areas are listed in Table 3. This list was assembled by considering present and historical pesticide use patterns (Pait *et al.* 1989), in conjunction with the physical/chemical properties of each substance (Worthing and Hance 1991). In addition, the pesticides which have been detected in coastal sediments (Long and Morgan 1990; Long *et al.* 1991; Delfino *et al.* 1991) or in aquatic biota (Trefry *et al.* 1983; Leslie 1990) in Florida were included in this list.

As might be expected in a state characterized by rapid urban development, inputs of domestic wastewater represent potentially significant sources of environmental contaminants. While wastewater treatment plant (WWTP) upgrades have resulted in improved water quality in many areas, progress towards effective management of domestic wastewater treatment plant effluents is hampered by rapid population growth and severe limitations on financial resources in some portions of the state (Hand *et al.* 1990). Environmental contaminants that are commonly associated with WWTP effluents include nutrients, metals, halogenated methanes, and various chlorinated organic substances (MacDonald 1989).

Table 3. Preliminary identification of chemicals of concern in Florida coastal waters.

Substance	Reference/Rationale
Metals	
Arsenic	Long *et al.* (1991); FDEP (1994).
Cadmium	Long *et al*. (1991); FDEP (1994).
Chromium	Long and Morgan (1990); Long *et al.* (1991); FDEP (1994).
Copper	Used in aquatic herbicides/found in fish; Long *et al.* (1991); Trefry *et al.* (1983); Leslie (1990); FDEP (1994).
Lead	Long and Morgan (1990); Long *et al.* (1991); FDEP (1994).
Mercury	Long and Morgan (1990); Long *et al.* (1991); FDEP (1994).
Nickel	Long *et al.* (1991); FDEP (1994).
Silver	Long and Morgan (1990); FDEP (1994).
Tributyltin	Used as an antifoulant on ships.
Zinc	Long and Morgan (1990); Long *et al.* (1991); FDEP (1994).
Polycyclic Aromatic Hydrocarbons (PAHs)	
Acenaphthene	Delfino *et al.* (1991); FDEP (1994).
Acenaphthylene	Delfino *et al.* (1991); FDEP (1994).
Anthracene	Long and Morgan (1990); Delfino *et al.* (1991); FDEP (1994).
Benz(a)anthracene	Long and Morgan (1990); Delfino *et al.* (1991); FDEP (1994).
Benzo(a)pyrene	Long and Morgan (1990); Delfino *et al*. (1991); FDEP (1994).
Chrysene	Long and Morgan (1990); Delfino *et al.* (1991); FDEP (1994).
Dibenzo(a,h)anthracene	Long and Morgan (1990); Delfino *et al.* (1991); FDEP (1994).
Fluorene	Long and Morgan (1990); Delfino *et al*. (1991); FDEP (1994).
Fluoranthene	FDEP (1994).
Napthalene	Long and Morgan (1990); Delfino *et al.* (1991); FDEP (1994).
2-methylnapthalene	Long and Morgan (1990).
Phenanthrene	Long and Morgan (1990); Delfino *et al.* (1991); FDEP (1994).
Pyrene	Long and Morgan (1990); Delfino *et al.* (1991); FDEP (1994).
Total PAHs	Long and Morgan (1990); Long *et al.* (1991); FDEP (1994).
Polychlorinated Biphenyls (PCBs)	
Total PCBs	Long and Morgan (1990); Long *et al.* (1991); Delfino *et al*. (1991); FDEP (1994).

Table 3. Preliminary identification of chemicals of concern in Florida coastal waters (continued).

Substance	Reference/Rationale
Pesticides	
Aldrin/Dieldrin	Long and Morgan (1990); Long *et al.* (1991); FDEP (1994).
Azinphos-methyl (guthion)	Organophosphorous insecticide (K_{ow}* > 10,000?)
Chlordane	Long and Morgan (1990); Long *et al.* (1991); FDEP (1994).
Chlorothalonil	Chlorophenyl fungicide (K_{ow} = 20,000)
Chlorpyrifos	Organophosphorous insecticide (K_{ow} > 50,000)
DDT and metabolites	Long and Morgan (1990); Long *et al*. (1991); FDEP (1994); Delfino *et al*. (1991).
Disulfoton	Organophosphorous insecticide (K_{ow} > 10,000)
Endosulfan	Delfino *et al*. (1991); FDEP (1994).
Endrin	Organochlorine insecticide (K_{ow} > 10,000?); FDEP (1994).
Heptachlor	Organochlorine insecticide (K_{ow} > 10,000?); FDEP (1994).
Heptachlor epoxide	Organochlorine insecticide (K_{ow} > 10,000?); FDEP (1994).
Lindane (gamma-BHC)	Organochlorine insecticide (K_{ow} > 10,000?); FDEP (1994).
Mirex	Organochlorine insecticide (K_{ow} > 10,000?); FDEP (1994).
Phorate	Organophosphorous insecticide (K_{ow} > 10,000?).
Quintozene (PCNB)	Chlorophenyl fungicide (K_{ow} = 10,000).
Toxaphene (alpha-BHC)	Organochlorine insecticide; FDEP (1994).
Trifluralin	Dinitroanaline herbicide (K_{ow} > 200,000); FDEP (1994).

* K_{ow} = Octanol-water partition coefficient which provides an indication of the hydrophobicity of a substance; Criteria for selection of pesticides: K_{ow} > 5,000.

Chlorinated Organic Compounds	
2,3,7,8-T4CDD	Pulp and paper industry.
2,3,7,8-T4CDF	Pulp and paper industry
Pentachlorophenol	Delfino *et al.* (1991); FDEP (1994).
Phthalates	
Bis(2-ethylhexyl)phthalate	Delfino *et al.* (1991).
Dimethyl phthalate	Delfino *et al.* (1991).
Di-n-butylphthalate	Delfino *et al.* (1991).

While Florida is generally not characterized by high densities of heavy manufacturing industries, substantial quantities of industrial wastewater are discharged into Florida waters (Farrow 1990). The major sources of these effluents are the pesticides, organic chemicals and plastics, petroleum refining, and pulp and paper industries (Farrow 1989; 1990). In addition to pesticides, metals, and PAHs (Long and Morgan 1990; Long *et al.* 1991; Delfino *et al.* 1991), industrial activities are likely to have resulted in the release of PCBs, polychlorinated dibenzo-*p*-dioxins (and related substances), and a wide variety of other organic contaminants into coastal waters (see MacDonald 1989 for a discussion on the nature and extent of contaminants that are typically associated with specific industrial wastewaters).

6.2 Numerical Sediment Quality Assessment Guidelines

Numerical sediment quality assessment guidelines have been developed for a total of 34 high priority substances in Florida. Using the procedures described in Chapter 5, a threshold effect level and a probable effect level were derived using the information contained in the expanded NSTP database. These numerical guidelines, which are expressed on a dry weight basis, are presented in Table 4. A brief discussion of the sources, fate, and effects of each substance (or group of substances) has also been prepared to provide additional information for applying the SQAGs. Lastly, the results of the evaluation of the reliability of the SQAGs are expressed as "high", "medium", and "low confidence" to provide guidance on the application of the SQAGs. However, the reader is urged to read Chapter 7 for the details of this evaluation, as well as an assessment of the comparability and predictability of the SQAGs.

6.2.1 Metals

Numerical SQAGs have been derived for nine metals that occur in Florida coastal sediments. As is the case for the other substances, the SQAGs are reported on a dry weight basis. While it is possible that further research could support the derivation of effects-based guidelines that are expressed in terms of the factors that influence bioavailability, such as acid volatile sulfide (AVS), the necessary data are not yet available. As discussed in Chapter 5, the preliminary guidelines should be used in conjunction with other assessment tools (such as the FDEP metals interpretive tool described in Volume 2) to evaluate sediment quality conditions in coastal waters.

Table 4. A summary of sediment quality assessment guidelines applicable to Florida coastal waters.

Substance	Total Number of Records	Number of Entries in the EDS	Number of Entries in the NEDS	Sediment Quality Assessment Guidelines TEL	PEL
Metals (SQAGs in mg/kg)					
Arsenic	295	39	256	7.24	41.6
Cadmium	433	107	326	0.676	4.21
Chromium	354	53	301	52.3	160
Copper	440	105	335	18.7	108
Lead	402	95	307	30.2	112
Mercury	331	66	265	0.13	0.696
Nickel	355	23	332	15.9	42.8
Silver	190	35	155	0.733	1.77
Tributyltin	72	6	66	ID	ID
Zinc	411	96	315	124	271
Polychlorinated Biphenyls (PCBs; SQAGs in µg/kg)					
Total PCBs	199	65	134	21.6	189
Polycyclic Aromatic Hydrocarbons (PAHs; SQAGs in µg/kg)					
Acenaphthene	240	62	178	6.71	88.9
Acenaphthylene	209	36	173	5.87	128
Anthracene	259	70	189	46.9	245
Fluorene	263	73	190	21.2	144
2-methylnaphthalene	189	40	149	20.2	201
Naphthalene	256	57	199	34.6	391
Phenanthrene	268	74	194	86.7	544
Sum LMW-PAHs	274	69	205	312	1442

'able 4. **A summary of sediment quality assessment guidelines applicable to Florida coastal waters (continued).**

ubstance	Total Number of Records	Number of Entries in the EDS	Number of Entries in the NEDS	Sediment Quality Assessment Guidelines	
				TEL	PEL
'olycyclic Aromatic Hydrocarbons (PAHs; SQAGs in µg/kg)					
enz(a)anthracene	249	63	186	74.8	693
enzo(a)pyrene	259	68	191	88.8	763
hrysene	258	68	190	108	846
ibenzo(a,h)anthracene	246	54	192	6.22	135
uoranthene	279	85	194	113	1494
/rene	263	70	193	153	1398
ım HMW-PAHs	274	64	210	655	6676
otal PAHs	250	58	192	1684	16770
:sticides (SQAGs in µg/kg)					
ldrin	180	15	165	ID	ID
zinphos-methyl (Guthion)	0	0	0	ID	ID
ılordane	203	25	178	2.26	4.79
ılorthalonil	0	0	0	ID	ID
ılorpyrifos	1	1	0	ID	ID
p'-DDD	173	22	151	1.22	7.81
p'-DDE	211	37	174	2.07	374
p'-DDT	175	26	149	1.19	4.77
otal DDT	89	37	52	3.89	51.7
eldrin	181	25	156	0.715	4.3
sulfoton	0	0	0	ID	ID
ıdosulfan	6	4	2	ID	ID
ıdrin	146	14	132	ID	ID

Table 4. A summary of sediment quality assessment guidelines applicable to Florida coastal waters (continued).

Substance	Total Number of Records	Number of Entries in the EDS	Number of Entries in the NEDS	Sediment Quality Assessment Guidelines	
				TEL	PEL
Pesticides (SQAGs in µg/kg)					
Heptachlor	168	14	154	ID	ID
Heptachlor epoxide	137	9	128	ID	ID
Lindane (gamma-BHC)	181	21	160	0.32	0.99
Mirex	120	3	117	ID	ID
Phorate	0	0	0	ID	ID
Quintozene (PCNB)	0	0	0	ID	ID
Toxaphene (alpha-BHC)	133	4	129	ID	ID
Trifluralin	0	0	0	ID	ID
Chlorinated Organic Substances (SQAGs in µg/kg)					
2,3,7,8-Tetrachlorodibenzo-p-dioxin	18	2	16	ID	ID
2,3,7,8-Tetrachlorodibenzofuran	17	1	16	ID	ID
Pentachlorophenol	82	7	75	ID	ID
Phthalates (SQAGs in µg/kg)					
Bis(2-ethylhexyl)phthalate	131	31	100	182	2647
Dimethyl phthalate	86	10	76	ID	ID
Di-n-butyl phthalate	79	7	72	ID	ID

Total Number of Records = Number of data records in the expanded biological effects database for sediments.
All of the sediment quality assessment guidelines are expressed on a dry weight basis, as potential normalizers (e.g., Al, TOC, AVS) were rarely reported.
EDS = Effects data set: NEDS = No effects data set; TEL = Toxic effect level; PEL = Probable effect level.
ID = insufficient data to derive sediment quality assessment guidelines.
SQAG = Sediment quality assessment guidelines

Arsenic

Arsenic is released naturally into the environment due to the weathering of arsenic-rich rocks and volcanic activity. In addition to the natural sources of this substance, however, arsenic is released into the environment as a result of human activities. For example, arsenic is used in pigments, for medical purposes, in glass making, and in alloys with lead and copper. In addition, arsenic is also used in some pesticides (including herbicides), in plant defoliants, and in various preservatives. Any of these activities may result in contamination of aquatic resources with arsenic (CCREM 1987).

The majority of arsenic in surface water occurs in a soluble form which can be co-precipitated with hydrated iron and aluminum oxides, or adsorbed/chelated by suspended organic matter in sediments or humic substances in bottom sediments. Arsenic has a strong affinity for sulphur, and it readily adsorbs on and co-precipitates with other metal sulfides (Demayo *et al.* 1979).

The availability of arsenic in sediments to aquatic biota appears to be minimal under oxidizing conditions. Bioaccumulation of arsenic has been observed in numerous aquatic organisms, though there is no evidence that arsenic is biomagnified to a significant degree through the food web (Jaagumagi 1990a).

Exposure of aquatic organisms to arsenic-contaminated sediments may result in a variety of effects. While arsenic is known to be acutely toxic to aquatic biota, a variety of sublethal effects (including effects on the growth, reproduction, locomotion, behavior, and respiration) have also been observed in organisms exposed to arsenic (Eisler 1988). In mammals, exposure to arsenic has also been linked with a number of carcinogenic, mutagenic, and teratogenic effects.

Consideration of the available information on the toxicity of sediment-associated arsenic to aquatic biota results in the derivation of a ***TEL of 7.2 mg/kg and a PEL of 41.6 mg/kg***. An evaluation of the reliability of the SQAGs for arsenic suggests that a moderate degree of confidence can be placed on these guidelines.

Cadmium

Cadmium is a trace element used in a wide variety of applications, including electroplating, the manufacture of pigments, storage batteries, telephone wires, photographic supplies, glass, ceramics, some biocides, and as a stabilizer in plastics. In addition, cadmium may be present in phosphate rock used for fertilizers. The main anthropogenic sources of cadmium appear to be mining, metals smelting, industries involved in the manufacture of alloys, paints, batteries, and plastics, agricultural uses of sludge, fertilizers and pesticides that contain cadmium, and the burning of fossil fuels (CCREM 1987).

In surface waters, cadmium generally occurs in the Cd(II) form as a constituent of inorganic (halides, sulfides, and oxides) and organic compounds. Transport of cadmium to the sediments occurs mainly through sorption to organic matter (and subsequent deposition) and through co-precipitation with iron, aluminum, and manganese oxides (Jaagumagi 1990a).

The availability of cadmium to aquatic biota is dependent on such factors as pH, redox potential, water hardness, and the presence of other complexing agents. Recently, Di Toro *et al.* (1991) presented evidence on the role of AVS in controlling the availability of cadmium. In general, cadmium is considered to have an extensive residence time and can accumulate to significant levels in biological tissues (Jaagumagi 1990a).

Exposure of aquatic organisms to cadmium can result in various adverse effects, including acute mortality, reduced growth, and inhibited reproduction (Eisler 1985a). In sediment, cadmium is toxic to marine amphipods at concentrations as low as 6.9 mg/kg (Swartz *et al.* 1985). Effects on the emergence, reburial, and avoidance behavior of marine amphipods have also been observed in spiked-sediment bioassays with cadmium (Long and Morgan 1990).

Consideration of the available information on the toxicity of sediment-associated cadmium to aquatic biota results in the derivation of a ***TEL of 0.68 mg/kg and a PEL of 4.2 mg/kg***. An evaluation of the reliability of the SQAGs for cadmium suggests that a high degree of confidence can be placed on these guidelines.

Chromium

Like cadmium, chromium is a trace metallic element widely used in industrial processes. Hexavelant chromium compounds are used in the metallurgical industry in the production of chrome alloy and chromium metal. In addition, these compounds are used in the chemical industry in chrome plating and in the production of paints, dyes, explosives, ceramics, and paper. Trivalent chromium salts are used in textile dyeing, in the ceramics and glass industry, and in photography (CCREM 1987). The main sources of chromium to the environment are emissions from the ferrochromium and metal plating industries, with coal and oil burning, refractory production, cement manufacturing, and the production of chromium steels representing relatively less important sources (Taylor *et al.* 1979).

In aquatic systems, chromium is present mainly in the Cr(III) and Cr(VI) forms. The Cr(VI) form is relatively soluble and does not tend to sorb onto particulate matter to any significant extent. Under anaerobic conditions, Cr(VI) may be reduced to Cr(III). In contrast to Cr(VI), Cr(III) readily sorbs onto organic particulates and co-precipitates with hydrous iron and manganese oxides. Under anoxic conditions in the sediments, Cr may also form insoluble sulfides (Jaagumagi 1990a).

Adverse biological effects associated with exposure to chromium include mortality and decreased growth, with plants being more sensitive than fish (CCREM 1987). While chromium is not accumulated to a significant degree by fish (BCF < 3; BCFs, bioconcentration factors are the ratio of tissue concentrations to concentrations in water), algal communities may concentrate this substance (BCF $= 8500$; CCREM 1987). Chromium(VI) is more readily accumulated than Cr(III) and is considered to be the more toxic form (Jaagumagi 1990a).

Consideration of the available information on the toxicity of sediment-associated chromium to aquatic biota results in the derivation of a ***TEL of 52.3 mg/kg and a PEL of 160 mg/kg***. An evaluation of the reliability of the SQAGs for chromium suggests that a moderate degree of confidence can be placed on these guidelines.

Copper

Copper is a common metallic element in crustal rocks and minerals. Natural sources of copper in aquatic environments include the weathering or the solution of copper-bearing minerals, copper sulfides, and native copper. Potential anthropogenic sources of copper include corrosion of brass and copper pipe by acidic waters, the use of copper compounds as aquatic algicides, sewage treatment plant effluents, runoff and groundwater contamination from agricultural uses of copper as fungicides and pesticides in the treatment of soils, and effluents and atmospheric fallout from industrial sources. Major industrial sources include mining, smelting and refining industries, copper wire mills, coal burning industries, and iron and steel producing industries (CCREM 1987).

Copper can exist in four oxidation states in aquatic systems, with Cu(I) and Cu(II) being the most common. In water, copper may form associations with organic matter and precipitates of hydroxides, phosphates, and sulfides. Formation of these complexes tends to facilitate transport to sediments. Under normal pH and redox conditions, copper tends to be present in sediments in the form of organic complexes, cupric carbonate complexes, and co-precipitates with iron and manganese oxides (Jaagumagi 1990a).

Copper is an essential micronutrient, and, therefore, it is readily accumulated by aquatic organisms (particularly in plants). However, no evidence exists to suggest that this substance is biomagnified in aquatic ecosystems (Jaagumagi 1990a). Copper is a broad spectrum biocide, which may be associated with acute and chronic toxicity, reduction in growth, interference with smoltification (the physiological changes that occur in preparation for the transition from freshwater to saltwater) in salmonids, and a wide variety of sublethal effects (Spear and Pierce 1979). There appears to be little difference in the sensitivity of aquatic organisms across taxonomic groups (CCREM 1987).

Consideration of the available information on the toxicity of sediment-associated copper to aquatic biota results in the derivation of a ***TEL of 18.7 mg/kg and a PEL of 108 mg/kg***. An evaluation of the reliability of the SQAGs for copper suggests that a moderate degree of confidence can be placed on these guidelines.

Lead

Lead occurs as a constituent in a variety of minerals. The single largest use of lead is in the production of lead-zinc batteries. The second largest use of lead is in the manufacture of chemical compounds, particularly alkyllead additives for gasolines. Lead and its compounds are also used in electroplating, metallurgy, construction materials, coatings and dyes, electronic equipment, plastics, veterinary medicines, fuels and radiation shielding. Other uses of lead are for ammunition, corrosive-liquid containers, paints, glassware, fabricating storage tank linings, transporting radioactive materials, solder, piping, cable sheathing, roofing and sound attenuators (CCREM 1987).

While lead may be present in three oxidation states in aquatic environments, Pb(II) is the most stable ionic species. In sediments, lead is primarily found in association with iron and manganese hydroxides, however, it may also form associations with clays and organic matter. Lead tends to remain tightly bound to sediments under oxidizing conditions, however, it may be released into the water column under reducing conditions (Jaagumagi 1990a).

Aquatic organisms exhibit a wide range of sensitivities to lead, with gastropods being particularly vulnerable. Aquatic plants appear to be relatively insensitive to the toxic effects of lead. Lead may be accumulated to relatively high levels by aquatic biota. Bioconcentration factors in algae may be as high as 20,000; however, BCFs for fish and invertebrates tend to be much lower (500 to 1700; CCREM 1987).

Consideration of the available information on the toxicity of sediment-associated lead to aquatic biota results in the derivation of a ***TEL of 30.2 mg/kg and a PEL of 112***

mg/kg. An evaluation of the reliability of the SQAGs for lead suggests that a moderate degree of confidence can be placed on these guidelines.

Mercury

Mercury is a trace element that occurs most commonly in the sulfide mineral cinnabar. Mercury is used in the production of chlorine, caustic soda and hydrogen, in the paint industry, in the pulp and paper industry, for electrical equipment, in medicinal compounds, and in thermometers. Mercury-based pesticides were once used in agriculture, however, the use of such pesticides has now been restricted (CCREM 1987). Anthropogenic sources to aquatic ecosystems can include waste incineration, coal combustion, paints, mining and smelting, and the chlor-alkali industry (Jaagumagi 1990a).

In aquatic systems, mercury is generally sorbed to particulate matter. In natural systems, mercury can exist in three oxidation states, including elemental Hg, Hg(I), and Hg(II). Both Hg(I) and Hg(II) can be methylated by microorganisms under anaerobic and aerobic conditions. In sediments, mercury tends to form associations with organic matter. Under anaerobic conditions, mercury may combine with sulphur to form insoluble sulfides (Jaagumagi 1990a).

Mercury is highly toxic to aquatic biota, with methylmercury being the most toxic form of the substance. Aquatic plants, invertebrates, and fish exhibit similar sensitivities to mercury, however, a great deal of variability exists within each of these groups. Mercury has the potential to accumulate to high levels in aquatic organisms, with BCFs as high as 85,000 observed in some fish species (CCREM 1987). Due to its high mammalian toxicity, bioaccumulation of mercury in fish and other aquatic species has significant implications with respect to human health.

Consideration of the available information on the toxicity of sediment-associated mercury to aquatic biota results in the derivation of a ***TEL of 0.13 mg/kg and a PEL of 0.70 mg/kg***. An evaluation of the reliability of the SQAGs for mercury suggests that a low degree of confidence can be placed on these guidelines.

Nickel

Nickel ranks as the 23rd element in order of abundance in the earth's crust and occurs naturally, mainly, in combination with sulphur, arsenic, and antimony. In ore deposits, it commonly occurs with iron and copper. Nickel is used, primarily, in the manufacturing of stainless steel, nickel plating, and other nickel alloys. Nickel is also used as a catalyst in industrial processes and in oil refining. More recently, it has been used in nuclear power generating plants, gas turbine engines, cryogenic containers, and pollution abatement equipment. The most important anthropogenic sources of nickel include fossil fuel combustion, nickel ore mining, smelting and refining activities, and the electroplating industries (CCREM 1987).

In aquatic systems, nickel occurs primarily in the Ni(II) form. Nickel is deposited in sediments as a result of co-precipitation with iron and manganese oxides and sorption to organic matter. In sediments, nickel tends to form complexes with iron and manganese oxides, however, it may form insoluble complexes with sulfides under anaerobic conditions (Jaagumagi 1990a).

Exposure of aquatic organisms to nickel-contaminated sediments may result in a variety of adverse effects, including mortality, reduction in growth, and avoidance reactions. The toxicity of nickel increases in the presence of copper, therefore, synergism may be a factor that modifies the toxicity of this substance. While bioconcentration of nickel has been observed in a variety of organisms (particularly in annelids), biomagnification is not a significant concern in aquatic environments (CCREM 1987).

Consideration of the available information on the toxicity of sediment-associated nickel to aquatic biota results in the derivation of ***a TEL of 15.9 mg/kg and a PEL of 42.8 mg/kg***. An evaluation of the reliability of the SQAGs for nickel suggests that a low degree of confidence can be placed on these guidelines.

Silver

Silver is among the least common but most widely distributed elements in crustal rocks. Photographic materials represent the single largest use of silver. Other uses of this element include the manufacture of sterling and plated ware, jewellery, coins and medallions, electrical and electronic products, brazing alloys and solders, catalysts, mirrors, fungicides, and dental and medical supplies. Potential sources of silver to the aquatic environment include leachates from landfills, waste incineration, coal combustion, and effluents from the iron, steel and cement industries. In addition, wastewater treatment plants may also contribute significant loadings of silver to aquatic ecosystems (CCREM 1987).

In aqueous systems, silver may occur as elemental Ag, Ag(I), or Ag(II), however, ionic silver is primarily found in the univalent state. In water, silver may occur in colloidal form, sorbed to humic substances, and in various complexes with sulphur, arsenic, antimony, tellurium, and selenium. In sediments, silver tends to be found in association with manganese dioxide, sulphur, and various halides. Silver may also be adsorbed to organic material in sediments (CCREM 1987).

Silver is one of the most toxic metals to aquatic life. In general, plants are somewhat less sensitive than fish and aquatic invertebrates, with toxicity dependent primarily on metal speciation. Silver nitrate and silver iodide have been identified as highly toxic chemical species. Silver has a fairly low potential to accumulate in aquatic organisms, with BCFs ranging from less than 1 to 240 (CCREM 1987).

Consideration of the available information on the toxicity of sediment-associated silver to aquatic biota results in the derivation of a ***TEL of 0.73 mg/kg and a PEL of 1.77 mg/kg***. An evaluation of the reliability of the SQAGs for silver suggests that a moderate degree of confidence can be placed on these guidelines.

Tributyltin

Tributyltin is a member of a family of organotin compounds that are used in the production of plastics and as biocidal wood preservatives. Tributyltin oxide (TBTO) and tributyltin fluoride (TBTF) are the most important of the tributyltin compounds. Tributyltin oxide is used as a slimicide in cooling water towers, as a wood preservative, and as an antifouling additive in marine paint. The major use of TBTF is also as an antifouling agent in marine paint, and the use of both substances in marine paints represents potentially significant sources of tributyltin into aquatic ecosystems (CCREM 1987).

Tributyltin compounds are highly toxic to aquatic organisms (both plants and animals), as would be expected given their use as general biocides. Eisler (1985b) reported that tributyltins were capable of causing adverse biological effects at extremely low levels, and that these substances have been implicated as a major cause of reproductive failure in European flat oysters at several locations in recent years. Its high toxicity and significant potential for release into the aquatic environment make tributyltins a serious concern in marine sediments. While insufficient data are available to develop SQAGs (TEL and PEL) for tributyltin, extreme mortality (100%) has been observed in grass shrimp exposed (96 hour static test) to concentrations as low as 10 mg/kg (Clark *et al.* 1987). Since grass shrimp are a relatively insensitive test species, adverse effects on other organisms could be expected at concentrations well below this level.

Zinc

Zinc ranks as the 24th most abundant crustal element, occurring primarily as sulfide, carbonate, and silicate ores. Zinc is used in coatings to protect iron and steel, in alloys for die casting, in brass, in dry batteries, in roofing and exterior fittings for buildings, and in some printing processes. The principal sources of zinc to aquatic systems include municipal wastewater effluents, zinc mining, smelting, and refining activities, wood combustion, waste incineration, iron and steel production, and other atmospheric emissions (CCREM 1987).

In aquatic systems, zinc occurs primarily as Zn(II), but can also form organozinc compounds. At neutral pH, zinc may be deposited in sediments by sorption to hydrous iron and manganese oxides, clay minerals, and organic matter. However, adsorption is very low at pHs below 6. Iron and manganese oxides/hydroxides appear to be the most important scavengers of zinc in coarse sediments that are low in organic matter. However, sorption to organic matter appears to be the most important environmental fate process in fine grained sediments. Under reducing conditions, organically-bound zinc generally forms insoluble sulfides (Jaagumagi 1990a).

Zinc is an essential micronutrient and uptake in most aquatic organisms appears to be independent of environmental concentrations. It has been found to bioaccumulate in some organisms, though there is no evidence of biomagnification (Jaagumagi 1990a). Aquatic organisms exhibit a wide range of sensitivities to zinc, however, there do not appear to be systematic differences in the toxicity of this substance between three major taxonomic groups (fish, invertebrates, and aquatic plants; CCREM 1987).

Consideration of the available information on the toxicity of sediment-associated zinc to aquatic biota results in the derivation of a ***TEL of 124 mg/kg and a PEL of 271 mg/kg***. An evaluation of the reliability of the SQAGs for zinc suggests that a moderate degree of confidence can be placed on these guidelines.

6.2.2 Polycyclic Aromatic Hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) is the general term applied to a group of compounds comprised of several hundred organic substances with two or more benzene rings. They occur in the environment mainly as a result of incomplete combustion of organic matter (forest fires, internal combustion engines, wood stoves, coal, coke, etc.). They are also major constituents of petroleum and its derivatives, with oil spills and refinery effluents being major sources of PAH contamination to estuarine and marine environments (MacDonald *et al.* 1992). In addition, WWTP effluents and runoff from urban areas, particularly from roads, are known to contain significant quantities of PAHs. Furthermore, inputs of PAHs in aquatic ecosystems may occur as a result of oil spills, forest fires and agricultural burning, leaching from waste disposal sites, and coal gasification (Eisler 1987; Neff 1979; Campbell *et al.* 1979). PAHs are also produced by natural processes at very low rates (Blumer 1976).

In marine and estuarine environments, PAHs tend to form associations with suspended and deposited particulate matter (Eisler 1987). This sorption of PAHs to sediments is strongly correlated with the total organic carbon (TOC) content of sediments (Gillam 1991). Sediments contaminated with PAHs have been identified in a number of locations in the Florida coastal zone (Long and Morgan 1990). Substances detected most frequently in coastal sediments include acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, phenanthrene, and pyrene (Delfino *et al.* 1991). In general, elevated levels of sediment-associated PAHs in Florida are found in the vicinity of urban areas.

Exposure to PAHs may result in a wide range of effects on biological organisms. While some PAHs are known to be carcinogenic, others display little or no carcinogenic, mutagenic, or teratogenic activity (Neff 1979; EPA 1980, 1982a, b, c; NRCC 1983; Sims and Overcash 1983). Many carcinogenic PAHs also exhibit teratogenic and mutagenic effects. Several PAHs exhibit low levels of toxicity to terrestrial life forms, yet are highly toxic to aquatic organisms (Eisler 1987). The bioavailability (and hence, toxicity) of PAHs may depend on the concentration of TOC in the sediment (Bolton *et al.* 1985; Lyman *et al.* 1987).

Acenaphthene

Consideration of the available information on the toxicity of sediment-associated acenaphthene to aquatic biota results in the derivation of a ***TEL of 6.7 µg/kg and a PEL of 88.9 µg/kg***. An evaluation of the reliability of the SQAGs for acenaphthene suggests that a moderate degree of confidence can be placed on these guidelines.

Acenaphthylene

Consideration of the available information on the toxicity of sediment-associated acenaphthylene to aquatic biota results in the derivation of a ***TEL of 5.9 µg/kg and a PEL of 128 µg/kg***. An evaluation of the reliability of the SQAGs for acenaphthylene suggests that a moderate degree of confidence can be placed on these guidelines.

Anthracene

Consideration of the available information on the toxicity of sediment-associated anthracene to aquatic biota results in the derivation of a ***TEL of 46.9 µg/kg and a PEL of 245 µg/kg***. An evaluation of the reliability of the SQAGs for anthracene suggests that a high degree of confidence can be placed on these guidelines.

Fluorene

Consideration of the available information on the toxicity of sediment-associated fluorene to aquatic biota results in the derivation of a ***TEL of 21.2 µg/kg and a PEL of 144 µg/kg***. An evaluation of the reliability of the SQAGs for fluorene suggests that a moderate degree of confidence can be placed on these guidelines.

2-methylnaphthalene

Consideration of the available information on the toxicity of sediment-associated 2-methylnaphthalene to aquatic biota results in the derivation of a ***TEL of 20.2 µg/kg and a PEL of 201 µg/kg***. An evaluation of the reliability of the SQAGs for 2-methylnaphthalene suggests that a high degree of confidence can be placed on these guidelines.

Naphthalene

Consideration of the available information on the toxicity of sediment-associated naphthalene to aquatic biota results in the derivation of a ***TEL of 34.6 µg/kg and a PEL of 391 µg/kg***. An evaluation of the reliability of the SQAGs for naphthalene suggests that a high degree of confidence can be placed on these guidelines.

Phenanthrene

Consideration of the available information on the toxicity of sediment-associated phenanthrene to aquatic biota results in the derivation of a ***TEL of 86.7 µg/kg and a PEL of 544 µg/kg***. An evaluation of the reliability of the SQAGs for phenanthrene suggests that a high degree of confidence can be placed on these guidelines.

Total Low Molecular Weight PAHs

The group of low molecular weight (LMW) PAHs considered in the present study includes acenaphthene, acenaphthylene, anthracene, fluorene, 2-methylnaphthalene, naphthalene, and phenanthrene. Due to their similar mode of toxic action, these substances are frequently considered together in toxicity assessments (e.g., Gillam 1991). Consideration of the available information on the toxicity of sediment-associated total LMW PAHs to aquatic biota results in the derivation of a ***TEL of 312 µg/kg and a PEL of 1440 µg/kg***. An evaluation of the reliability of the SQAGs for total LMW PAHs suggests that a high degree of confidence can be placed on these guidelines.

Benz(a)anthracene

Consideration of the available information on the toxicity of sediment-associated benz(a)anthracene to aquatic biota results in the derivation of a ***TEL of 74.8 µg/kg and a PEL of 693 µg/kg***. An evaluation of the reliability of the SQAGs for benz(a)anthracene suggests that a moderate degree of confidence can be placed on these guidelines.

Benzo(a)pyrene

Consideration of the available information on the toxicity of sediment-associated benzo(a)pyrene to aquatic biota results in the derivation of a ***TEL of 88.8 µg/kg and a PEL of 763 µg/kg***. An evaluation of the reliability of the SQAGs for benzo(a)pyrene suggests that a high degree of confidence can be placed on these guidelines.

Chrysene

Consideration of the available information on the toxicity of sediment-associated chrysene to aquatic biota results in the derivation of a ***TEL of 108 µg/kg and a PEL of 846 µg/kg***. An evaluation of the reliability of the SQAGs for chrysene suggests that a high degree of confidence can be placed on these guidelines.

Dibenzo(a,h)anthracene

Consideration of the available information on the toxicity of sediment-associated dibenzo(a,h)anthracene to aquatic biota results in the derivation of a ***TEL of 6.2 µg/kg and a PEL of 135 µg/kg***. An evaluation of the reliability of the SQAGs for dibenzo(a,h)anthracene suggests that a moderate degree of confidence can be placed on these guidelines.

Fluoranthene

Consideration of the available information on the toxicity of sediment-associated fluoranthene to aquatic biota results in the derivation of a ***TEL of 113 µg/kg and a***

PEL of 1490 µg/kg. An evaluation of the reliability of the SQAGs for fluoranthene suggests that a high degree of confidence can be placed on these guidelines.

Pyrene

Consideration of the available information on the toxicity of sediment-associated pyrene to aquatic biota results in the derivation of a ***TEL of 153 µg/kg and a PEL of 1400 µg/kg***. An evaluation of the reliability of the SQAGs for pyrene suggests that a high degree of confidence can be placed on these guidelines.

Total High Molecular Weight PAHs

The group of high molecular weight (HMW) PAHs considered in the present study consists of benz(a)anthracene, benzo(a)pyrene, chrysene, dibenzo(a,h)anthracene, fluoranthene, and pyrene. Due to similarities in their mode of action and toxic effect levels, these substances are frequently considered together in sediment quality assessments (Gillam 1991). Consideration of the available information on the toxicity of sediment-associated total HMW PAHs to aquatic biota results in the derivation of a ***TEL of 655 µg/kg and a PEL of 6680 µg/kg***. An evaluation of the reliability of the SQAGs for total HMW PAHs suggests that a moderate degree of confidence can be placed on these guidelines.

Total PAHs

Total PAHs refers to the sum of the concentrations of each of the 13 low and high molecular weight PAHs listed in the previous sections. While the mode of action of LMW and HMW PAHs is thought to differ (MacDonald *et al.* 1992), these substances are sometimes grouped in assessments of sediment quality (Gillam 1991). Consideration of the available information on the toxicity of sediment-associated total PAHs to aquatic biota results in the derivation of a ***TEL of 1680 µg/kg and a PEL of 16800 µg/kg***. An evaluation of the reliability of the SQAGs for total PAHs suggests that a high degree of confidence can be placed on these guidelines.

6.2.3 Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) is the generic term for a group of 209 congeners that contain a varying number of substituted chlorine atoms in a biphenyl ring. Commercially, PCBs are used in complex mixtures, based primarily on the percentage of chlorine in the mixture. Mixtures containing 21 - 54% chlorine by weight have been used extensively in closed electric systems as dielectric fluids. Other PCBs have been used as plasticizers, heat transfer fluids, hydraulic fluids, fluids in vacuum pumps and compressors, lubricants, wax extenders, special adhesives, and surface coatings for carbonless copy paper (Moore and Walker 1991). However, all of these uses were curtailed in the United States in 1971.

Contamination of aquatic ecosystems by PCBs has arisen exclusively from human activities. While PCBs may enter the environment from a variety of sources, the major inputs to aquatic systems include leachates from landfills, municipal wastewater effluents, industrial effluents, atmospheric deposition (due to incomplete incineration of PCB contaminated wastes), and disposal of industrial and municipal wastewater treatment sludges (Moore and Walker 1991).

PCBs are highly persistent, stable compounds, which have high octanol/water partition coefficients. As such, sorption to sediments is a predominant environmental fate process in aquatic systems (Jaagumagi 1990a). PCBs tend to be associated with fine grained particles (< 0.15 µm) and organic matter in sediments. As is the case with many non-polar organic contaminants, the bioavailability of PCBs may depend on the TOC content of the sediments (Bolton *et al.* 1985; Lyman *et al.* 1987).

Exposure to PCBs may result in a wide variety of effects on aquatic organisms, including acute and chronic lethality, reproductive toxicity, developmental abnormalities, and growth retardation (Moore and Walker 1991). While PCBs are not highly toxic to aquatic organisms, these substances have considerable potential to accumulate in the tissues of aquatic species and, therefore, may represent significant hazards to consumers of aquatic species. Bioaccumulation factors for PCBs have ranged as high as 4.4×10^7 in laboratory studies and biomagnification in higher trophic levels has been demonstrated (Moore and Walker 1991).

Consideration of the available information on the toxicity of sediment-associated total PCBs to aquatic biota results in the derivation of a ***TEL of 21.6 µg/kg and a PEL of 189 µg/kg***. An evaluation of the reliability of the SQAGs for total PCBs suggests that a low degree of confidence can be placed on these guidelines.

6.2.4 Pesticides

A wide variety of pesticides are used in agricultural and other applications throughout Florida. A list of the substances of greatest concern with respect to contamination of coastal sediments is provided in Table 3. These substances were identified based on historic and current use patterns (i.e., > 100,000 pounds applied in Florida annually), physical/chemical properties (i.e., log K_{ow}), and existing sediment quality monitoring data (Long and Morgan 1990; Long *et al.* 1991; Delfino *et al.* 1991).

Sufficient toxicological data exist to develop SQAGs for only a subset of the priority pesticides used in Florida. Additional information will be required to support the derivation of guidelines for the other priority pesticides in Florida coastal waters.

Aldrin/Dieldrin

Aldrin is an organochlorine pesticide that has been used as a pest control agent in a variety of domestic and agricultural applications (Jaagumagi 1990b). Originally, aldrin was used to control a broad spectrum of soil, fruit, and vegetable pests, as well as for specific control of grasshoppers, locusts, and termites (CCREM 1987). However, the current uses of aldrin are restricted to those situations where there is no effluent discharge (i.e., ground injection for termite control; CCREM 1987). In aquatic systems, aldrin is rapidly biotransformed (through epoxidation) to dieldrin, which is highly stable in aquatic environments.

Like aldrin, dieldrin is an organochlorine pesticide. Dieldrin has been one of the most widely used domestic pesticides in the United States (CCREM 1987), primarily to control soil, fruit, and vegetable pests. As is the case with aldrin, dieldrin use is currently restricted to situations where there is no effluent discharge (CCREM 1987). Sorption to sediments is an important environmental fate process for dieldrin. In sediments, this substance may persist for extended periods. Dieldrin has been detected in coastal sediments at a number of locations throughout Florida (Long and Morgan 1990).

Consideration of the available information on the toxicity of sediment-associated dieldrin to aquatic biota results in the derivation of a ***TEL of 0.72 µg/kg and a PEL of 4.3 µg/kg***. An evaluation of the reliability of the SQAGs for dieldrin suggests that a moderate degree of confidence can be placed on these guidelines.

Azinphos-methyl

Insufficient data were available to develop SQAGs for azinphos-methyl, which is also known as guthion.

Total Chlordane

Chlordane is a broad spectrum chlorinated hydrocarbon pesticide that occurs as a mixture of isomers, the most common of which are alpha-chlordane and gamma-chlordane (Jaagumagi 1990b). Chlordane has been used in a wide variety of agricultural and domestic applications in Florida. Specifically, it has been used as a wood preservative, as an insecticide in home and garden applications, and to control pests on livestock (Worthing and Hance 1991). While the use of this compound has been discontinued in recent years, its persistence and tendency to accumulate in sediments makes chlordane an ongoing concern in Florida sediments. This substance has been detected in coastal sediments in various locations in the state (Long and Morgan 1990).

Consideration of the available information on the toxicity of sediment-associated total chlordane to aquatic biota results in the derivation of a ***TEL of 2.3 μg/kg and a PEL of 4.8 μg/kg***. An evaluation of the reliability of the SQAGs for chlordane suggests that a low degree of confidence can be placed on these guidelines.

Chlorthalonil

Insufficient data were available to develop SQAGs for chlorthalonil.

Chlorpyrifos

Insufficient data were available to develop SQAGs for chlorpyrifos.

DDT and Metabolites

DDT or 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane is a broad spectrum organochlorine insecticide that has been used worldwide since the early 1940s (Jaagumagi 1990b). DDT has been used extensively in agricultural applications, primarily as a non-systemic ingested and contact insecticide to control a wide variety of pest species (Worthing and Hance 1991). While this substance is no longer registered for use in North America, it is highly toxic and persistent in the environment. Therefore, residues of DDT and its metabolites (DDE and DDD) may represent significant sediment quality concerns in Florida. DDT, DDE, and DDD have all been detected recently in Florida coastal sediments (Delfino *et al.* 1991; Long and Morgan 1990).

p,p'-DDD

Consideration of the available information on the toxicity of sediment-associated p,p'-DDD to aquatic biota results in the derivation of a ***TEL of 1.2 μg/kg and a PEL of 7.8 μg/kg***. An evaluation of the reliability of the

SQAGs for p,p'-DDD suggests that a moderate degree of confidence can be placed on these guidelines.

p,p'-DDE

Consideration of the available information on the toxicity of sediment-associated p,p'-DDE to aquatic biota results in the derivation of a ***TEL of 2.1 µg/kg and a PEL of 374 µg/kg***. An evaluation of the reliability of the SQAGs for p,p'-DDE suggests that a moderate degree of confidence can be placed on these guidelines.

p,p'-DDT

Consideration of the available information on the toxicity of sediment-associated p,p'-DDT to aquatic biota results in the derivation of a ***TEL of 1.2 µg/kg and a PEL of 4.8 µg/kg***. An evaluation of the reliability of the SQAGs for p,p'-DDT suggests that a moderate degree of confidence can be placed on these guidelines.

Total DDT

Consideration of the available information on the toxicity of sediment-associated total DDT (the sum of the concentrations of *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDE, *o,p'*-DDE, *p,p'*-DDD, *o,p'*-DDD) to aquatic biota results in the derivation of a ***TEL of 3.89 µg/kg and a PEL of 51.7 µg/kg***. An evaluation of the reliability of the SQAGs for total DDT suggests that a low degree of confidence can be placed on these guidelines.

Disulfoton

Insufficient data were available to develop SQAGs for disulfoton.

Endosulfan

Insufficient data were available to develop SQAGs for endosulfan. McLeese *et al.* (1982) reported a 12 day LC_{50} of 340 µg/kg for the sandworm, *Nereis virens.* Chandler and Scott (1991) reported effects on colonization of polychaetes in South Carolina at 50 µg/kg and mortality to copepods at 200 µg/kg.

Endrin

Insufficient data were available to develop SQAGs for endrin. Chronic marine sediment quality criteria, calculated using the EqPA, ranged from 0.53 to 3.21 μg/kg (EPA 1988; JRB Associates 1984). More recently, Hansen *et al.* (1993a) reported a chronic SQC of 7.6 μg/kg at 1% OC.

Heptachlor

Insufficient data were available to develop SQAGs for heptachlor. The chronic marine sediment quality criterion, calculated using the EqPA, was 5 μg/kg (Bolton *et al.* 1985).

Heptachlor Epoxide

Insufficient data were available to develop SQAGs for heptachlor epoxide.

Lindane

Consideration of the available information on the toxicity of sediment-associated lindane (gamma-BHC) to aquatic biota results in the derivation of a ***TEL of 0.32 μg/kg and a PEL of 0.99 μg/kg***. An evaluation of the reliability of the SQAGs for lindane suggests that a low degree of confidence can be placed on these guidelines.

Mirex

Insufficient data were available to develop SQAGs for mirex.

Phorate

Insufficient data were available to develop SQAGs for phorate.

Toxaphene

Insufficient data were available to develop SQAGs for toxaphene. Bolton *et al.* (1985) reported a chronic marine sediment quality criterion of 5 μg/kg for this substance.

Trifluralin

Insufficient data were available to develop SQAGs for trifluralin.

6.2.5 Chlorinated Organic Substances

Dioxins and Furans

Polychlorinated dibenzo-*p*-dioxins (PCDDs) are composed of a triple-ring structure consisting of two benzene rings connected to each other by two oxygen atoms. Depending on the number and position of chlorine substitution on the benzene rings, 75 chlorinated dioxin congeners are possible. The polychlorinated dibenzofuran (PCDF) molecule is also a triple-ring structure with the two benzene rings connected to themselves by a single oxygen atom. One hundred and thirty-five (135) chlorinated dibenzofuran congeners are possible.

Sources and releases to the environment have been well documented in the literature (OMOE 1985; Hutzinger *et al.* 1985; EPA 1985; NRCC 1981; NRCC 1984). Dioxins and furans are not produced intentionally but are unavoidable by-products of chemical manufacturing or the result of incomplete combustion of materials containing chlorine atoms and organic compounds (OMOE 1985). Dioxins and furans may also be formed during the disinfection of complex effluents (e.g. pulp and paper effluents) containing many organic constituents.

Dioxins and furans have the potential to enter the aquatic environment due to direct effluent discharges, runoff from areas in which dioxin/furan contaminated products are used and stored, and deposition of materials that are transported atmospherically. The most significant sources of dioxins include the wood preservative pentachlorophenol, municipal incinerators, and pulp and paper mills that utilize chlorine in the bleaching process. Polychlorinated biphenyls (PCBs) are the most significant source of furans (Boddington *et al.* 1990).

Dioxins and furans may be distributed throughout the environment via air, water, soil, and sediments. Dioxins and furans tend to be very insoluble in water, adsorb strongly onto soils, sediments, and airborne particulates, and bioaccumulate in biological tissues (Hutzinger *et al.* 1985). These substances have been associated with a wide variety of toxic effects in animals, including acute toxicity, enzyme activation, tissue damage, developmental abnormalities, and cancer.

Insufficient toxicological data are available to derive SQAGs for any of the 75 dioxin or furan congeners that could be present in Florida coastal sediments.

Pentachlorophenol

Insufficient data were available to develop SQAGs for pentachlorophenol. In Puget Sound, AETs of 360 and 690 µg/kg have been reported for amphipods and benthic species, respectively (PTI 1988).

6.2.6 Phthalate Esters

Phthalate esters represent a large group of chemicals that are used widely as plasticizers in polyvinyl chloride (PVC) resins, adhesives, and cellulose film coatings. They are also found in cosmetics, rubbing alcohol, insect repellents, insecticides, and solid rocket propellants (CCREM 1987). Due to their wide use, phthalate esters have a significant potential to be released into coastal ecosystems. For this reason, numerical SQAGs for these substances are required to assess the hazards posed to aquatic organisms.

Bis(2-ethylhexyl)phthalate

Consideration of the available information on the toxicity of sediment-associated bis(2-ethylhexyl)phthalate to aquatic biota results in the derivation of a ***TEL of 182 µg/kg and a PEL of 2650 µg/kg***. An evaluation of the reliability of the SQAGs for bis(2-ethylhexyl)phthalate suggests that a high degree of confidence can be placed on these guidelines.

Dimethyl phthalate

Insufficient data were available to develop SQAGs for dimethyl phthalate. Puget Sound AETs ranged from 71 µg/kg (Microtox) to > 160 µg/kg (amphipods and bivalves) for this substance (PTI 1988; Bellar *et al.* 1986). Bolton *et al.* (1985) reported a chronic marine sediment quality criterion of 490 µg/kg, using the EqPA.

Di-n-butyl phthalate

Insufficient data were available to develop SQAGs for di-n-butyl phthalate. Puget Sound AETs ranged from 1400 µg/kg (Microtox and oysters) to > 5100 µg/kg (benthic species) for this substance (PTI 1988; Bellar *et al.* 1986).

Chapter 7

An Evaluation of the Sediment Quality Assessment Guidelines for Florida Coastal Waters

7.0 Introduction

The numerical sediment quality assessment guidelines (SQAGs) presented in Chapter 6 were derived to help FDEP assess sediment quality in Florida coastal waters. When used with high quality sediment chemistry data and in conjunction with other assessment techniques, these guidelines provide a sound technical basis for assessing the potential for adverse biological effects in contaminated sediments (see Volume 2 for more information on the potential uses of the SQAGs). This chapter provides further information on the reliability, comparability, and predictive ability of these management tools. The following evaluation should be reviewed by potential users to judge the appropriateness of the SQAGs for their specific situations.

A variety of procedures have been used by state and federal agencies to evaluate the applicability of SQAGs. For example, the California State Water Resources Control Board (Lorenzato *et al.* 1991) considered it important to evaluate the precision or comparability of SQAGs. The Board defined precision as the level of agreement among guidelines based on different data and/or different approaches. Long *et al.* (In press) considered that reliability was an essential attribute of SQAGs and evaluated reliability by determining the extent to which guidelines satisfied previously established narrative objectives (i.e., does the PEL define the lower limit of a range of contaminant concentrations that is usually associated with adverse biological effects). In turn, this information may be used to assess the degree of confidence that could be placed in numerical SQAGs for each substance. Finally, SQAGs have been evaluated in terms of their ability to identify impacted and unimpacted sites, using sediment chemistry data alone (PTI 1988). The present evaluation addresses all three of these considerations and includes the following elements:

- An assessment of the comparability of the SQAGs with similar assessment tools derived using different approaches and procedures;

- An assessment of the reliability of the SQAGs using the matching sediment chemistry and biological effects data contained within the expanded NSTP database; and,

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- An assessment of the predictive capability of the SQAGs using independent data sets (i.e., not included in the expanded NSTP database) from the southeast and elsewhere in the United States.

The methods used for each of these assessments and their results are discussed in the following sections. Potential users should consider the results of these evaluations before using the SQAGs in the applications outlined in Volume 2.

7.1 Comparability of the Sediment Quality Assessment Guidelines

Several governmental agencies in North America have derived sediment quality criteria, guidelines, objectives, or standards to support the assessment, management, and/or remediation of coastal sediments. These sediment management tools, developed using a wide array of approaches and procedures, often span several orders of magnitude for any given substance (MacDonald *et al.* 1992; Haines *et al.* 1994). Nonetheless, many of these guidelines share common assumptions. For example, certain sediment quality guidelines are assumed to provide a high level of protection for marine organisms, while other guidelines are intended to identify the concentrations of contaminants above which adverse effects are expected. Determination of the level of agreement among similar sediment quality guidelines provides a basis for assessing their comparability (Long *et al.* In press).

In this section, the SQAGs are compared with various sediment quality criteria, guidelines, objectives, and standards developed for other applications. The first step in this process involved collating available North American sediment quality assessment values. The expanded NSTP database was a major source of these assessment values; however, several documents containing compilations of sediment quality criteria, guidelines, objectives, and standards also were used (MacDonald *et al.* 1992; Haines *et al.* 1994). Next, the guideline values that were similar to the threshold effect levels (TELs) were identified. Likewise, guidelines that were similar to the PELs were assembled for each substance. Freshwater guidelines were not considered in this evaluation. Subsequently, the guideline values from each source were tabulated on a substance by substance basis for comparison (Tables 5 and 6).

Threshold effect levels derived from the expanded NSTP database are considered to provide a high level of protection for aquatic organisms. A total of four sets of similar guidelines were identified for comparison with the TELs, including:

- The effects range-low values (ER-Ls) promulgated under the NOAA National Status and Trends Program (Long and Morgan 1990);

able 5. A comparison of sediment quality assessment guidelines (SQAGs) applicable to coastal and marine waters: Threshold effect level (TEL) equivalents.

ıbstance	TEL	ER-L	PSDDA - SL	SQC - Chronic	SQO	Number of SQAGs Comparable to TEL
letals (SQAGs in mg/kg)						
rsenic	7.24	8.2*	70	8.2*	20	2
ıdmium	0.68	1.2*	0.96*	7.7	1*	3
ıromium	52.3	81*	NG	NG	60*	2
›pper	18.7	34*	81	34*	100	2
:ad	30.2	46.7*	66*	33*	30*	4
ercury	0.13	0.15*	0.21*	0.01	0.15*	3
ıckel	15.9	20.9*	NG	NG	45*	2
lver	0.73	1*	1.2*	NG	NG	2
nc	124	150*	160*	190*	150*	4
ılycyclic Aromatic Hydrocarbons (PAHs; SQAGs in µg/kg)						
:enaphthene	6.71	16*	63	2400	50	1
:enaphthylene	5.87	44	64	NG	60	0
ıthracene	46.9	85.3*	130*	190	10	2
ıorene	21.2	19*	64	59	50*	2
ıphthalene	34.6	160	210	500	200	0
Methylnapthalene	20.2	70	67	NG	NG	0
enanthrene	86.7	240*	320	2400	15	1
ıtal Low Molecular Weight PAHs	312	552*	610*	NG	NG	2
:nz(a)anthracene	74.8	261	450	1600	130*	1
:nzo(a)pyrene	88.8	430	680	18000	160*	1
ırysene	108	384	670	1200	140*	1
benz(a,h)anthracene	6.22	63.4	120	12000	60	0

Table 5. A comparison of sediment quality assessment guidelines (SQAGs) applicable to coastal and marine waters: Threshold effect level (TEL) equivalents (continued).

Substance	TEL	ER-L	PSDDA - SL	SQC - Chronic	SQO	Number of SQAGs Comparable to TEL
Polycyclic Aromatic Hydrocarbons (PAHs; SQAGs in µg/kg; cont.)						
Fluoranthene	113	600	630	1600	170*	1
Pyrene	153	665	430*	850	260*	2
Total High Molecular Weight PAHs	655	1700*	1800*	NG	NG	2
Total PAHs	1684	4022*	NG	NG	NG	1
Polychlorinated Biphenyls (PCBs; SQAGs in µg/kg)						
Total PCBs	21.6	22.7*	130	NG	30*	2
Pesticides (SQAGs in µg/kg)						
Chlordane	2.26	0.5	NG	0.3	NG	0
Dieldrin	0.72	0.02	NG	200	NG	0
p,p'-DDD	1.22	2*	NG	NG	NG	1
p,p'-DDE	2.07	2.2*	NG	NG	NG	1
p,p'-DDT	1.19	1*	NG	1.6*	NG	2
Total DDT	3.89	1.58*	NG	1.6*	NG	2
Lindane (gamma-BHC)	0.32	NG	NG	3.1	NG	0
Phthalates (SQAGs in µg/kg)						
Bis(2-ethylhexyl)phthalate	182	NG	3100	NG	NG	0

ER-L = Effects range low (Long and Morgan 1990).

PSDDA - SL = Screening level used in the Puget Sound Dredged Disposal Analysis program (USACOE 1988).

SQC - Chronic = Chronic sediment quality criterion (EqPA; Lyman *et al.* 1987; Pavlou *et al.* 1987; Hansen *et al.* 1993a,b,c,d,e).

SQO = Sediment quality objective (Swain and Nijman 1991).

* = Indicates that the SQAGs are within a factor of three of the PEL.

NG = No guideline.

ıble 6. **A comparison of sediment quality guidelines (SQAGs) applicable to coastal and marine waters: Probable effect level (PEL) equivalents.**

ıbstance	PEL	ER-M	LAET	SQC - Acute	SLC	Number of SQAGs Comparable to PEL
etals (SQAGs in mg/kg)						
senic	41.6	70*	57*	16	NG	2
dmium	4.21	9.6*	5.1*	24	NG	2
romium	160	370*	260*	NG	NG	2
pper	108	270*	390	54	NG	1
ad	112	218*	450	840	NG	1
ercury	0.7	0.71*	0.41*	0.15	NG	2
ckel	42.8	51.6*	> 140	NG	NG	1
ver	1.77	3.7*	> 0.56	NG	NG	1
ıc	271	410*	410*	560*	NG	3
lycyclic Aromatic Hydrocarbons (PAHs; SQAGs in µg/kg)						
enaphthene	88.9	500	500	NG	NG	0
enaphthylene	128	640	> 560	NG	47.4*	1
thracene	245	1100	960	NG	163*	1
ıorene	144	540	540	NG	101*	1
phthalene	391	2100	2100	10500	414*	1
Aethylnapthalene	201	670	670	NG	NG	0
enanthrene	544	1500*	1500*	14000	368	2
tal Low Molecular Weight PAHs	1442	3160*	5200	NG	NG	1
ız(a)anthracene	693	1600*	1300*	55000	261	2
ızo(a)pyrene	763	1600*	1600*	450000	397	2
rysene	846	2800	1400*	115000	384	1
enz(a,h)anthracene	135	260*	230*	NG	NG	2

Table 6. A comparison of sediment quality guidelines (SQAGs) applicable to coastal and marine waters: Probable effect level (PEL) equivalents (continued).

Substance	PEL	ER-M	LAET	SQC - Acute	SLC	Number of SQAGs Comparable to PEL
Polycyclic Aromatic Hydrocarbons (PAHs; SQAGs in µg/kg; cont.)						
Fluoranthene	1494	5100	1700*	9000	644*	2
Pyrene	1398	2600*	2600*	49500	665	2
Total High Molecular Weight PAHs	6676	9600*	12000*	NG	NG	2
Total PAHs	16770	44792*	NG	NG	NG	1
Polychlorinated Biphenyls (PCBs; SQAGs in µg/kg)						
Total PCBs	189	180*	130*	NG	36.6	2
Pesticides (SQAGs in µg/kg)						
Chlordane	4.79	6*	NG	NG	NG	1
Dieldrin	4.3	8*	NG	NG	NG	1
p,p'-DDD	7.81	20*	16*	NG	NG	2
p,p'-DDE	374	27	9	NG	NG	0
p,p'-DDT	4.77	7*	34	NG	NG	1
Total DDT	51.7	46.1*	NG	210	505	1
Lindane (gamma-BHC)	0.99	NG	NG	NG	NG	0
Phthalates (SQAGs in µg/kg)						
Bis(2-ethylhexyl)phthalate	2647	NG	1900*	NG	NG	1

ER-M = Effects range median (Long and Morgan 1990).
LAET = Lowest apparent effects threshold (PTI 1988).
SQC - Acute = Acute sediment quality criterion (EqPA; Lyman et al. 1987; Pavlou et al. 1987).
SLC = National screening level concentration (Neff et al. 1987).
* = Indicates that the SQGs are within a factor of three of the TEL.
NG = No guideline available.

- The screening levels (PSDDA-SL) developed for use in Washington State under the Puget Sound Dredged Disposal Analysis Program (USACOE 1988);

- The USEPA chronic sediment quality criteria (SQC - Chronic) developed using the equilibrium partitioning approach (assuming 1% TOC; Lyman *et al.* 1987; Pavlou *et al.* 1987; Hansen *et al.* 1993a, b, c, d, and e); and,

- The sediment quality objectives (SQOs) developed for Burrard Inlet, British Columbia (Swain and Nijman 1991). These objectives were derived using a variation of the sediment background approach and are intended to protect the most sensitive use of bed sediments.

Probable effect levels define the lower limit of the range of contaminant concentrations that has a high probability of being associated with adverse biological effects. Hence, the PELs are considered to provide a low level of protection for aquatic organisms. The four sets of guidelines identified for comparison with the PELs included:

- The effects range median (ER-M) values promulgated under the NOAA National Status and Trends Program (Long and Morgan 1990);

- The lowest apparent effects threshold values (LAET) calculated for Puget Sound (PTI 1988);

- The acute sediment quality criteria (SQC - Acute) developed using the equilibrium partitioning approach (assuming 1% TOC; Lyman *et al.* 1987; Pavlou *et al.* 1987); and,

- The national screening level concentrations developed using the screening level concentration (SLC) approach (Neff *et al.* 1987).

While it is difficult to define an acceptable level of comparability for the SQAGs, a panel of experts assembled in California recommended that agreement within a factor of three or less among various guidelines was indicative of good concordance (Lorenzato *et al.* 1991). Using this guidance, the comparability of the SQAGs was evaluated by comparing them with those that have been developed using other approaches and other procedures. Comparable guidelines (i.e., agreeing within a factor of three of the SQAGs) were designated with an asterisk (*) in Tables 5 and 6.

Evaluation of the comparability of the SQAGs was impaired by the lack of guidelines for certain substances. For example, four or more guidelines were available for only 19 and 18 of the substances for which TELs and PELs, respectively, have been developed. An adequate number of guidelines were not available for chromium, nickel, silver, bis(2-ethylhexyl)phthalate, several PAHs, and most of the pesticides. Nonetheless, the results of this evaluation indicate that many of the SQAGs are comparable to the guidelines that have been derived for other applications and, hence, provide a precise basis for evaluating sediment quality conditions.

The recommended TELs for 17 of the 34 substances were comparable to two or more other guidelines, which were intended to provide a high level of protection for aquatic biota (Table 5). The best agreement was observed for metals, while the poorest agreement was observed for high molecular weight PAHs. This evaluation revealed that the TELs were usually lower than the other guidelines with which they were compared.

The recommended PELs for 14 of the 34 substances were comparable to two or more other guidelines (Table 6). Once again, the best agreement among the various guidelines was observed for metals. Relatively poor agreement was observed among the guidelines for pesticides and the low molecular weight PAHs. As was the case for the TELs, the PELs were generally lower than the other guidelines that were derived using different approaches and different procedures.

While agreement between guideline values provides users with additional confidence in these assessment tools, comparability does not guarantee that the guidelines will accurately identify impacted and unimpacted sites. Therefore, the reliability and predictability of the guidelines were also evaluated to determine if they can be used to identify impacted and unimpacted sites in the field.

7.2 Reliability of the Sediment Quality Assessment Guidelines

An evaluation of the reliability of the SQAGs was conducted to provide practitioners with an indication of the level of confidence that should be placed in these management tools. The recommended SQAGs were derived by applying a consistent arithmetic procedure to the information contained in the expanded NSTP database. This procedure was designed to support the derivation of two guideline values for each substance, which could be used together to define three ranges of contaminant concentrations: the minimal effects range; the possible effects range; and, the probable effects range. A high degree of confidence in the guidelines would be indicated if a low, moderate, and high incidence of adverse biological effects were actually observed within these three ranges of concentrations, respectively. In addition, confidence in the SQAGs would be warranted if the incidence of effects increased consistently and markedly with increasing chemical concentrations (Long *et al.* In press).

In this section, the reliability of the SQAGs was evaluated using information in the expanded NSTP database. To conduct this evaluation, a scoring system was devised to integrate the following information:

(i) The incidence of adverse biological effects within the minimal effects range;

(ii) The incidence of adverse biological effects within the probable effects range; and,

(iii) The degree of concordance between the concentrations of sediment-associated contaminants and the incidence of adverse biological effects.

The first step in applying this scoring system was to determine the TEL Score (TS). This parameter quantifies the extent to which the TEL fulfills the objective of defining the upper limit of a range of chemical concentrations within which adverse biological effects occurred only infrequently. The key metric in this evaluation was the incidence of adverse biological effects within the minimal effects range, as calculated using the expanded NSTP database. Specifically, the number of "hits" (*) and total number of records within the minimal effects range were identified on a substance by substance basis. Subsequently, the percent incidence of adverse effects was calculated for each substance by dividing the number of hits by the total number of records in the minimal effects range and multiplying by 100 (Table 7). A TS of two (2), one (1), or zero (0) was assigned if the incidence of adverse biological effects was < 10%, 10 to 25%, or > 25%, respectively, within the minimal effects range (Table 8; Long *et al.* In press).

Next, PEL Scores (PS) were determined for each substance and group of substances for which SQAGs were derived. This second parameter assesses the extent to which the PEL fulfills the objective of defining the lower limit of a range of chemical concentrations within which adverse biological effects usually or always occurred. Consistent with the procedures used to determine the TS, the percent incidence of adverse biological effects within the probable effects range was calculated on a substance by substance basis (i.e., by dividing the number of hits by the total number of records in the probable effects range and multiplying by 100). A PS of two (2), one (1), or zero (0) was assigned if the incidence of adverse biological effects was > 65%, 50 to 65%, or < 50%, respectively, within the probable effects range.

A Concordance Score (CS) was then determined to assess the agreement between contaminant concentrations and the incidence of adverse biological effects. The first step in this process was to calculate the incidence of adverse biological effects within the possible effects range (i.e., between the TEL and PEL). Next, the percent incidence of adverse biological effects within each of the three ranges of contaminant concentrations were compared. As there should be a consistent and marked increase in the incidence of hits

Table 7. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments.

Substance	% 'Hits' in the Minimal Effects Range (< =TEL)	% 'Hits' in the Possible Effects Range (>TEL to <PEL)	% 'Hits' in the Probable Effects Range (>= PEL)
Metals			
Arsenic	2.7	12.9	46.8
Cadmium	5.6	20.1	70.8
Chromium	3.5	15.4	52.9
Copper	9.0	21.9	55.9
Lead	5.8	25.8	58.4
Mercury	7.8	23.6	36.7
Nickel	3.3	8.4	9.4
Silver	6.6	9.8	60.5
Zinc	3.8	27.2	64.8
Polycyclic Aromatic Hydrocarbons (PAHs)			
Acenaphthene	7.5	29.1	57.4
Acenaphthylene	7.4	13.9	51.4
Anthracene	8.7	20.5	75.0
Fluorene	11.7	20.5	70.0
2-methylnaphthalene	0.0	23.4	81.5
Naphthalene	2.6	19.3	71.2
Phenanthrene	8.0	22.8	77.8
Sum LMW-PAHs	8.7	19.4	65.6
Benz(a)anthracene	8.7	15.7	78.4
Benzo(a)pyrene	8.5	22.1	70.9
Chrysene	9.2	18.8	72.4
Dibenzo(a,h)anthracene	15.8	11.6	65.1
Fluoranthene	9.5	20.2	79.7
Pyrene	7.4	19.3	83.0
Sum HMW-PAHs	9.5	15.0	65.5
Total PAHs	7.3	19.3	76.7
Polychlorinated Biphenyls (PCBs)			
Total PCBs	15.7	36.9	54.9

Table 7. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments (continued).

Substance	% 'Hits' in the Minimal Effects Range (< =TEL)	% 'Hits' in the Possible Effects Range (>TEL to <PEL)	% 'Hits' in the Probable Effects Range (>= PEL)
Pesticides			
Chlordane	9.0	12.1	17.0
Dieldrin	3.5	13.2	50.0
Lindane	2.9	21.1	25.6
p,p'-DDD	3.6	10.9	46.2
p,p'-DDE	5.3	16.5	50.0
p,p'-DDT	7.9	4.8	58.6
Total DDT	47.6	25.6	64.0
Phthalates			
Bis(2-ethylhexyl)phthalate	8.5	21.2	66.7

% 'Hits' = Number of effects entries/total number of data entries within each range.
TEL = Threshold effect level.
PEL = Probable effect level.
H = High; M = Moderate; L = Low.
Confidence in the TEL was considered to be H, M, and L when % 'hits' was <10%, 10-25%, and >25%, respectively.
Confidence in the PEL was considered to be H, M, and L when % 'hits' was >65%, 50-65%, and <50%, respectively.

Table 8. An evaluation of the reliability of the sediment quality assessment guidelines for Florida coastal waters.

Substance	TEL Score (TS)	PEL Score (PS)	Concordance Score (CS)	Total Reliability Score (TRS)	Degree of Reliability
Metals					
Arsenic	2	0	2	4	M
Cadmium	2	2	2	6	H
Chromium	2	1	2	5	M
Copper	2	1	2	5	M
Lead	2	1	2	5	M
Mercury	2	0	1	3	L
Nickel	2	0	1	3	L
Silver	2	1	1	4	M
Zinc	2	1	2	5	M
Polycyclic Aromatic Hydrocarbons (PAHs)					
Acenaphthene	2	1	1	4	M
Acenaphthylene	2	1	1	4	M
Anthracene	2	2	2	6	H
Fluorene	1	2	1	4	M
Naphthalene	2	2	2	6	H
2-Methylnapthalene	2	2	2	6	H
Phenanthrene	2	2	2	6	H
Total Low Molecular Weight PAHs	2	2	2	6	H
Benz(a)anthracene	2	2	1	5	M
Benzo(a)pyrene	2	2	2	6	H
Chrysene	2	2	2	6	H
Dibenz(a,h)anthracene	1	2	1	4	M
Fluoranthene	2	2	2	6	H
Pyrene	2	2	2	6	H
Total High Molecular Weight PAHs	2	2	1	5	M
Total PAHs	2	2	2	6	H

Table 8. An evaluation of the reliability of the sediment quality assessment guidelines for Florida coastal waters (continued).

Substance	TEL Score (TS)	PEL Score (PS)	Concordance Score (CS)	Total Reliability Score (TRS)	Degree of Reliability
Polychlorinated Biphenyls (PCBs)					
Total PCBs	1	1	1	3	L
Pesticides					
Chlordane	2	0	0	2	L
Dieldrin	2	1	2	5	M
p,p'-DDD	2	0	2	4	M
p,p'-DDE	2	1	2	5	M
p,p'-DDT	2	1	1	4	M
Total DDT	0	1	0	1	L
Lindane (gamma-BHC)	2	0	1	3	L
Phthalates					
Bis(2-ethylhexyl)phthalate	2	2	2	6	H

H = High (TRS = 6); M = Moderate (TRS = 4-5); L = Low (TRS <4).
TEL = Threshold effect level; PEL = Probable effect level.

within the three concentration ranges (Long *et al.* In press), the presence of at least a two fold increase in the incidence of hits between adjacent ranges of concentrations was used as an indicator of concordance between increasing chemical concentrations and increased incidence of adverse biological effects. A CS of two (2) was assigned if the percent incidence of adverse biological effects was a factor of two or more higher in the possible effects range compared to the minimal effects range ***and*** a factor of two or more higher in the probable effects range compared to the possible effects range. Lower CSs were assigned if this criterion was not met. Thus, a CS of 1 was assigned if the factor of two difference was apparent between only two of the ranges, while a CS of 0 was assigned if there was no apparent concordance.

Finally, the overall reliability of the SQAGs for each substance and group of substances was evaluated by calculating a Total Reliability Score (TRS). The TRS was determined by calculating the sum of the TEL, PEL, and Concordance Scores. The SQAGs were considered to have a high degree of reliability if they met all of the evaluation criteria identified previously (i.e., TRS = 6). A moderate degree of reliability was considered to exist when intermediate scores were obtained for one or two of the parameters, or a low score was obtained for one parameter but high scores were assigned for the other two parameters resulting in a TRS of four (4) or five (5). A lower degree of reliability was assigned to SQAGs when TRSs of less than four (4) were calculated.

The results of this evaluation indicate that, in general, the recommended SQAGs provide reliable tools for evaluating sediment quality in Florida coastal waters. The TELs for a total of 30 substances were considered to have a high degree of reliability (TS = 2), as indicated by the low incidence of effects within the minimal effects range. Nine trace metals, 14 individual PAHs or groups of PAHs, six pesticides, and bis(2-ethylhexyl)phthalate were included in this group (Table 8). Moderate reliability (TS = 1) was indicated for fluorene, dibenzo(a,h)anthracene, and total PCBs. A low degree of confidence was placed on the TEL for only one substance, total DDT (TS = 0).

In general, the reliability of the PELs was lower than that for the TELs. The PELs for 16 substances were considered to have a high degree of reliability (PS =2), as indicated by a high incidence of adverse biological effects within the probable effects ranges. Of the highly reliable PELs, 14 were for individual PAHs or groups of PAHs (Table 8). The PELs for cadmium and bis(2-ethylhexyl)phthalate were also considered to be highly reliable. A moderate degree of reliability (PS = 1) was indicated for the PELs for most of the trace metals (5 of 9); while a low degree of reliability (PS = 0) was apparent for three metals (arsenic, mercury, and nickel). The PELs for pesticides and total PCBs were considered to have either a moderate or low level of reliability.

A high degree of concordance between contaminant concentrations and the incidence of adverse biological effects was observed for the majority of the recommended SQAGs (Tables 6 and 7). The incidence of adverse effects increased consistently and markedly with increasing concentrations of all trace metals, except mercury, nickel, and silver. Two-fold increases in the incidence of effects between the minimal and possible effects ranges, ***and*** the possible and probable effects ranges were also observed for ten of the 16 individual PAHs and groups of PAHs. The concordance scores for dieldrin, p,p-DDD, and p,p-DDE were also high (CS = 2), while those for four other pesticides and total PCBs were lower (CS = 0 or 1).

As indicated previously, the overall reliability of the SQAGs for each substance and group of substances was determined using all three measures of reliability. The results of this evaluation indicate that the majority of the SQAGs are highly or moderately reliable (TRS ≥ 4) and can be used with confidence to conduct sediment quality assessments (Table 8). A high degree of reliability (TRS = 6) is indicated for the guidelines for one trace metal (cadmium), ten individual PAHs or groups of PAHs, and bis(2-ethylhexyl)phthalate. The SQAGs for 16 other substances were considered to be moderately reliable (TRS = 4 or 5), including those for six trace metals, five individual PAHs, total HMW-PAHs, dieldrin, p,p-DDE, p,p-DDD, and p,p-DDT. The guidelines for mercury, nickel, total PCBs, chlordane, lindane, and total DDT were all considered to have a low level of reliability (TRS ≤ 3). It is important to consider the results of this evaluation when applying the SQAGs.

7.3 Predictability of the Sediment Quality Assessment Guidelines

The SQAGs are intended to provide effective tools for screening sediment quality data to identify priorities for further actions. For this objective to be realized, the SQAGs must support accurate predictions regarding the biological effects of sediment-associated contaminants in the field. Therefore, an initial evaluation is provided in this section to determine their ability to correctly identify biologically impacted and non-impacted sites. As the applicability of the SQAGs to Florida coastal waters and other areas in the southeastern portion of the United States is the focus of this evaluation, the predictability of the guidelines was assessed using the results of field studies from Florida (Tampa Bay and Pensacola Bay) and nearby areas (Gulf of Mexico). However, data from field studies conducted in California (San Pedro Bay) and in New York (Hudson-Raritan Estuary) were also used to evaluate the predictability of the SQAGs in more highly contaminated areas. It should be noted that these independent data sets were not used to derive the SQAGs (i.e., they are independent data sets).

The predictability of the TELs and PELs was determined separately for each of the data sets considered in this evaluation. The first step in the evaluation process was to assemble the sediment chemistry data for each geographic area. Next, the concentrations of each chemical in each sediment sample were compared to the SQAGs. These comparisons formed the basis of the predictions that were made regarding the toxicity of each sediment sample. Sediment samples with concentrations of one or more substances that exceeded their respective PELs were predicted to be toxic. Sediment samples were predicted to be non-toxic if the concentrations of all measured substances were below the respective TELs that had been recommended for those substances. Samples with concentrations of one or more substances greater than the TELs and no exceedances of the PELs were considered to be possibly toxic. These samples were not considered in the evaluation of predictability; nonetheless, the incidence of toxicity was calculated for these samples to provide an indication of the potential for observing toxic effects when contaminant concentrations fall within the possible effects range.

The predictability of the SQAGs was evaluated by comparing the predictions with the results of the biological investigations. The predictability of the PELs and the TELs were calculated as the ratio of the number of stations that were observed to be impacted and the total number of stations that were predicted to be impacted (expressed as a percentage). In this assessment, toxic samples were defined as those in which one or more of the measured bioassay endpoints were significantly different from those in control/reference samples.

During 1991 and 1992, a total of 144 sediment samples were collected to assess the toxicity of Tampa Bay sediments (Long *et al.* 1994). A suite of bioassays was used in this assessment, including a 10-d amphipod (*Ampelisca abdita*) survival test, a 1-hr sea urchin (*Arbacia punctulata*) fertilization test (using porewater), and a Microtox test (using organic extracts). Matching sediment chemistry data, including metals, PAHs, PCBs, and a suite of pesticides, were collected on 61 of these samples. Based on a comparison of the sediment chemistry data with the PELs, a total of 46 samples were predicted to be toxic (Table 9). Of these, 40 samples were observed to be toxic. Therefore, the predictability of the PELs was roughly 87%. Only two sites were predicted to be not toxic, based on comparisons of the sediment chemistry data with the TELs. The results of the biological tests conducted on these samples revealed that neither sample was toxic. Hence, the predictability of the TELs was calculated to be 100% in Tampa Bay.

In 1993, a total of 40 samples were collected to assess sediment quality in Pensacola Bay (Long Unpublished data). Sediment chemistry data were obtained on 20 of these samples, with the analytes including metals, PAHs, and a suite of pesticides. In this study, toxicity was assessed using a 10-d amphipod (*Ampelisca abdita*) survival test, a 48-hr sea urchin (*Arbacia punctulata*) fertilization and embryo development test (using porewater), and Microtox (using organic extracts). Based on comparisons of the chemistry data with the PELs, a total of 12 samples were predicted to be toxic (Table 10). Of these, 11 of the samples were observed to be toxic. Therefore, the predictability of the PELs was 92%. Using the TELs, two samples were predicted to be not toxic; both of these were observed to be toxic. Hence, the predictability of the TELs was calculated to be 0%.

As part of the USEPA Environmental Monitoring and Assessment Program (EMAP 1991), matching sediment chemistry and biological effects data were collected from eight areas in the Gulf of Mexico region in 1991. The areas sampled in this survey included Galveston Bay able 9. **Predicted toxicity vs. observed toxicity in Tampa Bay sediments (1991 and 1992 survey; Long *et al.* 1994).**

redicted Toxicity	Number of Toxic Samples Amphipod Test (%)	Number of Toxic Samples Sea Urchin Test (%)	Number of Toxic Samples Microtox Test (%)	Predictability (Using All Tests; % Correct)
verall Toxicity	8 of 61 (13%)	50 of 61 (82%)	7 of 16 (44%)	-
ɔt Toxic (< TELs)	0 of 2 (0%)	0 of 2 (0%)	0 of 2 (0%)	100% (2 of 2)
ıssibly Toxic (> TELs; < PELs)	1 of 13 (8%)	10 of 13 (77%)	1 of 5 (20%)	-
ɔxic (1 PEL exceeded)	0 of 22 (0%)	16 of 22 (73%)	1 of 2 (50%)	73% (16 of 22)
ɔxic (2-5 PELs exceeded)	2 of 3 (67%)	3 of 3 (100%)	0 of 2 (0%)	100% (3 of 3)
ɔxic (6-9 PELs exceeded)	1 of 5 (20%)	5 of 5 (100%)	1 of 1 (100%)	100% (5 of 5)
ɔxic (> 10 PELs exceeded)	4 of 16 (25%)	16 of 16 (100%)	4 of 4 (100%)	100% (16 of 16)
ɔxic (1 or more PELs exceeded)	7 of 46 (15%)	40 of 46 (87%)	6 of 9 (66%)	87% (40 of 46)
ıxic (2 or more PELs exceeded)	7 of 24 (29%)	24 of 24 (100%)	5 of 7 (71%)	100% (24 of 24)

L = Threshold effect level; PEL = Probable effect level.

Table 10. Predicted toxicity vs. observed toxicity in Pensacola Bay sediments (Long Unpublished data).

Predicted Toxicity	Number of Toxic Samples Amphipod Test (%)	Number of Toxic Samples Sea Urchin Test (%)	Number of Toxic Samples Microtox Test (%)	Predictability (Using All Tests; % Correct)
Overall Toxicity	0 of 20 (0%)	13 of 20 (65%)	15 of 20 (75%)	-
Not Toxic (< TELs)	0 of 2 (0%)	1 of 2 (50%)	2 of 2 (100%)	0% (0 of 2)
Possibly Toxic (> TELs; < PELs)	0 of 6 (0%)	3 of 6 (50%)	2 of 6 (33%)	-
Toxic (1 PEL exceeded)	0 of 2 (0%)	2 of 2 (100%)	2 of 2 (100%)	100% (2 of 2)
Toxic (2-5 PELs exceeded)	0 of 5 (0%)	3 of 5 (60%)	4 of 5 (80%)	80% (4 of 5)
Toxic (6-9 PELs exceeded)	0 of 2 (0%)	2 of 2 (100%)	2 of 2 (100%)	100% (2 of 2)
Toxic (> 10 PELs excceded)	0 of 3 (0%)	2 of 3 (67%)	3 of 3 (100%)	100% (3 of 3)
Toxic (1 or more PELs exceeded)	0 of 12 (0%)	9 of 12 (75%)	11 of 12 (92%)	92% (11 of 12)
Toxic (2 or more PELs exceeded)	0 of 10 (0%)	7 of 10 (70%)	9 of 10 (90%)	90% (9 of 10)

TEL = Threshold effect level; PEL = Probable effect level.

(TX), Matagora Bay (TX), Mississippi River (LA), Mississippi Sound (LA), Mobile Bay (AL), Pensacola Bay, Florida Panhandle, and West Central Florida. Sediment chemistry data were collected on metals (including organotins), PAHs, PCBs, a suite of pesticides, and several additional substances. Sediment toxicity was assessed using acute toxicity tests on two crustacean species, including the amphipod, *Ampelisca abdita*, and the mysid shrimp, *Mysidopsis bahia*. As no statistical evaluation of the toxicity test results were reported by the investigators, a 20% difference between the survival of test organisms in Gulf of Mexico sediments and control sediments was considered to be indicative of toxicity. Of the 47 samples collected in this survey, three were predicted to be toxic and 16 were predicted to be not toxic (Table 11). The results of the two bioassays indicated that none of the samples that were predicted to be toxic were observed to be toxic (predictability = 0%). In contrast, 15 of the samples that were predicted to be not toxic were observed to be not toxic (predictability = 94%).

Although additional evaluations of the predictability of the SQAGs are needed, they appear to provide predictive tools for evaluating sediment quality in the southeastern portion of the United States. Considering the field survey results from the Gulf of Mexico region, 51 of the 61 sites that were predicted to be toxic actually were toxic to one or more species (Table 12). Hence, an overall predictability of roughly 84% was calculated for the PELs. The PELs were more predictive of toxicity when two of more of the SQAGs were exceeded in bed sediments (predictability = 97%; Table 12). As might be expected, these data suggest that the likelihood of observing toxic effects increases with the number of chemicals that are present at concentrations that fall within the probable effects range. By comparison, 17 of the 20 samples that were predicted to be not toxic actually were not toxic to the organisms tested. The predictability of the TELs was, therefore, calculated to be 85%. However, nearly half of the samples collected in these surveys had concentrations of one or more contaminants that fell within the possible effects range; it was not possible to predict whether or not these samples would be toxic. It should be noted that roughly 40% of the samples with contaminant concentrations within the possible effects range were observed to be toxic, based on the results of several tests.

While the recommended SQAGs were developed to assess sediment quality in Florida coastal waters, it has become apparent that these guidelines may be used in broader coastal applications throughout the United States. Data from other regions are important because they provide a means of evaluating the predictability of the SQAGs in more contaminated areas and in other sediment types. Therefore, the predictability of the SQAGs was evaluated using matching sediment chemistry and biological effects data from two additional locations, including San Pedro Bay (CA) and the Hudson-Raritan Estuary (NY). In the San Pedro Bay survey (Long Unpublished data), sediment samples were collected from 44 sites, with toxicity evaluated using a 10-d amphipod (*Eohaustorius estuarius*) survival test and a 48-hr abalone (*Haliotis rufescens*) embryo development test (using porewater). Using the PELs, 36 of these samples were predicted to be toxic (Table 13). Thirty-four of the 36 samples were observed to be toxic in one or more assays, resulting in a predictability of 94%. Based on

Table 11. Predicted toxicity vs. observed toxicity in Gulf of Mexico sediments (EMAP 1991).

Predicted Toxicity	Number of Toxic Samples Amphipod Test (%)	Number of Toxic Samples Mysid Test (%)	Predictability (Using Both Tests; % Correct)
Overall Toxicity	7 of 47 (15%)	0 of 47 (0%)	-
Not Toxic (< TELs)	1 of 16 (6%)	0 of 16 (0%)	94% (15 of 16)
Possibly Toxic (> TELs; < PELs)	6 of 28 (21%)	0 of 28 (0%)	-
Toxic (1 PEL exceeded)	0 of 3 (0%)	0 of 3 (0%)	0% (0 of 3)
Toxic (2-5 PELs exceeded)	-	-	-
Toxic (6-9 PELs exceeded)	-	-	-
Toxic (> 10 PELs exceeded)	-	-	-
Toxic (1 or more PELs exceeded)	0 (0%)	0 (0%)	0% (0 of 3)
Toxic (2 or more PELs exceeded)	-	-	-

TEL = Threshold effect level; PEL = Probable effect level.

Table 12. Predicted toxicity vs. observed toxicity in Gulf of Mexico sediment quality surveys.

Predicted Toxicity	Number of Toxic Samples Amphipod Test (%)	Number of Toxic Samples Mysid Test (%)	Number of Toxic Samples Sea Urchin Test (%)	Number of Toxic Samples Microtox Test (%)	Predictability (Using All Tests; % Correct)
Overall Toxicity	15 of 128 (12%)	0 of 47 (0%)	63 of 81 (78%)	22 of 36 (61%)	-
Not Toxic (< TELs)	1 of 20 (5%)	0 of 16 (0%)	1 of 4 (25%)	2 of 4 (50%)	85% (17 of 20)
Possibly Toxic (> TELs; < PELs)	7 of 47 (15%)	0 of 28 (0%)	13 of 19 (68%)	3 of 11 (27%)	-
Toxic (1 PEL exceeded)	0 of 27 (0%)	0 of 3 (0%)	18 of 24 (75%)	3 of 4 (75%)	67% (18 of 27)
Toxic (2-5 PELs exceeded)	2 of 8 (25%)	-	7 of 8 (88%)	4 of 7 (57%)	88% (7 of 8)
Toxic (6-9 PELs exceeded)	1 of 7 (14%)	-	7 of 7 (100%)	3 of 3 (100%)	100% (7 of 7)
Toxic (> 10 PELs excceded)	4 of 19 (21%)	-	19 of 19 (100%)	7 of 7 (100%)	100% (19 of 19)
Toxic (1 or more PELs exceeded)	7 of 61 (11%)	0 (0%)	51 of 58 (88%)	17 of 21 (81%)	84% (51 of 61)
Toxic (2 or more PELs exceeded)	7 of 34 (21%)	-	33 of 34 (97%)	14 of 17 (82%)	97% (33 of 34)

TEL = Threshold effect level; PEL = Probable effect level.

Table 13. Predicted toxicity vs. observed toxicity in San Pedro Bay sediments (Long Unpublished data).

Predicted Toxicity	Number of Toxic Samples Amphipod Test (%)	Number of Toxic Samples Abalone Test (%)	Predictability (Using Both Tests; % Correct)
Overall Toxicity	22 of 44 (50%)	40 of 44 (91%)	-
Not Toxic (< TELs)	-	-	-
Possibly Toxic (> TELs; < PELs)	3 of 8 (38%)	7 of 8 (88%)	-
Toxic (1 PEL exceeded)	8 of 18 (44%)	16 of 18 (89%)	94% (17 of 18)
Toxic (2-5 PELs exceeded)	6 of 12 (50%)	10 of 12 (83%)	92% (11 of 12)
Toxic (6-9 PELs exceeded)	4 of 6 (67%)	6 of 6 (100%)	100% (6 of 6)
Toxic (> 10 PELs excceded)	-	-	-
Toxic (1 or more PELs exceeded)	19 of 36 (53%)	33 of 36 (92%)	94% (34 of 36)
Toxic (2 or more PELs exceeded)	10 of 18 (56%)	16 of 18 (89%)	94% (17 of 18)

TEL = Threshold effect level; PEL = Probable effect level.

comparisons of the sediment chemistry data to the TELs, none of the remaining samples had concentrations of contaminants which all fell within the minimal effects range; therefore, it was not possible to evaluate the predictability of the TELs.

In the Hudson-Raritan Estuary, 38 samples were collected in 1992 to evaluate sediment quality conditions (Long Unpublished data). Four biological tests were conducted to assess the toxicity of these samples, including a 10-d amphipod (*Ampelisca abdita*) survival test, 48-hr bivalve (*Mulinea lateralis*) embryo survival and development tests (using elutriates), and a Microtox assay. Of the 34 samples that were predicted to be toxic, 26 samples exhibited toxicity in one or more of the biological tests (Table 14). Hence, the predictability of the PELs was calculated to be 76%. Two samples were predicted to be not toxic and toxicity was not observed in any of the tests conducted with these samples. Therefore, the predictability of the TELs was determined to be 100%. Of the two samples that were considered to be possibly toxic, both samples were observed to be toxic in one or more biological tests.

In addition to providing predictive tools for evaluating sediment quality conditions in Florida, the results of this preliminary evaluation indicate that the recommended SQAGs may be predictive in other areas, as well. Overall, the predictability of the PELs in San Pedro Bay and the Hudson-Raritan Estuary was greater than 85% (60 of 70 samples were correctly classified as toxic). Both of the samples that were predicted to be not toxic were correctly classified. Nine of the 10 of the samples that were classified as possibly toxic were found to be toxic using a battery of tests.

Considering information from all five areas used in this evaluation, the SQAGs appear to provide predictive tools for assessing sediment quality (Table 15). Of the 22 samples that were predicted to be not toxic, 19 were observed to be not toxic in two or more bioassays. The overall predictability of the TELs was, therefore, calculated to be 88%. It is possible that water-borne contaminants (e.g., ammonia, hydrogen sulfide, etc.), unmeasured contaminants in sediments, or other factors were responsible for the observed toxicity in the samples that were incorrectly classified. Of the 131 samples that were predicted to be toxic (i.e., the concentrations of one or more substances exceeded the PELs), 111 were observed to be toxic in one or more biological tests. Therefore, the PELs were determined to have a predictability of roughly 85%. Predictability increased to 89% when the PELs for two or more substances were exceeded in sediment samples. Approximately 74% of the samples collected had contaminant concentrations that fell within either the minimal or probable effects ranges. Therefore, it was possible to classify as toxic or not toxic the majority of the samples collected in these studies.

Table 14. Predicted toxicity vs. observed toxicity in Hudson-Raritan Estuary sediments (Long Unpublished data).

Predicted Toxicity	Number of Toxic Samples Amphipod Test (%)	Number of Toxic Samples Any of 4 Tests (%)	Predictability (Using All Tests; % Correct)
Overall Toxicity	21 of 38 (55%)	28 of 38 (74%)	-
Not Toxic (< TELs)	0 of 2 (0%)	0 of 2 (0%)	100% (2 of 2)
Possibly Toxic (> TELs; < PELs)	2 of 2 (100%)	2 of 2 (100%)	-
Toxic (1 PEL exceeded)	0 of 1 (0%)	0 of 1 (0%)	0% (0 of 1)
Toxic (2-5 PELs exceeded)	7 of 13 (54%)	10 of 13 (77%)	77% (10 of 13)
Toxic (6-9 PELs exceeded)	4 of 11 (36%)	7 of 11 (64%)	64% (7 of 11)
Toxic (> 10 PELs excceded)	8 of 9 (89%)	9 of 9 (100%)	100% (9 of 9)
Toxic (1 or more PELs exceeded)	19 of 34 (56%)	26 of 34 (76%)	76% (26 of 34)
Toxic (2 or more PELs exceeded)	19 of 33 (58%)	26 of 33 (79%)	79% (26 of 33)

TEL = Threshold effect level; PEL = Probable effect level.

Table 15. Overall predictability of the recommended sediment quality assessment guidelines (SQAGs; using observed toxicity in any bioassay).

Location	Predictability of the SQAGs (% Correct)			
	Not Toxic (< TELs)	Possibly Toxic (>TELs, < PELs)	Toxic (1 or More PELs Exceeded)	Toxic (2 or More PELs Exceeded)
Tampa Bay (FL)	100% (2 of 2)	(10 of 13)	87% (40 of 46)	100% (24 of 24)
Pensacola Bay (FL)	0% (0 of 2)	(1 of 2)	92% (11 of 12)	90% (9 of 10)
Gulf of Mexico	94% (15 of 16)	(6 of 28)	0% (0 of 3)	-
San Pedro Bay (CA)	-	(7 of 8)	94% (34 of 36)	94% (17 of 18)
Hudson-Raritan Estuary (NY)	100% (2 of 2)	(2 of 2)	76% (26 of 34)	79% (26 of 33)
Overall	**86% (19 of 22)**	**(26 of 53)**	**85% (111 of 131)**	**89% (76 of 85)**

TEL = Threshold effect level; PEL = Probable effect level.
Note: Samples with contaminant concentrations within the possible effects range (i.e., > TEL and < PEL) were not predicted to be toxic or not toxic. Therefore, the predictability of the SQAGs was not evaluated using these samples.

7.4 Summary

A preliminary evaluation of the recommended sediment quality assessment guidelines was conducted to determine their potential applicability in Florida coastal waters and other areas in the United States. The results of this evaluation indicate that, in general, the SQAGs can be used with a high or moderate degree of confidence to conduct sediment quality assessments. The SQAGs for 18 to 20 substances were comparable to the functionally-similar guidelines that have been developed using different approaches and/or different data. In addition, the SQAGs for 28 substances had a moderate or high degree of reliability, as indicated by the data contained in the expanded NSTP database. Furthermore, the SQAGs for up to 34 substances, when used collectively, were found to provide predictive tools for classifying marine and estuarine sediments in terms of their potential for being associated with adverse biological effects. Overall, the predictability of the PELs and TELs was 85% and 86%, respectively. Therefore, the results of all three evaluations indicated that the SQAGs are likely to be appropriate for use in a variety of applications in Florida and elsewhere.

While the foregoing evaluation provides important information for assessing the SQAGs, additional data are required to fully evaluate the applicability of these assessment tools. Specifically, matching sediment chemistry and biological effects data from additional areas in Florida are needed to determine the predictability of the SQAGs in various types of sediments and in sediments affected by distinct contaminant sources. For example, the predictability of the SQAGs could be different in carbonate-type sediments and/or sediments that are affected principally by industrial or agricultural contaminant sources (i.e., contaminated with substances for which no SQAGs are currently available). Additional data sets, from sediment quality surveys conducted elsewhere in the United States, are also required to evaluate the regional applicability of the SQAGs.

Chapter 8

Summary and Recommendations

8.1 Summary

This report recommends and evaluates numerical sediment quality assessment guidelines (SQAGs) for priority substances in Florida coastal waters. An approach was selected that would respond to Florida's management requirements. Following refinement of this approach, numerical SQAGs were derived for 34 substances or groups of substances. These SQAGs were subsequently evaluated to determine their comparability, reliability, and predictability. Volume 2, ***Applications of the Sediment Quality Assessment Guidelines***, provides guidance on the intended uses of the SQAGs. Volumes 3 and 4, ***Supporting Documentation - Biological Effects Database for Sediments*** and ***Supporting Documentation - Regional Biological Effects Database for Sediments***, summarize the data that were used to develop the SQAGs.

In Florida, conservation and protection of natural resources is a high priority environmental management goal. Achieving this goal requires protection of living resources and their habitats in estuarine, nearshore, and marine ecosystems. In the last decade, there has been a significant increase in the level of understanding (and public recognition) of the role sediments play in coastal ecosystem functions. Sediments are particularly important in determining the fate and effects of environmental contaminants.

Recent monitoring data indicate that concentrations of various contaminants are elevated at numerous locations in Florida coastal sediments. The SQAGs are needed to evaluate the potential for biological effects associated with these contaminants and to provide assistance in managing coastal resources. In this respect, SQAGs provide useful tools for focusing limited resources on the highest management priorities.

To identify an appropriate procedure for deriving SQAGs, the major approaches used in other jurisdictions to derive numerical SQAGs were evaluated in the context of Florida's requirements for sediment quality assessment values. The results of this analysis indicated that a weight of evidence approach (WEA) used by the NOAA National Status and Trends Program (Long and Morgan 1990) would respond most directly to Florida's requirements. Therefore, a strategy that relied on a refined version of the WEA was recommended to derive numerical SQAGs for near-term use in addressing sediment quality concerns.

Sediment quality assessment guidelines have been developed for 34 priority contaminants and groups of contaminants in Florida coastal waters. However, insufficient data were available to derive guidelines for another 20 substances that are known or are suspected to contaminate Florida coastal sediments. The numerical SQAGs were used to define three ranges of concentrations for each of the 34 contaminants: a probable effects range; a possible effects range; and, a minimal effects range.

A preliminary evaluation of the recommended SQAGs was conducted to determine their potential applicability in Florida coastal waters and other areas in the United States. The results of this evaluation indicate that most of the SQAGs can be used with a high or moderate degree of confidence to conduct sediment quality assessments. The SQAGs for 18 to 20 substances were comparable to similar guidelines developed by other investigators using different approaches and procedures. In addition, the SQAGs for 28 substances had a moderate or high degree of reliability, as indicated by analysis of the incidence of adverse effects in the expanded NSTP database. Furthermore, the SQAGs for 34 substances compared to field-collected data, were found to provide predictive tools for classifying sediments in terms of their potential for being associated with adverse biological effects. Therefore, the results of all three evaluations indicated that the SQAGs are likely to be appropriate for use in a variety of applications in Florida and elsewhere in the United States.

The recommended SQAGs support the identification of contaminated sites and priority chemicals of concern in Florida coastal waters. As such, the guidelines can contribute to the design, implementation, and evaluation of local and state sediment quality monitoring programs. In addition, the guidelines may be used in a variety of environmental management applications, including identifying the need for further testing to support regulatory decisions and evaluating the need for remedial actions. Furthermore, SQAGs provide a common basis for reaching agreements on sediment quality.

The preliminary guidelines were established to provide a yardstick for evaluating sediment quality in Florida. As such, these guidelines may be used to screen sediment chemistry data and establish priorities with respect to sediment quality management. They should not be used in lieu of water quality criteria, nor should they be used as sediment quality criteria. Ambient environmental conditions may influence the applicability of these guidelines at specific locations.

8.2 Recommendations

The following recommendations will strengthen the identification and management of contaminated sediments. While several tasks might appear onerous, most will not require significant resources to complete. Importantly, FDEP has forged partnerships with key investigators in this field, including the National Atmospheric and Oceanic Administration, National Biological Survey, U.S. Environmental Protection Agency, California State Water Resources Board, and Environment Canada. Activities which are being conducted or planned by these and other agencies will provide products which can be used directly to implement the recommendations. The Department is encouraged to strengthen these relationships and develop a plan of action for addressing sediment contamination.

8.2.1 Conduct Further Screening and Expansion of the NSTP Database

An expanded NSTP database was used to support the derivation of numerical SQAGs for Florida coastal waters. This database should be updated and expanded as new information on the biological effects of sediment-associated contaminants becomes available (see discussion in Section 4.3). Specifically, the database should be expanded to include the results of high quality coastal studies that have recently been conducted in Florida (e.g., Pensacola Bay, St. Andrews Bay), the southeast (e.g., Savannah, GA; Charleston, SC), and elsewhere in the United States (e.g., San Pedro Bay and San Diego Harbor, CA; Boston Harbor, MA). The database should also be improved by further screening the data to identify the highest quality data; additional procedures for screening data were recently proposed by the Science Advisory Group on the Assessment of Sediment Quality.

8.2.2 Strengthen and Add Sediment Quality Assessment Guidelines

An updated and further expanded NSTP database should be used to strengthen the SQAGs recommended in this document and to derive guidelines for additional priority substances (for which insufficient data were available for developing this report) identified in Florida coastal sediments. Numerical SQAGs or refined SQAGs are required for the following substances and groups of substances:

- Metals (specifically, mercury and nickel);
- Organotins;
- Polychlorinated biphenyls (PCBs);
- Pesticides (specifically, azinphos-methyl, chlordane, chlorothalonil, chlorpyrifos, DDTs, disulfoton, endosulfan, endrin, heptachlor, heptachlor epoxide, endrin, lindane, phorate, toxaphene, and trifluralin);
- Polychlorinated dibenzo-*p*-dioxins (PCDDs);
- Polychlorinated dibenzofurans (PCDFs);
- Pentachlorophenol; and,
- Phthalate esters (specifically, dimethyl phthalate and di-n-butyl phthalate).

8.2.3 Further Evaluate the Sediment Quality Assessment Guidelines

In Chapter 7, the SQAGs were evaluated to determine their applicability in Florida coastal waters. This evaluation focused on the comparability, reliability, and predictability of the SQAGs. However, this evaluation was preliminary and additional data from field surveys and laboratory studies are required to further evaluate the SQAGs.

Many types of sediments occur in Florida coastal ecosystems, ranging from terrigenous sediments in the northern portion of the Gulf coast to carbonate sediments in some areas of south Florida. There is significant potential for differences in the bioavailability (and hence the toxicity) of contaminants in different sediment types. Although the information used to derive the SQAGs includes data from a wide variety of sites in North America, it is possible that these data do not adequately represent the range of conditions in Florida. Further biological testing and benthic invertebrate community evaluations should be conducted in various Florida sediments to determine the applicability of SQAGs. These locations should be selected to encompass a wide range of sediment types and should include contaminated sites and uncontaminated "reference" locations.

The recommended guidelines are based on dry weight-normalized contaminant concentrations. The preliminary evaluation of these SQAGs indicated that they were both reliable and predictive. Nonetheless, the results of several studies suggest that certain variables (such as total organic carbon and acid volatile sulfide) could influence the bioavailability of sediment-associated contaminants. Data from other studies have not confirmed these relationships. Therefore, additional data is needed to define the conditions governing the bioavailability of individual contaminants in Florida coastal sediments. The guidelines should be refined appropriately when these relationships become more clearly established.

8.2.4 Determine the Sensitivities of Selected Florida Estuarine Invertebrate Species

The relative sensitivity of species that occur in Florida is a central consideration for further evaluating the applicability of the SQAGs. The SQAGs recommended for assessing the potential for biological effects of sediment-associated contaminants in Florida were developed using data on a wide variety of species that occur in North America. However, biological effects data on aquatic organisms from the southeastern portion of the United States are limited. Therefore, it is difficult to determine if the recommended SQAGs would adequately protect aquatic organisms that occur in Florida coastal waters. Additional biological testing and benthic invertebrate community evaluations should be undertaken to determine if aquatic organisms that occur in Florida have sensitivity ranges similar to organisms occurring in other parts of North America.

8.2.5 Develop Bioaccumulation-Based Sediment Quality Assessment Guidelines

The numerical SQAGs recommended in this study were primarily developed from information on the effects of sediment-associated contaminants on sediment-resident organisms. However, these SQAGs do not consider the potential for bioaccumulation of persistent substances in the tissues of aquatic organisms nor the potential for adverse effects on the human and non-human consumers (wildlife) of these aquatic organisms. Therefore, bioaccumulation-based SQAGs should be developed for the most persistent and bioaccumulative substances that occur in Florida coastal sediments and used with the effects-based SQAGs that were derived in this study. The tissue residue approach may provide appropriate procedures for developing the required SQAGs (see Section 3.4).

8.2.6 Develop Sediment Quality Assessment Guidelines for Freshwater Ecosystems

The SQAGs developed in the present study and the Department's metals interpretive approach are tools for evaluating coastal sediment quality conditions. No such tools exist for use in Florida's freshwater ecosystems. Effects-based SQAGs should be developed to evaluate the biological significance of contaminated sediments in freshwater systems. In the past year, Environment Canada has made progress in developing a biological effects database for freshwater sediments. Upon completion, the information contained in this database could be used to derive numerical SQAGs for freshwater ecosystems. Hence, the FDEP is encouraged to cooperate with this agency to take advantage of the considerable cost-savings and head-start in developing freshwater SQAGs.

In addition to effects-based SQAGs, a companion tool is required to identify metals contamination in freshwater sediments. Therefore, it is recommended that the Department's metals interpretive tool and similar procedures for identifying anthropogenic enrichment of sediment-associated metals be evaluated for application in Florida freshwater sediments.

8.2.7 Improve Survey Procedures

In the past, several sampling, chemical analytical, and biological testing procedures have been used in sediment toxic effects studies (e.g., dredged material disposal, etc.) conducted in Florida coastal waters. Often, the procedures have limited the applicability of the studies and hindered their use in broader ecological investigations. Routine practices should be re-evaluated in light of recent information and procedures refined as appropriate.

Standard procedures for collecting, storing, characterizing, and manipulating sediments that are to be used in toxicological testing have been established by the ASTM (1994) and should be followed. The results of the assessment of the SQAGs indicate that aquatic organisms exhibit a range of sensitivities to sediment-associated contaminants. Therefore, there is a need to ensure that biological investigations of sediment quality employ a battery of tests, with a focus on sensitive species and sensitive endpoints. For example, the results of the sea urchin fertilization test (using porewater) was highly correlated with sediment chemistry in Tampa Bay and Pensacola Bay (Long *et al.* 1994; Long Unpublished data). In contrast, the results of short-term toxicity tests which measure the survival of adult sand worms, bivalves, or shrimp provide little information for assessing sediment quality. Standard methods for conducting biological tests with a range of species (e.g., amphipods and polychaetes; ASTM 1993) have been developed to provide guidance to practitioners in this field and adherence to these protocols will improve the quality of data that are generated in Florida.

8.2.8 Increase Coordination with Federal Agencies on Contaminated Sediment Management

In the southeastern United States, there are a relatively large number of independent and loosely-related initiatives involved in evaluating and managing contaminated sediments. Development of a regional intergovernmental strategy for contaminated sediment assessment and management would improve the effectiveness of state and federal programs, encourage greater local support in preventing sediment contamination and restoring sediment quality, and reduce unnecessary regulatory delays. For example, the FDEP coastal contaminants database is used in a variety of applications, including wetland permitting and restoration, contaminated site clean up, and identifying stormwater management priorities. The consolidation of this data with comparable sediment quality data from other programs, such as the EPA Environmental Monitoring and Assessment Program (EMAP), would be of considerable benefit to both the responsible agencies and the regulated entities.

A cooperative effort should be pursued by the National Oceanic and Atmospheric Administration, National Biological Survey, United States Fish and Wildlife Service, United States Environmental Protection Agency, United States Army Corps of Engineers, United States Geological Survey, Florida Department of Environmental Protection, and other affected agencies to identify priority sediment management, monitoring, and regulatory objectives, and to develop an interagency strategy for achieving them.

9.0 References

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Appendix 1: Screening Criteria for Evaluating Candidate Data Sets for the Sediment Toxicity (SEDTOX) Database

A. Spiked Sediment Bioassay Data

1. Toxicity tests which follow published protocols set by the ASTM are acceptable. Other tests which employ more novel protocols **should** be evaluated on a case by case basis (e.g., Green Book test protocols are acceptable).

2. Concentrations of the contaminant in sediment **must** be measured (with the number of measurements taken dependent on the nature of the chemical and duration of the test). Calculated (nominal) concentrations of the substances in sediment are not acceptable.

3. The chemical analytical procedures **must** have been appropriate for determining the total concentrations of the analytes in bulk sediment samples. For example, strong acid digestions are required to determine total concentrations of metals.

4. Test sediments **should** be characterized so that any factors which may affect toxicity can be included in the evaluation process. In the overlying water, variables such as temperature, pH, dissolved oxygen, residual chlorine, suspended solids, and water hardness (and/or alkalinity) or salinity **should** be measured. In the sediment, variables such as moisture content, organic carbon, acid volatile sulfides, and particle size distribution **should** be reported. However, studies that do not report these variables may still be included in the database.

5. Acceptable biological tests **should** demonstrate that adequate environmental conditions for the test species were maintained throughout the test.

6. Preferred endpoints include effects on embryonic development, early survival, growth, reproduction, and adult survival.

7. Responses and survival of controls **must** be reported and within acceptable limits.

8. Appropriate statistical procedures **should** be used and reported in detail.

9. The equilibrium adjustment period (i.e., time between spiking and initiation of the biological test) and information relevant to the determination if equilibrium had been established **should** be reported.

Appendix 1: Screening Criteria for Evaluating Candidate Data Sets for the Sediment Toxicity (SEDTOX) Database (continued)

B. Matching Sediment Chemistry and Biological Effects Data

1. The data set **must** contain matching sediment chemistry and biological effects data. That is, biological and chemical data **must** be collected from the same locations and at the same time.

2. The procedures used for collection, handling, and storage of saltwater and freshwater sediments **should** be consistent with the protocols recommended by the ASTM (E 1391-90). For example:
   (a) Sediments that have been frozen **must** not be used for biological tests (except for Microtox tests).
   (b) Sediments **should** not be stored for greater than two weeks prior to use in toxicity tests.

3. The concentrations of one or more analyte(s) **must** vary by at least a factor of ten at different sampling sites.

4. The chemical analytical procedures **must** have been appropriate for determining the total concentrations of the analytes in bulk sediment samples. For example, strong acid digestions are required to determine total concentrations of metals.

5. Test sediments **should** be characterized so that any factors which may affect toxicity can be included in the evaluation process. In the overlying water, variables such as temperature, pH, dissolved oxygen, residual chlorine, suspended solids, and water hardness (and/or alkalinity) or salinity **should** be measured. In the sediment, variables such as moisture content, organic carbon, acid volatile sulfides, and particle size distribution **should** be reported. However, studies that do not report these variables may still be included in the database.

6. The procedures used to assess the toxicity of sediment-sorbed contaminants in whole sediments (and other appropriate media) **should** be consistent with the protocols recommended by the ASTM (E 1367-90, E 1383-90, etc.). Other tests which employ other published protocols **should** be evaluated on a case by case basis (e.g., Green Book tests are acceptable).

7. Responses and survival of controls **must** be reported and within acceptable limits.

8. Appropriate statistical procedures **should** be used and reported in detail.

Appendix 2: Description of the Procedures for Deriving Sediment Quality Assessment Guidelines.

An overview of the procedures for deriving numerical sediment quality assessment guidelines (SQAGs) using the information in the expanded NSTP database was included in Chapter 5. Additional information on the procedures is provided here. While these procedures have been automated to generate the SQAGs for this report, they may also be conducted manually with satisfactory results. The manual procedures that can be applied to the data contained in Volume 3 of the report (MacDonald *et al.* 1994) are described below.

The information in the expanded NSTP database is presented in tabular form (i.e., the ascending data tables) in MacDonald *et al.* (1994). These data tables contain information on the concentration of the contaminant (sorted from lowest to highest), geographic area investigated, analysis type, test type, endpoint measured, species tested, life stage, TOC and AVS levels, and bibliographic reference (see Section 5.2). In addition, each entry in the ascending data tables was assigned an 'effects/no-effects' descriptor, which indicates whether or not the contaminant was associated with the biological effect (i.e., endpoint) that was measured. An entry was assigned an 'effects' descriptor (*) if:

(i) an adverse biological effect, such as acute toxicity, was reported; and,

(ii) concordance was apparent between the observed biological response and the measured chemical concentration.

In the co-occurrence analysis of field-collected data entered into the BEDS, an effects descriptor was assigned to data entries in which adverse biological effects were observed in association with at least a two-fold elevation in the chemical concentration above reference concentrations. This two-fold criterion provided a consistent basis for identifying chemical concentrations that were strongly associated with the adverse effect that was measured. Data entries from spiked-sediment bioassays were also assigned an 'effects' descriptor if significant biological effects were reported.

A 'no gradient' (NG) descriptor was assigned when no differences in the concentrations of the chemical of concern was reported between the toxic and non-toxic stations. A 'small gradient' (SG) descriptor was assigned when the concentrations of a substance differed by less than a factor of two between the toxic and non-toxic samples. A 'no concordance' (NC) descriptor was assigned when there was no concordance between the severity of the effect and the chemical concentration (i.e., the concentration of a chemical in the toxic samples was lower than the concentration of that substance in the non-toxic samples). In these cases (i.e., NG, SG, and NC), it was assumed that other factors (whether measured or not) were more important in the etiology of the observed effect than the concentration of the contaminant considered. Finally, a 'no effects' (NE) descriptor was applied to biological data from unaffected, background, reference, or control samples.

Appendix 2: Description of the Procedures for Deriving Sediment Quality Assessment Guidelines (continued).

Collectively, the 'effects' data entries from laboratory and field studies were included in the ***effects data set*** (EDS). Collectively, data assigned 'no gradient', 'small gradient', 'no concordance', and 'no effects' descriptors were included in the ***no effects data set*** (NEDS). These latter data entries were included in the no effects data set because the concentrations of the substance were not associated with the observed biological effects. Hence, the substance was not considered to be harmful at the concentration that was measured. Data entries with greater than values (e.g., > 72 mg/kg for arsenic) were assigned dashes (-) and were not included in either data set.

Derivation of numerical SQAGs from information in the ascending data tables requires several steps. First, the number of data entries in the effects data set is determined by counting all asterisks in the ascending data table for the substance under consideration. For example, examination of Table 1 (arsenic) in MacDonald *et al.* (1994) reveals that the effects data set consists of 38 data entries. Then, the 15th percentile (EDS-L) and the 50th percentile (EDS-M) of the effects data set are determined. For example, the EDS-L and EDS-M for arsenic are 8.2 and 54 mg/kg, respectively. Next, the number of data entries in the no effects data set is established (e.g., there are 257 data entries in the no effects data set for arsenic). The next step in this process necessitates identification of the 50th percentile (NEDS-M) and 85th percentile (NEDS-H) of the no effects data set. For arsenic, the NEDS-M and NEDS-H are 6.4 and 32 mg/kg, respectively. These four values are used directly to calculate the SQAGs.

As indicated in Chapter 5, the TEL is calculated by taking the geometric mean of the 15th percentile concentration in the effects data set (EDS-L) and the 50th percentile concentration in the no effects data set (NEDS-M). The geometric mean is calculated because the effects and no effects data sets are probably not normally-distributed. If these data sets were demonstrated to have normal distributions, then an arithmetic mean could be used to calculate the sediment quality assessment guidelines. The geometric mean of two values is determined by calculating the square root of the product of the two values. This procedure is represented by the following equation:

$$
\begin{aligned}
\text{TEL} &= \sqrt{(\text{EDS-L} * \text{NEDS-M})} \\
&= \sqrt{(8.2 * 6.4)} \\
&= \sqrt{(52.48)} \\
&= 7.24
\end{aligned}
$$

Appendix 2: Description of the Procedures for Deriving Sediment Quality Assessment Guidelines (continued).

Similarly, the PEL is calculated as the geometric mean of the 50th percentile concentration in the effects data set (EDS-M) and the 85th percentile concentration in the no effects data set (NEDS-H). This procedure is represented by the following equation:

$$
\begin{aligned}
PEL &= \sqrt{(EDS\text{-}M * NEDS\text{-}H)} \\
&= \sqrt{(54 * 32)} \\
&= \sqrt{(1728)} \\
&= 41.6
\end{aligned}
$$

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Approach to the Assessment of Sediment Quality in Florida Coastal Waters

Volume 3 - Supporting Documentation: Biological Effects Database for Sediments

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Please note that the following pages (253-267) were not included in the document entitled *Approach to the Assessment of Sediment Quality in Florida Coastal Waters: Volume Three - Supporting Documentation: Biological Effects Database for Sediments*. We apologize for any problems caused by this omission. Please call the Florida DEP - Office of Water Policy if you have any questions (904-488-0784).

nary of the available data on the biological effects associated with sediment-sorbed TOXAPHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+7-13363 ug/g	Windom In Prep
SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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\ summary of the available data on the biological effects associated with sediment-sorbed PENTACHLOROPHENOL (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

·rophenol +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-0.085	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
	NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
+/-0.314	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
+/-2.99	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
	-	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
	-	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
	-	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
	-	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
+/-106	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992

ımmary of the available data on the biological effects associated with sediment-sorbed PENTACHLOROPHENOL (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

›henol SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
:50	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
69	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
69	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
	-	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
.06	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
61	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
61	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
61	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
61	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.64	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
:13	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
4.1	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
3.2	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
;2	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
;4.1	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
;7.8	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
;7.1	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
;3.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
;0.3	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
27	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
27	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
37	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep

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summary of the available data on the biological effects associated with sediment-sorbed PENTACHLOROPHENOL (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ophenol '-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
-137	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
-86.2	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988

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ummary of the available data on the biological effects associated with sediment-sorbed TOTAL 2,3,7,8-T4CDD (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

4CDD /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-0.00002	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (88.2+/-4.24% normal development)	Arbacia punctulata (sea urchin)		0.127+/-0.127	223+/-292 ug/g	Windom In Prep
/-0.00004	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
/-0.00004	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
/-0.00004	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
/-0.00004	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
/-0.00022	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not significantly toxic (10+/-2.77% mortality)	Menidia berllina (silverside)		1.42+/-1.11	10655+/-13994 ug/g	Windom In Prep
/-0.00023	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not significantly toxic (6.33+/-2.34% mortality)	Mysidopsis bahia (mysid)		1.4+/-1.1	10566+/-14023 ug/g	Windom In Prep
/-0.00021	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.1+/-3.53% mortality)	Ampelisca abdita (amphipod)		1.46+/-1.02	10070+/-12868 ug/g	Windom In Prep
/-0.00021	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.29+/-3.25% mortality)	Mysidopsis bahia (mysid)		1.46+/-1.02	10070+/-12868 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Significantly toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
/-0.00016	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Significantly toxic (22.3% mortality)	Menidia berllina (silverside)		1.71	6562 ug/g	Windom In Prep
	NC	Grays Harbor/Chehalis River, WA	COA	96-h	Significantly toxic (53% normal development)	Crassostrea gigas (oyster)	LAR	1.3		Word et al. 1990
/-0.00097	NE	Grays Harbor/Chehalis River, WA	COA	30-d	Not significantly toxic (12.3+/-4.92% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.45+/-0.63		Word et al. 1990
/-0.00097	NE	Grays Harbor/Chehalis River, WA	COA	30-d	Not significantly toxic (4.35+/-3.94% mortality)	Macoma nasuta (clam)	ADT	1.45+/-0.63		Word et al. 1990
/-0.00097	NE	Grays Harbor/Chehalis River, WA	COA	60-d	Not significantly toxic (14.2+/-8.12% mortality)	Macoma nasuta (clam)	ADT	1.45+/-0.63		Word et al. 1990
/-0.00096	NE	Grays Harbor/Chehalis River, WA	COA	96-h	Not significantly toxic (83.6+/-9.96% normal development)	Crassostrea gigas (oyster)	LAR	1.46+/-0.65		Word et al. 1990
	*	New York State	EqPA		New York State Sediment Criteria Value			1		Newell 1989

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summary of the available data on the biological effects associated with sediment-sorbed TOTAL 2,3,7,8-T4CDF (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

T4CDF +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-000006	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (88.2+/-4.24% normal development)	Arbacia punctulata (sea urchin)		0.127+/-0.127	223+/-292 ug/g	Windom In Prep
+/-0.0013	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.0013	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.0013	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.0013	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-000087	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not significantly toxic (10+/-2.77% mortality)	Menidia berllina (silverside)		1.42+/-1.11	10655+/-13994 ug/g	Windom In Prep
+/-000088	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not significantly toxic (6.33+/-2.34% mortality)	Mysidopsis bahia (mysid)		1.4+/-1.1	10566+/-14023 ug/g	Windom In Prep
+/-00008	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.1+/-3.53% mortality)	Ampelisca abdita (amphipod)		1.46+/-1.02	10070+/-12868 ug/g	Windom In Prep
+/-00008	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.29+/-3.25% mortality)	Mysidopsis bahia (mysid)		1.46+/-1.02	10070+/-12868 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Significantly toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Significantly toxic (22.3% mortality)	Menidia berllina (silverside)		1.71	6562 ug/g	Windom In Prep
+/-000044	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
+/-000167	NE	Grays Harbor/Chehalis River, WA	COA	96-h	Not significantly toxic (83.6+/-9.96% normal development)	Crassostrea gigas (oyster)	LAR	1.46+/-0.65		Word et al. 1990
+/-000166	NE	Grays Harbor/Chehalis River, WA	COA	30-d	Not significantly toxic (12.3+/-4.92% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.45+/-0.63		Word et al. 1990
+/-000166	NE	Grays Harbor/Chehalis River, WA	COA	30-d	Not significantly toxic (4.35+/-3.94% mortality)	Macoma nasuta (clam)	ADT	1.45+/-0.63		Word et al. 1990
+/-000166	NE	Grays Harbor/Chehalis River, WA	COA	60-d	Not significantly toxic (14.2+/-8.12% mortality)	Macoma nasuta (clam)	ADT	1.45+/-0.63		Word et al. 1990
	SG	Grays Harbor/Chehalis River, WA	COA	96-h	Significantly toxic (53% normal development)	Crassostrea gigas (oyster)	LAR	1.3		Word et al. 1990

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ımmary of the available data on the biological effects associated with sediment-sorbed BIS(2-ethylexyl)PHTHALATE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

xyl) e D	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
2.45	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
2.45	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
2.45	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
2.45	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
23.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
23.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
23.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
23.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
25.8	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
25.8	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992

summary of the available data on the biological effects associated with sediment-sorbed BIS(2-ethylexyl)PHTHALATE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

lexyl) ite SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-25.8	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
/-25.8	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
/-25.8	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
/-25.8	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
/-28.8	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
/-33.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	101+/-71.1 ug/g	Windom In Prep
/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
	NE	Palos Verdes, CA	COA		High density (4.4 N/0.1 sq.m.)	Echinoderm		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (88 N/0.1 sq.m.)	Foraminifera (sponge)		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (132 N/0.1 sq.m.)	Ophiuroidea (brittle star)		0.9		Swartz et al. 1985a
		TEL								
	-	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
+/-110	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
+/-482	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
+/-49.5	SG	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
+/-338	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
	NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
	NE	Palos Verdes, CA	COA		High density (93.4 N/0.1 sq.m.)	Echinoderm		1.3+/-0.77		Swartz et al. 1986
	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
	*	Puget Sound, WA	SQG		Chemical Criteria	*Benthic community*		1		WDE 1989
+/-588	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
+/-703	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990

ummary of the available data on the biological effects associated with sediment-sorbed BIS(2-ethylexyl)PHTHALATE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

exyl) te SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
'-303	NC	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
'-676	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
'-661	SG	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
	NE	Palos Verdes, CA	COA		High abundance (208 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
'-709	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
'-696	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
'-816	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
'-816	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
'-778	SG	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
'-912	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
'-794	NE	Palos Verdes, CA	COA		High density (20.9+/-0.23 N/0.1 sq.m.)	Amphipod		1.7+/-0.61		Swartz et al. 1986
'-794	NE	Palos Verdes, CA	COA		High density (11.2+/-1.64 N/0.1 sq.m.)	Phoxocephalid		1.7+/-0.61		Swartz et al. 1986
'-552	NE	Palos Verdes, CA	COA		High abundance (54.6+/-5.09 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
'-552	NE	Palos Verdes, CA	COA		High abundance (30.7+/-0.99 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
'-8460	*	Palos Verdes, CA	COA		Low density (0.03+/-0.08 N/0.1 sq.m.)	Echinoderm		3.53+/-0.742		Swartz et al. 1985a
	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
'-937	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
'-2661	NE	Palos Verdes, CA	COA		High species richness (80.8+/-13.7 S/0.1 sq.m.)	Macro benthos		2.10+/-1.15		Swartz et al. 1985a
'-2661	NE	Palos Verdes, CA	COA		High density (54.5+/-9.91 N/0.1 sq.m.)	Amphipod		2.1+/-1.15		Swartz et al. 1985a
'-2661	NE	Palos Verdes, CA	COA		High density (34.3+/-5.67 N/0.1 sq.m.)	Phoxocephalid		2.1+/-1.15		Swartz et al. 1985a
'-2661	NE	Palos Verdes, CA	COA		High density (111+/-32 N/0.1 sq.m.)	Crustacea		2.1+/-1.15		Swartz et al. 1985a
		PEL								
	-	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
/-3354	NE	Palos Verdes, CA	COA		High density (594+/-688 N/0.1 sq.m.)	Mollusca		2.53+/-1.27		Swartz et al. 1985a
/-3354	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (8+/-5.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.53+/-1.27		Swartz et al. 1985a
/-807	NE	Palos Verdes, CA	COA		High abundance (944+/-101 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
	NE	Palos Verdes, CA	COA		High density (2177 N/0.1 sq.m.)	Polychaeta		3.2		Swartz et al. 1985a
/-3891	NE	Palos Verdes, CA	COA		High species richness (70.9+/-16.9 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
/-5642	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5+/-5.45% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.42+/-0.88		Swartz et al. 1986
/-5600	*	Palos Verdes, CA	COA		Low density (0.2+/-0.14 N/0.1 sq.m.)	Echinoderm		2.64+/-0.77		Swartz et al. 1986
/-9248	SG	Palos Verdes, CA	COA		Low density (365+/-178 N/0.1 sq.m.)	Polychaeta		3.15+/-1.32		Swartz et al. 1985a
/-8460	*	Palos Verdes, CA	COA		Low density (0.233+/-0.367 N/0.1 sq.m.)	Foraminifera (sponge)		3.53+/-0.742		Swartz et al. 1985a
/-8460	*	Palos Verdes, CA	COA		Low density (0.3+/-0.8 N/0.1 sq.m.)	Ophiuroidea (brittle star)		3.53+/-0.742		Swartz et al. 1985a
/-2961	*	Palos Verdes, CA	COA		Low density (5.3+/-3.7 N/0.1 sq.m.)	Amphipod		3.13+/-0.15		Swartz et al. 1986
/-2961	*	Palos Verdes, CA	COA		Low density (0.13+/-0.23 N/0.1 sq.m.)	Phoxocephalid		3.13+/-0.15		Swartz et al. 1986
/-16415	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (11.9+/-5.36% mortality)	Rhepoxynius abronius (amphipod)	VAR			Ferraro et al. 1991
/-17146	*	Palos Verdes, CA	COA		Low abundance (2.4+/-5.65 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991

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\ summary of the available data on the biological effects associated with sediment-sorbed BIS(2-ethylexyl)PHTHALATE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ıylexyl) ılate ·/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-8236	•	Palos Verdes, CA	COA		Low species richness (26.0+/-11.5 S/0.1 sq.m.)	Macro benthos		3.95+/-0.238		Swartz et al. 1985a
+/-8326	•	Palos Verdes, CA	COA		Low density (1.0+/-1.2 N/0.1 sq.m.)	Amphipod		3.95+/-0.238		Swartz et al. 1985a
+/-8236	•	Palos Verdes, CA	COA		Low density (0 N/0.1 sq.m.)	Phoxocephalid		3.95+/-0.238		Swartz et al. 1985a
+/-8236	•	Palos Verdes, CA	COA		Low density (8.7+/-6.01 N/0.1 sq.m.)	Crustacea		3.95+/-0.238		Swartz et al. 1985a
+/-18009	•	Palos Verdes, CA	COA		Low abundance (13.8+/-11.4 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
+/-18009	•	Palos Verdes, CA	COA		Low abundance (5.87+/-7.06 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
+/-20715	•	Palos Verdes, CA	COA		Low abundance (415+/-94.4 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
+/-8664	•	Palos Verdes, CA	COA		Low density (21.5+/-11.6 N/0.1 sq.m.)	Mollusca		4+/-0.265		Swartz et al. 1985a
+/-8664	•	Palos Verdes, CA	COA	10-d	Significantly toxic (21+/-6.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	4+/-0.265		Swartz et al. 1985a
	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	•	Palos Verdes, CA	COA		Low species richness (19.2 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991

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ummary of the available data on the biological effects associated with sediment-sorbed DIMETHYL PHTHALATE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

hthalate '-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
	NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992

A summary of the available data on the biological effects associated with sediment-sorbed DIMETHYL PHTHALATE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

l Phthalate :.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
9 +/-10.1	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
7 +/-12	NC	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
4 +/-13.6	NC	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
1	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
1	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
1	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
4	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
5 +/-29.5	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
7 +/-31.6	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
1 +/-31.2	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
7 +/-35.6	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
1 +/-43.1	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
3 +/-55.7	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
0	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
0	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
0 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
0	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
0	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
9 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
8 +/-179	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8 +/-179	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8 +/-179	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8 +/-179	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992

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ummary of the available data on the biological effects associated with sediment-sorbed DIMETHYL PHTHALATE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

hihalate +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
	-	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	-	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988

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A summary of the available data on the biological effects associated with sediment-sorbed DI-N-BUTYL PHTHALATE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

yl Phthalate ic.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992

ummary of the available data on the biological effects associated with sediment-sorbed DI-N-BUTYL PHTHALATE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

?hthalate /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
/-21.7	NC	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
/-26	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
/-26	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
/-27.8	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
/-77.6	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
/-82.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
/-81.8	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
/-95	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
	-	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
	-	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	-	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
+/-151	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-151	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-151	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-151	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
	-	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	NE	Laboratory	SSBA	96-h ST	Not toxic (0% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Clark et al. 1987
	NE	Laboratory	SSBA	10-d ST	Not toxic (0% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Clark et al. 1987
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985

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Approach to the Assessment of Sediment Quality in Florida Coastal Waters

Volume 3 - Supporting Documentation: Biological Effects Database for Sediment

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GLOSSARY OF ACRONYMS

SUBSTANCE

Conc.+/-SD	=	Concentration Plus or Minus Standard Deviation

ANALYSIS TYPE

COA	=	Co-occurrence Analysis
AETA	=	Apparent Effects Threshold Approach
EqPA	=	Equilibrium Partitioning Approach
SQO	=	Sediment Quality Objective
SQG	=	Sediment Quality Guideline
SBA	=	Sediment Background Approach
SSBA	=	Spike Sediment Bioassay Approach
SLCA	=	Screening Level Concentration Approach

TEST DURATION

d	=	Day
h	=	Hour
wk	=	Week
m	=	Month
FT	=	Flow-Through Test
ST	=	Static Test

ENDPOINT MEASURED

ACOE	=	Army Corps of Engineers
AET	=	Apparent Effects Threshold
C.L.	=	Confidence Limit
EC50	=	Effective Concentration to 50% of the Tested Organisms
EPA	=	Environmental Protection Agency
EqP	=	Equilibrium Partitioning
FCV	=	Final Chronic Value
LC50	=	Lethal Concentration to 50% of the Tested Organisms
LPL	=	Lower Prediction Limit
MFO	=	Mixed-Function Oxidase
N	=	Number of Organisms
NSLC	=	National Screening Level Concentration
PSDDA	=	Puget Sound Dredge Disposal Analysis
S	=	Species
SDUs	=	Species Diversity Units
sq.m.	=	Square Meter
SRUs	=	Species Richness Units
TLm	=	Median Tolerance Limit
TU/g	=	Toxic Units / Gram

GLOSSARY OF ACRONYMS (continued)

SPECIES

sp.	=	Species
spp.	=	Species (plural)

LIFE STAGE

ADT	=	Adult
ADT/JUV	=	Adult and/or Juvenile
HAT	=	Hatchling
GAM	=	Gamete
I	=	Instar
JUV	=	Juvenile
LAR	=	Larval
NEO	=	Neonate
NYM	=	Nymph
SUBADT	=	Sub-Adult

HIT

NC	=	No Concordance
NE	=	No Effect
NG	=	No Gradient
SG	=	Small Gradient
*	=	Hit
-	=	Indeterminate

TOC

TOC	=	Total Organic Carbon

AVS

AVS	=	Acid Volatile Sulphide

\ summary of the available data on the biological effects associated with sediment-sorbed ARSENIC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

lc -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.3	NE	Stamford, CT	COA	96-h	Not toxic (10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
1.02	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
1.02	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
1.02	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
2	NE	Brunswick Harbour Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
0.15	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
0.32	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
0.32	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
0.32	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
	NE	Duwamish River, WA	COA	96-h	Not toxic (0-10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
	NC	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
	NC	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
	NC	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
).208	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
).208	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
).208	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
).36	NC	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
).464	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
).984	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
).6	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
).784	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
1.48	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
).514	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
	*	Black Rock Harbor, CT	COA	14-d	Significantly toxic (100% mortality)	Nereis virens (sandworm)				Simmers et al. 1984
1.32	NC	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
).248	SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
i	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
	NE	Savannah River Entrance Channel, GA	COA	48-h.	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
1.56	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
).942	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
1.26	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
1.26	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
1.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
1.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
1.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992

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ummary of the available data on the biological effects associated with sediment-sorbed ARSENIC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

[illegible]	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
7	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
[illegible]	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
1	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
[illegible]	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
[illegible]	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
[illegible]	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
	NE	Newport, RI	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.3+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
5	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
2	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
3	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
3	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (11.3% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
	NE	Norwalk River, CT	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
[illegible]	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	SG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	SG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991

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A summary of the available data on the biological effects associated with sediment-sorbed ARSENIC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ic SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
2.87	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Mmms et al. 1991
0.488	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
1.06	NE	Baltimore, MD	COA	20-d	Not significantly toxic (25.4+/-17.1% mortality)	Leptocheirus plumulosus (amphipod)	JUV.			McGee et al. 1993
3.93	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
2.04	SG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
2.36	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
3.52	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
2.03	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
2.03	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
2.21	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
0.283	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
2.56	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
1.83	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
).141	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
3.71	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.66	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
2.58	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
1.86	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
1.86	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
.86	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
.45	SG	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
.58	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
.54	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
.53	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
.61	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (15+/-7.21% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
.7	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
1.354	SG	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
.25	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
.97	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
1.03	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
.25	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
.88	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
.88	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
.84	SG	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
.36	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
.88	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
.06	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
1.16	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
.11	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
.61	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980

nmary of the available data on the biological effects associated with sediment-sorbed ARSENIC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
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NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
*	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (82.8+/-22.2% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
SG	Curtis Creek, Baltimore, MD	COA	20-d	Significantly toxic (94.6+/-9.35% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
*	United States	EqPA		EPA Chronic Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
SG	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991

A summary of the available data on the biological effects associated with sediment-sorbed ARSENIC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

...le ...-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.93	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
8.64	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
8.64	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
8.64	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
11.8	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.51	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
	NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
8.20	*	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
8.06	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
13.4	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
8.02	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
	*	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (55% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
9.27	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
1.76	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
	NE	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota				USACOE 1988
	*	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
8.44	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8.44	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8.44	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8.44	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
2.15	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
1.97	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
1.97	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
14.8	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
8.64	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
0.78	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
8.54	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
6.5	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
13.9	NC	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
7.88	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
8.63	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
8.63	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
3.54	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
14.2	NC	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
6.81	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
1.34	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
1.34	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
1.34	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
0.666	NE	Black Rock Beach, NS	COA	10-d	Not toxic (6.67+/-4.51% mortality)	Corophium volutator (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990

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ımmary of the available data on the biological effects associated with sediment-sorbed ARSENIC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

)	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
6	NE	Black Rock Beach, NS	COA	10-d	Not toxic (2.33+/-1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
6	NE	Black Rock Beach, NS	COA	10-d	Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
	*	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
	NC	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
	SG	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
	SG	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
	SG	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	SG	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
	SG	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	SG	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	SG	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
		PEL								
	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
	SG	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
	NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
	NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
	NC	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a

A summary of the available data on the biological effects associated with sediment-sorbed ARSENIC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

nic /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	•	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	•	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
	NC	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
	NC	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
-9.46	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
-10.5	NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
-148.0	•	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
-10.1	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
-11.6	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
	SG	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a
-148.0	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
-7.55	SG	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
-7.55	SG	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
-3.06	SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
	•	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	•	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
	•	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	•	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
	•	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	•	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	•	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		15		Bellar et al. 1986
78.6	•	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
78.6	•	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
	•	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
	•	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	15		Bellar et al. 1986
124	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7+/-11.4% mortality)	Nereis virens (polychaete)	ADT			Parrish 1987a
124	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3+/-2.31% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987a
124	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14+/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987a
216	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
216	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
216	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c
150	NE	Howe Sound, BC	COA	10-d	Not toxic (10.5+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
150	NE	Howe Sound, BC	COA	10-d	Not toxic (5.83+/-5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
150	NE	Howe Sound, BC	COA	10-d	Not toxic (96.3+/-4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
2351	•	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
	•	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	•	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
	•	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
	•	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		15		Bellar et al. 1986
	•	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	15		Bellar et al. 1986
1214	•	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985

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ummary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

)	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
22	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
1	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
15	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
14	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
	NE	Fraser River Estuary, BC	COA		Sediments populated by feral clams	Macoma balthica (bivalve)		0.45		McGreer 1982
14	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
18	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
21	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
14	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
48	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
45	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
46	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
46	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
33	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
18	NE	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.42+/-0.13		Chapman et al. 1991
47	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
52	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
48	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
2	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
2	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990 .
2	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
55	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
5	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
11	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
11	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
17	NE	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	0.443+/-0.127		Chapman et al. 1991
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
3	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
3	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
3	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a

A summary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ium /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-0.1	NE	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	0.425+/-0.128		Chapman et al. 1991
/-0.099	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
/-0.041	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
	NC	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
/-0.043	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
/-0.095	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
/-0.105	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
/-0.053	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
/-0.144	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
/-0.076	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
/-0.091	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
	NC	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox (Photobacterium phosphoreum)		0.4		Chapman et al. 1991
/-0.03	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
/-0.03	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
/-0.03	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
/-0.099	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
/-0.057	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
/-0.137	NC	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.45+/-0.058		Chapman et al. 1991
-0.131	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
-0.133	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
-0.082	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
-0.059	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
-0.099	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
-0.072	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
-0.13	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
-0.142	SG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
-0.141	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
-0.17	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
-0.17	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
-0.17	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
-0.17	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
-0.203	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
-0.05	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
-0.155	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
-0.201	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
-0.092	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
-0.057	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
-0.074	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
-0.142	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
	NG	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
-0.14	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
-0.18	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
-0.18	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992

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mmary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

)	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
8	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
8	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
	NE	Massachusetts Bay, MA	COA		High density (22 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
19	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
'0	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
17	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
'9	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
'6	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
4	NE	Massachusetts Bay, MA	COA		High density (299+/-40.3 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
	NE	Massachusetts Bay, MA	COA		High density (24 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
'7	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
'7	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
'	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
'	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
'	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
2	*	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
'8	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
19	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
'3	NE	Massachusetts Bay, MA	COA		High species richness (102+/-4.73 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
'9	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
'3	NE	Gulf of Mexico	COA		Not toxic (3.21+/-0.239 diversity index)	Benthic species		0.464+/-0.143		Chapman et al. 1991
'6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
'5	NE	Gulf of Mexico	COA		Least toxic (6.32+/-3.68 TU/g)	Microtox (Photobacterium phosphoreum)		0.47+/-0.149		Chapman et al. 1991
'7	NE	Massachusetts Bay, MA	COA		High density (201+/-33.4 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
'4	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
	NE	Southern California	COA		High abundance (191+/-70.1 N/0.1 sq.m.)	Echinoderm				Word & Means 1979

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summary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

m SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	SG	Strait of Georgia, BC	COA	48-h	Significant increase in burrowing time	Macoma balthica (bivalve)		1.13		McGreer 1979
.405	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3+/-1.51% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			Vittor & Associates 1988
.405	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (7.7+/-3.02% mortality)	Nereis virens (sandworm)	ADT			Vittor & Associates 1988
	NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
.375	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
.327	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
.19	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
.049	NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
.612	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
.612	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
.612	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
.612	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
.212	*	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
.265	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
.265	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
	NE	Massachusetts Bay, MA	COA		High density (4135 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
.274	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
.679	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
.679	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
.217	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
.177	NC	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
.834	NE	Gulf of Mexico	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.471+/-0.18		Chapman et al. 1991
.165	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
.269	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
.3	NC	Southern California	COA		Moderate abundance (56.2+/-23 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
.3	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (11.3% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
	NE	Curtis Creek, Baltimore, MD	COA	20-d	Not significantly toxic (25.4+/-17.1% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
	NE	Duwamish River, WA	COA	96-h	Not toxic (0-10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
	NE	Newport, RI	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
	NG	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC.	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
0.598	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
0.323	SG	Massachusetts Bay, MA	COA		Low density (1316+/-768 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
0.364	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
0.64	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
0.369	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
0.477	NE	Black Rock Beach, NS	COA	10-d	Not toxic (6.67+/-4.51% mortality)	Corophium volutator (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990

ımmary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ı Ɔ	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
177	NE	Black Rock Beach, NS	COA	10-d	Not toxic (2.33+/-1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
177	NE	Black Rock Beach, NS	COA	10-d	Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
576	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
193	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
195	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
13	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
	NE	Palos Verdes, CA	COA		High abundance (208 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
1	NC	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
7	NC	Southern California	COA		Moderate species richness (72+/-3.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
3	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
1	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
1	NG	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
363	*	Gulf of Mexico	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.5+/-0.155		Chapman et al. 1991
15	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (15+/-7.21% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
128	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
502	NE	Miami River/Seybold Canal, FL	COA	10-d	Significantly toxic (24.7+/-15% mortality)	Pennaeus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
1	NG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
191	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
73	NC	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
591	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
11	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
586	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
721	NC	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
117	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
515	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
		TEL								
	NE	Palos Verdes, CA	COA		High density (93.4 N/0.1 sq.m.)	Echinoderm		1.3+/-0.77		Swartz et al. 1986
	NE	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota				USACOE 1988
3	SG	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
5	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
7	NC	Southern California	COA		Moderate abundance (72.6+/-6.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
588	*	Massachusetts Bay, MA	COA		Low density (2.76+/-2.7 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
587	*	Massachusetts Bay, MA	COA		Low density (7.14+/-4.23 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
593	*	Massachusetts Bay, MA	COA		Low density (61.1+/-36.6 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
701	*	Massachusetts Bay, MA	COA		Low species richness (57.2+/-12.2 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
709	SG	Massachusetts Bay, MA	COA		Low density (39.1+/-30.8 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
383	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
355	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
355	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
289	SG	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (82.8+/-22.2% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
565	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
786	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992

A summary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

...ium +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-0.256	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
+/-0.550	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
+/-1.1	NC	Southern California	COA		Moderate abundance (75.6+/-12.7 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
+/-1.03	*	Gulf of Mexico	COA	48-h	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	LAR	0.5+/-0.18		Chapman et al. 1991
+/-0.289	SG	Curtis Creek, Baltimore, MD	COA	20-d	Significantly toxic (94.6+/-9.35% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
+/-0.51	NE	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-0.95	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
+/-0.447	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
+/-0.736	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
+/-0.736	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
+/-0.736	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
+/-0.456	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (4% mortality)	Citharichthys stigmaeus (sanddab)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	10-d	Not significantly toxic (14% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (13% mortality)	Neanthes arenaceodentata (polycheate)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (1% mortality)	Macoma nasuta (clam)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (0% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (18% mortality)	Acartia tonsa (copepod)				Salazar & Salazar 1985
+/-0.424	NE	Palos Verdes, CA	COA		High abundance (54.6+/-5.09 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
+/-0.424	NE	Palos Verdes, CA	COA		High abundance (30.7+/-0.99 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
+/-1.0	NE	Southern California	COA		High abundance (148+/-58 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
+/-1	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
+/-1.05	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
+/-0.960	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
+/-0.663	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
+/-0.972	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
	NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
	NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
	NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
	NG	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
	NG	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
	NG	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
	NG	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
	NG	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a
	NG	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
	NG	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
	NG	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
	SG	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (55% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
+/-1.09	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)				Ott 1986

ummary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

D	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
13	*	Gulf of Mexico	COA	48-h	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	LAR	0.567+/-0.153		Chapman et al. 1991
21	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
2	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
	SG	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
0	NC	Southern California	COA		Low abundance (57.6+/-13.6 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
355	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
777	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
867	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
155	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
0	*	Fraser River Estuary, BC	COA		Sediments devoid of feral clams	Macoma balthica (bivalve)		1.95		McGreer 1982
36	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
36	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
36	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
866	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
3	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7+/-11.4% mortality)	Nereis virens (polychaete)	ADT			Parrish 1987a
3	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3+/-2.31% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987a
3	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14+/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987a
12	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
	SG	Strait of Georgia, BC	COA	24-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)		3.09		McGreer 1979
86	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
797	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
85	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
0	NE	Southern California	COA		High species richness (96.3+/-22.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
3	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
829	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
	*	Black Rock Harbor, CT	COA	14-d	Significantly toxic (100% mortality)	Nereis virens (sandworm)				Simmers et al. 1984
85	NE	Miami River, FL	COA	10-d	Not toxic (18.6+/-7.27% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			ERCO 1985
85	NE	Miami River, FL	COA	10-d	Not toxic (1.2+/-0.837% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			ERCO 1985
85	NE	Miami River, FL	COA	10-d	Not toxic (3.6+/-1.67% mortality)	Nereis virens (sandworm)	ADT			ERCO 1985
79	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
871	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
03	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
84	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
66	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
03	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
03	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c

, summary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

um -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
-2.03	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c
-1.41	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
-1.1	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
-1.58	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
-1.2	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
-0.61	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
-0.929	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
-0.929	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
-0.929	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
-1.24	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
-0.813	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
-1.3	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
-1.36	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
-1.36	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
-1.96	NE	Palos Verdes, CA	COA		High density (20.9+/-0.23 N/0.1 sq.m.)	Amphipod		1.7+/-0.61		Swartz et al. 1986
-1.96	NE	Palos Verdes, CA	COA		High density (11.2+/-1.64 N/0.1 sq.m.)	Phoxocephalid		1.7+/-0.61		Swartz et al. 1986
-0.954	NE	Howe Sound, BC	COA	10-d	Not toxic (10.5+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
-0.954	NE	Howe Sound, BC	COA	10-d	Not toxic (5.83+/-5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
-0.954	NE	Howe Sound, BC	COA	10-d	Not toxic (96.3+/-4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
-1.51	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
	NC	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 1.4 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
	NE	Palos Verdes, CA	COA		High density (4.4 N/0.1 sq.m.)	Echinoderm		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (88 N/0.1 sq.m.)	Foraminifera (sponge)		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (132 N/0.1 sq.m.)	Ophiuroidea (brittle star)		0.9		Swartz et al. 1985a
-0.084	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.704+/-0.17 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
-2.0	SG	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
-0.1	NE	Stamford, CT	COA	96-h	Not toxic (10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
-2.3	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
	SG	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
-2.19	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
-5.95	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
	SG	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
-0.2	NE	Norwalk River, CT	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
-1.25	NE	Palos Verdes, CA	COA		High abundance (944+/-101 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
		PEL								
-11.4	*	Southern California	COA		Low abundance (35.3+/-15.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
-1.57	NC	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 3.79+/-3.29 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
-3.19	NE	Palos Verdes, CA	COA		High species richness (70.9+/-16.9 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
-3.64	NE	Palos Verdes, CA	COA		High species richness (80.8+/-13.7 S/0.1 sq.m.)	Macro benthos		2.10+/-1.15		Swartz et al. 1985a
-3.64	NE	Palos Verdes, CA	COA		High density (54.5+/-9.91 N/0.1 sq.m.)	Amphipod		2.1+/-1.15		Swartz et al. 1985a

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ummary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

m SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.64	NE	Palos Verdes, CA	COA		High density (34.3+/-5.67 N/0.1 sq.m.)	Phoxocephalid		2.1+/-1.15		Swartz et al. 1985a
.64	NE	Palos Verdes, CA	COA		High density (111+/-32 N/0.1 sq.m.)	Crustacea		2.1+/-1.15		Swartz et al. 1985a
2 2	•	Southern California	COA		Low species richness (51.2+/-8.6 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
	•	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	•	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
1 4	SG	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
	•	Laboratory	SSBA	72-h	Significantly toxic (98% avoidance)	Eohaustorius sencillus (amphipod)				Oakden et al. 1984b
	•	Laboratory	SSBA	72-h	Significantly toxic (70% avoidance)	Rhepoxynius spp.				Oakden et al. 1984a
	•	Laboratory	SSBA	72-h	Significantly toxic (40% mortality)	Rhepoxynius spp.				Oakden et al. 1984a
	•	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		15		Bellar et al. 1986
3.1	•	Southern California	COA		Low abundance (6.1+/-7.2 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
	•	Laboratory	SSBA	72-h	Significantly toxic (84% avoidance)	Rhepoxynius abronius (amphipod)				Oakden et al. 1984b
	•	Laboratory	SSBA	10-d	EC50; reburial	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1985c
	•	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
	•	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	15		Bellar et al. 1986
.2	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (11.9+/-5.36% mortality)	Rhepoxynius abronius (amphipod)	VAR			Ferraro et al. 1991
	•	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1985c
31	•	Palos Verdes, CA	COA		Low abundance (2.4+/-5.65 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
	•	United States	EqPA		EPA Chronic Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
	•	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
1	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.76+/-0.266 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
	•	Laboratory	SSBA	10-d	EC30; emergence	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1985b
	•	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	JUV			Robinson et al. 1988
04	•	Palos Verdes, CA	COA	.	Low abundance (415+/-94.4 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
	•	Laboratory	SSBA	72-h	LC98	Eohaustorius sencillus (amphipod)				Oakden et al. 1984b
	•	Laboratory	SSBA	72-h	Significantly toxic (94% avoidance)	Eohaustorius sencillus (amphipod)				Oakden et al. 1984b
	•	Laboratory	SSBA	72-h	LC76	Rhepoxynius abronius (amphipod)				Oakden et al. 1984b
38	•	Palos Verdes, CA	COA		Low abundance (13.8+/-11.4 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
38	•	Palos Verdes, CA	COA		Low abundance (5.87+/-7.06 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
	•	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)				Robinson et al. 1988
	NE	Palos Verdes, CA	COA		High density (2177 N/0.1 sq.m.)	Polychaeta		3.2		Swartz et al. 1985a
	•	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)				Kemp et al. 1986
24	NE	Palos Verdes, CA	COA		High density (594+/-688 N/0.1 sq.m.)	Mollusca		2.53+/-1.27		Swartz et al. 1985a
24	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (8+/-5.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.53+/-1.27		Swartz et al. 1985a
	•	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	•	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
	•	Laboratory	SSBA		LC50	Rhepoxynius abronius (amphipod)				Ott 1986
	•	Laboratory	SSBA	10-d	EC50; reburial	Rhepoxynius abronius (amphipod)				Mearns et al. 1986
3	NE	Southern California	COA		High abundance (88.9+/-35.4 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
	•	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	•	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
	•	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
	•	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		15		Bellar et al. 1986

A summary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

nium +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	15		Beller et al. 1986
	*	Laboratory	SSBA	10-d	EC50; emergence	Rhepoxynius abronius (amphipod)				Mearns et al. 1986
	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)				Mearns et al. 1986
	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)				Kemp et al. 1986
+/-10.2	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5+/-5.45% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.42+/-0.88		Swartz et al. 1986
	*	Laboratory	SSBA	446-d	Significantly toxic at 60-d	Pontoporeia affinis (amphipod)				Sundelin 1984
	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Robinson et al. 1988
+/-6.6	NE	Hudson-Raritan Bay, NY	COA	14-d	Not toxic (increased growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
+/-9.91	*	Palos Verdes, CA	COA		Low density (0.2+/-0.14 N/0.1 sq.m.)	Echinoderm		2.64+/-0.77		Swartz et al. 1986
+/-45.1	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
	*	Laboratory	SSBA	10-d	EC60; emergence	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1985b
+/-8.9	SG	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
+/-13.1	*	Palos Verdes, CA	COA		Low density (365+/-178 N/0.1 sq.m.)	Polychaeta		3.15+/-1.32		Swartz et al. 1985a
+/-6.11	*	Palos Verdes, CA	COA		Low density (5.3+/-3.7 N/0.1 sq.m.)	Amphipod		3.13+/-0.15		Swartz et al. 1986
+/-6.11	*	Palos Verdes, CA	COA		Low density (0.13+/-0.23 N/0.1 sq.m.)	Phoxocephalid		3.13+/-0.15		Swartz et al. 1986
+/-11.7	*	Palos Verdes, CA	COA		Low density (0.03+/-0.08 N/0.1 sq.m.)	Echinoderm		3.53+/-0.742		Swartz et al. 1985a
+/-11.7	*	Palos Verdes, CA	COA		Low density (0.233+/-0.367 N/0.1 sq.m.)	Foraminifera (sponge)		3.53+/-0.742		Swartz et al. 1985a
+/-11.7	*	Palos Verdes, CA	COA		Low density (0.3+/-0.8 N/0.1 sq.m.)	Ophiuroidea (brittle star)		3.53+/-0.742		Swartz et al. 1985a
	*	Laboratory	SSBA	4-d	EC50; reburial	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1985c
	NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Neanthes arenaceodentata (polychaete)				Salazar et al. 1980
-/-19.8	*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
-/-19.8	*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
	*	Palos Verdes, CA	COA		Low species richness (19.2 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
	*	Laboratory	SSBA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1985c
-/-4.16	*	Palos Verdes, CA	COA		Low species richness (26.0+/-11.5 S/0.1 sq.m.)	Macro benthos		3.95+/-0.238		Swartz et al. 1985a
/-4.16	*	Palos Verdes, CA	COA		Low density (1.0+/-1.2 N/0.1 sq.m.)	Amphipod		3.95+/-0.238		Swartz et al. 1985a
/-4.16	*	Palos Verdes, CA	COA		Low density (0 N/0.1 sq.m.)	Phoxocephalid		3.95+/-0.238		Swartz et al. 1985a
/-4.16	*	Palos Verdes, CA	COA		Low density (8.7+/-6.01 N/0.1 sq.m.)	Crustacea		3.95+/-0.238		Swartz et al. 1985a
/-8.25	*	Laboratory	SSBA	72-h	LC50	Rhepoxynius spp.				Oakden et al. 1984a
	NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)				Salazar et al. 1980
/-3.06	*	Palos Verdes, CA	COA		Low density (21.5+/-11.6 N/0.1 sq.m.)	Mollusca		4+/-0.265		Swartz et al. 1985a
/-3.06	*	Palos Verdes, CA	COA	10-d	Significantly toxic (21+/-6.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	4+/-0.265		Swartz et al. 1985a
	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Protothaca staminea (clam)				Salazar et al. 1980
	NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Citharichthys stigmaeus (sanddab)				Salazar et al. 1980
	NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)				Salazar et al. 1980
	NE	New York Harbor, NY	COA	100-d	Not toxic (<10% mortality)	Nereis virens (sandworm)	ADT			Rubinstein et al. 1983
	NE	New York Harbor, NY	COA	100-d	Not toxic (<10% mortality)	Mercenaria mercenaria (hard clam)	ADT			Rubinstein et al. 1983
	NE	New York Harbor, NY	COA	100-d	Not toxic (<10% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Rubinstein et al. 1983
	NE	Laboratory	SSBA	28-d	Not significantly toxic	Nereis virens (sandworm)				Olla et al. 1988
/-79.8	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985

ımary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b
•	Laboratory	SSBA	10-d	LC50	Rhepoxynius hudsoni (amphipod)	SUBADT		1.31+/-1.46	DiToro et al. 1990
•	Laboratory	SSBA	10-d	LC50	Ampelisca abdita (amphipod)	SUBADT		4.34+/-1.57	DiToro et al. 1990
•	Laboratory	SSBA	10-d	LC50	Ampelisca abdita (amphipod)	SUBADT			DiToro et al. 1990
•	Laboratory	SSBA	10-d	LC50	Ampelisca abdita (amphipod)	SUBADT		14.9+/-1.41	DiToro et al. 1990

A summary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

dium /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
-1.34	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
-1.34	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
-1.34	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
-1.82	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.704+/-0.17 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
-2.43	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
-2.12	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
-2.94	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
	SG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
-2.47	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
-5.03	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
	SG	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
3.54	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
8.94	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	SG	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 1.4 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
2.45	SG	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
2.30	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
2.30	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
2.30	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
2.49	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
2.49	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
2.49	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
3.27	SG	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
9.19	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
	NE	Massachusetts Bay, MA	COA		High density (24 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
10.6	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
3.7	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
4.61	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (11.3% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
9.7	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
9.7	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
9.7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
9.7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
14	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
11.5	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
12.3	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
5.11	SG	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep

mmary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
NE	Curtis Creek, Baltimore, MD	COA	20-d	Not significantly toxic (25.4+/-17.1% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
NE	Duwamish River, WA	COA	96-h	Not toxic (0-10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
SG	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crassostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b
NE	Massachusetts Bay, MA	COA		High density (299+/-40.3 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
SG	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
NE	Newport, RI	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (15+/-7.21% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
NE	Black Rock Beach, NS	COA	10-d	Not toxic (6.67+/-4.51% mortality)	Corophium volutator (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
NE	Black Rock Beach, NS	COA	10-d	Not toxic (2.33+/-1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
NE	Black Rock Beach, NS	COA	10-d	Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
SG	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
NE	Massachusetts Bay, MA	COA		High species richness (102+/-4.73 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
NG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992

A summary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

um -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
22.3	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
29.9	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
22.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
22.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
22.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
14.4	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (4% mortality)	Citharichthys stigmaeus (sanddab)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	10-d	Not significantly toxic (14% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (13% mortality)	Neanthes arenaceodentata (polycheate)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (1% mortality)	Macoma nasuta (clam)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (0% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (18% mortality)	Acartia tonsa (copepod)				Salazar & Salazar 1985
5.08	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
5.08	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
5.08	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
12	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		15		Bellar et al. 1986
40.1	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
40.1	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
40.1	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
40.1	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
7.68	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7+/-11.4% mortality)	Nereis virens (polychaete)	ADT			Parrish 1987a
7.68	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3+/-2.31% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987a
7.68	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14+/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987a
	NE	Massachusetts Bay, MA	COA		High density (4135 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
15.7	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)*	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
25.4	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
25.4	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
25.4	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
16	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
16	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
15.6	NE	Southern California	COA		High abundance (191+/-70.1 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
11.3	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
44.4	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
44.4	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
16.1	SG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
12.9	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
16.5	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
33.2	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
16.1	*	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (82.8+/-22.2% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
17.5	SG	Southern California	COA		Moderate abundance (56.2+/-23 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
17.1	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992

mary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
NC	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 3.79+/-3.29 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
*	Curtis Creek, Baltimore, MD	COA	20-d	Significantly toxic (94.6+/-9.35% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
·	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	15		Bellar et al. 1986
NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
NC	Southern California	COA		Moderate species richness (72+/-3.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
NE	Southern California	COA		High abundance (148+/-58 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
NE	Fraser River Estuary, BC	COA		Sediments populated by feral clams	Macoma balthica (bivalve)		0.45		McGreer 1982
NC	Southern California	COA		Moderate abundance (75.6+/-12.7 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
NE	Massachusetts Bay, MA	COA		High density (201+/-33.4 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
SG	Southern California	COA		Moderate abundance (72.6+/-6.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
SG	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
SG	Massachusetts Bay, MA	COA		Low density (1316+/-768 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
NE	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox (Photobacterium phosphoreum)		0.4		Chapman et al. 1991

\ summary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

m SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
18.3	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
12.9	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
3.05	NE	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.42+/-0.13		Chapman et al. 1991
2.56	NE	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	0.443+/-0.127		Chapman et al. 1991
2.42	NE	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	0.425+/-0.128		Chapman et al. 1991
		TEL								
2.36	NE	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynins abronius (amphipod)	ADT	0.45+/-0.058		Chapman et al. 1991
14.2	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
14.2	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
	*	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (55% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
33.5	NC	Southern California	COA		*Low abundance (57.6+/-13.6 N/0.1 sq.m.)*	*Benthic species*				Word & Mearns 1979
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
	SG	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
21	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
1.41	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
18.2	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
5.2	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
14.9	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
	NE	Palos Verdes, CA	COA		High abundance (208 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
29	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.76+/-0.266 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		15		Bellar et al. 1986
17.2	NC	Massachusetts Bay, MA	COA		Low density (7.14+/-4.23 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
5.2	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
	*	Strait of Georgia, BC	COA	48-h	Significant increase in burrowing time	Macoma balthica (bivalve)		1.13		McGreer 1979
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
26.1	*	Massachusetts Bay, MA	COA		Low density (2.76+/-2.7 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
27.3	SG	Massachusetts Bay, MA	COA		Low density (39.1+/-30.8 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
3.77	NE	Howe Sound, BC	COA	10-d	Not toxic (10.5+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
3.77	NE	Howe Sound, BC	COA	10-d	Not toxic (5.83+/-5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
3.77	NE	Howe Sound, BC	COA	10-d	Not toxic (96.3+/-4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
25.9	*	Massachusetts Bay, MA	COA		Low density (61.1+/-36.6 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
	NE	Palos Verdes, CA	COA		High density (4.4 N/0.1 sq.m.)	Echinoderm		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (88 N/0.1 sq.m.)	Foraminifera (sponge)		0.9		Swartz et al. 1985a
	NE	*Palos Verdes, CA*	*COA*		*High density (132 N/0.1 sq.m.)*	*Ophiuroidea (brittle star)*		0.9		Swartz et al. 1985a
139	NE	Southern California	COA		High species richness (96.3+/-22.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
25.7	*	Massachusetts Bay, MA	COA		Low species richness (57.2+/-12.2 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
53.7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
36.4	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
13.4	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
5.9	NE	Norwalk River, CT	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977

mmary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
NE	Gulf of Mexico	COA		Not toxic (3.21+/-0.239 diversity index)	Benthic species		0.464+/-0.143		Chapman et al. 1991
SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
NE	Gulf of Mexico	COA		Least toxic (6.32+/-3.68 TU/g)	Microtox (Photobacterium phosphoreum)		0.47+/-0.149		Chapman et al. 1991
NE	Massachusetts Bay, MA	COA		High density (22 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
NE	Gulf of Mexico	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.471+/-0.18		Chapman et al. 1991
*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
SG	Gulf of Mexico	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.5+/-0.155		Chapman et al. 1991
SG	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
NE	Stamford, CT	COA	96-h	Not toxic (10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
NG	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
*	Fraser River Estuary, BC	COA		Sediments devoid of feral clams	Macoma balthica (bivalve)		1.95		McGreer 1982
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
NE	Palos Verdes, CA	COA		High abundance (54.6+/-5.09 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
NE	Palos Verdes, CA	COA		High abundance (30.7+/-0.99 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
*	Strait of Georgia, BC	COA	24-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)		3.09		McGreer 1979
NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
NE	Palos Verdes, CA	COA		High density (93.4 N/0.1 sq.m.)	Echinoderm		1.3+/-0.77		Swartz et al. 1986
NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a

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A summary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

:um -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
23.6	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
52.3	SG	Gulf of Mexico	COA	48-h	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	LAR	0.5+/-0.18		Chapman et al. 1991
15.4	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
22.5	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
66.7	NC	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
31.1	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
32.8	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
21.8	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
33.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
96.4	SG	Long Island Sound,.NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
36.2	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
7.78	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
53.5	*	Gulf of Mexico	COA	48-h	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	LAR	0.567+/-0.153		Chapman et al. 1991
44.4	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
23.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
23.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
23.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c
27.1	SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
19.8	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
31.9	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
46.5	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
25	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
55.4	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
23.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
-24.3	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
-18.3	SG	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
-18.3	SG	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapmen et al. 1987a
	-	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	15		Bellar et al. 1986
	SG	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
-94.2	NC	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
-17.4	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
	SG	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a
-43.9	NE	Palos Verdes, CA	COA		High density (20.9+/-0.23 N/0.1 sq.m.)	Amphipod		1.7+/-0.61		Swartz et al. 1986
-43.9	NE	Palos Verdes, CA	COA		High density (11.2+/-1.64 N/0.1 sq.m.)	Phoxocephalid		1.7+/-0.61		Swartz et al. 1986
-86.5	NC	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
-11.9	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
-88.6	NE	Hudson-Raritan Bay, NY	COA	14-d	Not toxic (increased growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984

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nmary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
*	Southern California	COA		Low abundance (35.3+/-15.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
NC	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
NE	Palos Verdes, CA	COA		High species richness (80.8+/-13.7 S/0.1 sq.m.)	Macro benthos		2.10+/-1.15		Swartz et al. 1985a
NE	Palos Verdes, CA	COA		High density (54.5+/-9.91 N/0.1 sq.m.)	Amphipod		2.1+/-1.15		Swartz et al. 1985a
NE	Palos Verdes, CA	COA		High density (34.3+/-5.67 N/0.1 sq.m.)	Phoxocephalid		2.1+/-1.15		Swartz et al. 1985a
NE	Palos Verdes, CA	COA		High density (111+/-32 N/0.1 sq.m.)	Crustacea		2.1+/-1.15		Swartz et al. 1985a
*	Southern California	COA		Low species richness (51.2+/-8.6 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
NE	Palos Verdes, CA	COA		High species richness (70.9+/-16.9 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
*	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
	PEL								
NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
NC	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
NE	Palos Verdes, CA	COA		High abundance (944+/-101 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (11.9+/-5.36% mortality)	Rhepoxynius abronius (amphipod)	VAR			Ferraro et al. 1991
NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
SG	Palos Verdes, CA	COA		Low abundance (415+/-94.4 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
*	Southern California	COA		Low abundance (6.1+/-7.2 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
*	Palos Verdes, CA	COA		Low abundance (2.4+/-5.65 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
*	Palos Verdes, CA	COA		Low abundance (13.8+/-11.4 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
*	Palos Verdes, CA	COA		Low abundance (5.87+/-7.06 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
-	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
-	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
-	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)				Salazar et al. 1980
*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
NE	Southern California	COA		High abundance (88.9+/-35.4 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
NE	Palos Verdes, CA	COA		High density (594+/-688 N/0.1 sq.m.)	Mollusca		2.53+/-1.27		Swartz et al. 1985a
NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (8+/-5.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.53+/-1.27		Swartz et al. 1985a
NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Protothaca staminea (clam)				Salazar et al. 1980
NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Citharichthys stigmaeus (sanddab)				Salazar et al. 1980
NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Neanthes arenaceodentata (polychaete)				Salazar et al. 1980
NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)				Salazar et al. 1980
NE	Palos Verdes, CA	COA		High density (2177 N/0.1 sq.m.)	Polychaeta		3.2		Swartz et al. 1985a

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\ summary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

um -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
78.4	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	*Rhepoxynius abronius (amphipod)*	ADT	1.56+/-0.07	—	Word et al. 1988
	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
180	*NE*	*Baltimore Harbor, MD*	COA	48-h	Least toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
180	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Leiostomus xanthurus (spot)			—	Tsai et al. 1979
-226	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5+/-5.45% mortality).	Rhepoxynius abronius (amphipod)	ADT	2.42+/-0.88		Swartz et al. 1986
	*	Black Rock Harbor, CT	COA	14-d	Significantly toxic (100% mortality)	Nereis virens (sandworm)				Simmers et al. 1984
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	*Rhepoxynius abronius (amphipod)*	ADT	--	—	Long & Morgan 1990
-215	*	Palos Verdes, CA	COA	-	Low density (0.2+/-0.14 N/0.1 sq.m.)	Echinoderm		2.64+/-0.77	—	Swartz et al. 1986
	*	Palos Verdes, CA	COA		Low species richness (19.2 S/0.1 sq.m.)	Benthic species	VAR	...		Ferraro et al. 1991
-330	*SG*	Palos Verdes, CA	COA		Low density (365+/-178 N/0.1 sq.m.)	Polychaeta		3.15+/-1.32		Swartz et al. 1985a
-279	*	Palos Verdes, CA	COA		Low density (0.03+/-0.08 N/0.1 sq.m.)	Echinoderm		3.53+/-0.742		Swartz et al. 1985a
-279	*	Palos Verdes, CA	COA		Low density (0.233+/-0.367 N/0.1 sq.m.)	Foraminifera (sponge)		3.53+/-0.742		Swartz et al. 1985a
-279	*	Palos Verdes, CA	COA		Low density (0.3+/-0.8 N/0.1 sq.m.)	Ophiuroidea (brittle star)		3.53+/-0.742		Swartz et al. 1985a
-120	*	Palos Verdes, CA	COA		Low density (5.3+/-3.7 N/0.1 sq.m.)	Amphipod		3.13+/-0.15		Swartz et al. 1986
-120	*	Palos Verdes, CA	COA		Low density (0.13+/-0.23 N/0.1 sq.m.)	Phoxocephalid		3.13+/-0.15		Swartz et al. 1986
-173	*	Palos Verdes, CA	COA		Low density (21.5+/-11.6 N/0.1 sq.m.)	Mollusca		4+/-0.265		Swartz et al. 1985a
-173	*	Palos Verdes, CA	COA	10-d	Significantly toxic (21+/-6.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	4+/-0.265		Swartz et al. 1985a
-144	*	Palos Verdes, CA	COA		Low species richness (26.0+/-11.5 S/0.1 sq.m.)	Macro benthos		3.95+/-0.238		Swartz et al. 1985a
-144	*	Palos Verdes, CA	COA		Low density (1.0+/-1.2 N/0.1 sq.m.)	Amphipod		3.95+/-0.238		Swartz et al. 1985a
-144	*	Palos Verdes, CA	COA		Low density (0 N/0.1 sq.m.)	Phoxocephalid		3.95+/-0.238		Swartz et al. 1985a
-144	*	Palos Verdes, CA	COA		Low density (8.7+/-6.01 N/0.1 sq.m.)	Crustacea		3.95+/-0.238		Swartz et al. 1985a
	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
-1628	*	*Baltimore Harbor, MD*	COA	48-h	Most toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
-1628	*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979

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ımmary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

)	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Laboratory	SSBA		Not significantly toxic (ET50; initiation of burrowing 0.62 h)	Mya arenaria (clam)	17-25 mm			Phelps 1989
	NE	Laboratory	SSBA		Not significantly toxic (ET50; initiation of burrowing 0.34 h)	Mya arenaria (clam)	17-25 mm			Phelps 1989
	NE	Laboratory	SSBA		Not significantly toxic (ET50; initiation of burrowing 0.38 h)	Mya arenara (clam)	17-25 mm			Phelps 1989
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
'1	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
	NC	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
:2	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
'1	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
	NE	Savannah River Entrance Channel, GA	COA	48-h.	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
ı3	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
:3	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
ı3	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
!	*	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
ll	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Massachusetts Bay, MA	COA		High density (24 N/0.1 sq m.)	Echinodermata	VAR			Gilbert et al. 1976
l3	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
	NC	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 1.4 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
)	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.704+/-0.17 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
l	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
7	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.0% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
7	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
)	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
4	SG	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
5	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
5	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
3	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
5	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
2	NE	Massachusetts Bay, MA	COA		High density (299+/-40.3 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
4	NE	Massachusetts Bay, MA	COA		High species richness (102+/-4.73 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a

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\ summary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

r SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.91	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
.28	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
.51	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
.44	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
.44	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
.44	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
.44	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Massachusetts Bay, MA	COA		High density (4135 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
.63	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
.25	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
.66	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
.66	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
.01	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
.25	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
.669	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
.32	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
.32	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
.32	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
.00	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
.00	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.00	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.00	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.24	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
.24	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
.24	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
24	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
.287	NE	Laboratory	SSBA		Not toxic (mean ET50; burrowing time 0.47+/-0.156 h)	Protothaca staminea (littleneck clam)		0.09		Phelps et al. 1985
	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (11.3% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
03	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
3	NC	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
.42	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
42	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
.42	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
59	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
59	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
.93	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
.08	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
.16	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
76	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
.83	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
.81	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.81	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992

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ummary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

)	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5	NE	Laboratory	SSBA		Not toxic (mean ET50; burrowing time 0.48+/-0.261 h)	Protothaca staminea (littleneck clam)		0 09		Phelps et al. 1985
	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0 00203 sq.m.)	Copepoda		0 844+/-0.524	4.73+/-3.1	Carr 1992
	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1 59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3 17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3 25	Hall et al. 1992
	SG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5 2+/-2.6		Parrish 1988b
	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0 00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24 3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
	NE	Massachusetts Bay, MA	COA		High density (201+/-33.4 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8 8+/-7 12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0 626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4 42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
	NC	Galveston Bay, TX	COA		Low abundance (0 3+/-0 651 N/0 00203 sq.m.)	Amphipoda		0 859+/-0.487	7.67+/-8.12	Carr 1992
	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1 4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0 998+/-0 602	2.01+/-1.82	EMAP Louisiana Province 1991
8	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7 8+/-1 63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1 04	2.31+/-0.651	EMAP Louisiana Province 1991
9	NE	Laboratory	SSBA		Not toxic (mean ET50; burrowing time 0.72+/-0.214 h)	Protothaca staminea (littleneck clam)		0.09		Phelps et al. 1985
	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2 59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0 425	8.56+/-8.14	Carr 1992
	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0 00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3 89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3 6% mortality)	Amphipod	ADT	0 129+/-0.054		Crocker et al. 1991
	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0 00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al 1992

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A summary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

›er /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
-6 19	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
-7.12	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
-4 15	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
-6 23	*	Massachusetts Bay, MA	COA		Low density (1316+/-768 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
-4 35	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
-6.2	NE	Southern California	COA		High abundance (191+/-70.1 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
-7.61	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
7 53	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
	NE	Laboratory	SSBA		Not toxic (burial time; ET50 - 0.25 h)	Protothaca stamina (littleneck clam)	15-25 mm	0.09		Phelps et al. 1983
	NE	Laboratory	SSBA		Not toxic (reburial time; ET50 - 0.22 h)	Protothaca stamina (littleneck clam)	15-25 mm	0.09		Phelps et al. 1983
	NE	Laboratory	SSBA		Not toxic (burial; ET50 - 0.32 h)	Protothaca stamina (littleneck clam)	25-35 mm	0.09		Phelps et al. 1983
	NE	Laboratory	SSBA		Not toxic (reburial; ET50 - 0.4 h)	Protothaca stamina (littleneck clam)	25-35 mm	0.09		Phelps et al. 1983
0 7	NE	Newport, RI	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
3.85	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3.85	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
5 94	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
2 04	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
21.9	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
5.70	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
	NE	Laboratory	SSBA		Not significantly toxic (ET50; initiation of burrowing 0.4 h)	Mya arenaria (clam)	17-25 mm			Phelps 1989
1 50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
1.50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
1 50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
14.4	NC	Southern California	COA		Moderate abundance (56.2+/-23 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
3 54	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5 66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
3.83	*	Laboratory	SSBA		Toxic (mean ET50; burrowing time 15.5+/-15.8 h)	Protothaca staminea (littleneck clam)		0.09		Phelps et al. 1985
7 11	NC	Massachusetts Bay, MA	COA		Low density (7.14+/-4.23 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
4 93	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
3 05	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
5 85	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
5.87	*	Massachusetts Bay, MA	COA		Low density (2.76+/-2.7 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
1.78	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
5 8	*	Massachusetts Bay, MA	COA		Low density (61.1+/-36 6 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
5 98	SG	Massachusetts Bay, MA	COA		Low density (39.1+/-30.8 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992

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mary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
NE	Black Rock Beach, NS	COA	10-d	Not toxic (6.67+/-4.51% mortality)	Corophium volutator (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
NE	Black Rock Beach, NS	COA	10-d	Not toxic (2.33+/-1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
NE	Black Rock Beach, NS	COA	10-d	Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
•	Massachusetts Bay, MA	COA		Low species richness (57.2+/-12.2 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
NE	Laboratory	SSBA		Not toxic (burial time; ET50 - 0.24 h)	Protothaca staminea (littleneck clam)	15-25 mm	0.09		Phelps et al. 1983
NE	Laboratory	SSBA		Not toxic (reburial time; ET50 - 0.17 h)	Protothaca stamina (littleneck clam)	15-25 mm	0.09		Phelps et al. 1983
NE	Laboratory	SSBA		Not toxic (burial time; ET50 - 0.31 h)	Protothaca stamina (littleneck clam)	25-35 mm	0.09		Phelps et al. 1983
NE	Laboratory	SSBA		Not toxic (reburial; ET50 - 0.33 h)	Protothaca stamina (littleneck clam)	25-35 mm	0.09		Phelps et al. 1983
NC	Southern California	COA		Moderate species richness (72+/-3.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
NE	Curtis Creek, Baltimore, MD	COA	20-d	Not significantly toxic (25.4+/-17.1% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
NC	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 3.79+/-3.29 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
NC	Southern California	COA		Moderate abundance (72.6+/-6.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
NE	Massachusetts Bay, MA	COA		High density (22 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
NC	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
SG	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
NE	Southern California	COA		High abundance (148+/-58 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
•	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
•	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
•	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
NE	Laboratory	SSBA		Not toxic (burial time; ET50 - 0.32 h)	Protothaca staminea (littleneck clam)	15-25 mm	0.09		Phelps et al. 1983
NE	Laboratory	SSBA		Not toxic (reburial time; ET50 - 1.16 h)	Protothaca stamina (littleneck clam)	15-25 mm	0.09		Phelps et al. 1983
NE	Laboratory	SSBA		Not toxic (burial; ET50 - 0.4 h)	Protothaca stamina (littleneck clam)	25-35 mm	0.09		Phelps et al. 1983
NE	Laboratory	SSBA		Not toxic (reburial; ET50 - 3.2 h)	Protothaca stamina (littleneck clam)	25-35 mm	0.09		Phelps et al. 1983
NE	Palos Verdes, CA	COA		High abundance (208 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
	TEL								
NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
NE	Laboratory	SSBA	48-d	Not toxic (0% mortality)	Protothaca staminea (littleneck clam)	16-25 mm	0.09		Phelps et al. 1985
NE	Laboratory	SSBA	48-d	Not toxic (5% mortality)	Protothaca staminea (littleneck clam)	26-35 mm	0.09		Phelps et al. 1985
NC	Southern California	COA		Moderate abundance (75.6+/-12.7 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
NC	Southern California	COA		Low abundance (57.6+/-13.6 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991

A summary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

er '-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
22.4	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	*	Laboratory	SSBA		Toxic (reburial time; ET50 - 63.0 h)	Protothaca stamina (littleneck clam)	15-25 mm	0.09		Phelps et al. 1983
	*	Laboratory	SSBA		Toxic (reburial; ET50 - 69 h)	Protothaca stamina (littleneck clam)	25-35 mm	0.09		Phelps et al 1983
	NE	Laboratory	SSBA		Not toxic (burial time; ET50 - 1.85 h)	Protothaca stamina (littleneck clam)	15-25 mm	0.09		Phelps et al. 1983
	NE	Laboratory	SSBA		Not toxic (burial; ET50 - 1.46 h)	Protothaca stamina (littleneck clam)	25-35 mm	0.09		Phelps et al. 1983
15.7	NE	Fraser River Estuary, BC	COA		Sediments populated by feral clams	Macoma balthica (bivalve)		0.45		McGreer 1982
17	NE	Palos Verdes, CA	COA		High abundance (54.6+/-5.09 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
17	NE	Palos Verdes, CA	COA		High abundance (30.7+/-0.99 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
5.30	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
50.0	NE	Southern California	COA		High species richness (96.3+/-22.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
	*	Laboratory	SSBA		Toxic (burial time; ET50 - 25 h)	Protothaca stamina (littleneck clam)	15-25 mm	0.09		Phelps et al. 1983
	*	Laboratory	SSBA		Toxic (reburial time; ET50 - 97 h)	Protothaca stamina (littleneck clam)	15-25 mm	0.09		Phelps et al 1983
	*	Laboratory	SSBA		Toxic (burial; ET50 - 101 h)	Protothaca stamina (littleneck clam)	25-35 mm	0.09		Phelps et al 1983
	*	Laboratory	SSBA		Toxic (reburial; ET50 - 300 h)	Protothaca stamina (littleneck clam)	25-35 mm	0.09		Phelps et al. 1983
	*	United States	EqPA		EPA Chronic Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
6.8	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
0.2	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (15+/-7.21% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al 1993
0.8	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-1.32	Bricker et al 1993
7	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7+/-11.4% mortality)	Nereis virens (polychaete)	ADT			Parrish 1987a
7	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3+/-2.31% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987a
7	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14+/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987a
97	*	Laboratory	SSBA	48-d	Toxic (25% mortality)	Protothaca staminea (littleneck clam)	16-25 mm	0.09		Phelps et al. 1985
.97	*	Laboratory	SSBA	48-d	Toxic (15% mortality)	Protothaca staminea (littleneck clam)	26-35 mm	0.09		Phelps et al. 1985
5.2	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
2	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
7.3	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.76+/-0.266 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
8.0	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
24	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
0	NE	Duwamish River, WA	COA	96-h	Not toxic (0-10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
63	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
63	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
63	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c
	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al 1990
1.2	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
3.5	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
3.5	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
04	NC	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
	NE	Palos Verdes, CA	COA		High density (93.4 N/0.1 sq.m.)	Echinoderm		1.3+/-0.77		Swartz et al. 1986
7	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
5.9	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990

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mary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
*	Laboratory	SSBA		Significantly toxic (ET50; initiation of burrowing 1.21 h)	Mya arenaria (clam)	17-25 mm			Phelps 1989
NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
NE	Palos Verdes, CA	COA		High density (4.4 N/0.1 sq.m.)	Echinoderm.		0.9		Swartz et al. 1985a
NE	Palos Verdes, CA	COA		High density (88 N/0.1 sq.m.)	Foraminifera (sponge)		0.9		Swartz et al. 1985a
NE	Palos Verdes, CA	COA		High density (132 N/0.1 sq.m.)	Ophiuroidea (brittle star)		0.9		Swartz et al. 1985a
NC	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
NE	Palos Verdes, CA	COA		High density (20.9+/-0.23 N/0.1 sq.m.)	Amphipod		1.7+/-0.61		Swartz et al. 1986
NE	Palos Verdes, CA	COA		High density (11.2+/-1.64 N/0.1 sq.m.)	Phoxocephalid		1.7+/-0.61		Swartz et al. 1986
NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b
NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
*	Strait of Georgia, BC	COA	48-h	Significant increase in burrowing time	Macoma balthica (bivalve)		1.13		McGreer 1979
NE	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota				USACOE 1988
*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
*	Southern California	COA		Low abundance (35.3+/-15.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
*	Southern California	COA		Low species richness (51.2+/-8.6 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
NE	Howe Sound, BC	COA	10-d	Not toxic (10.5+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991

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\ summary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

:r -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
78.4	NE	Howe Sound, BC	COA	10-d	Not toxic (5.83+/-5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
78.4	NE	Howe Sound, BC	COA	10-d	Not toxic (96.3+/-4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
43.3	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
36.2	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
32.6	NE	Palos Verdes, CA	COA		High species richness (70.9+/-16.9 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
50.8	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
32.8	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
34.5	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
34.5	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
22	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
103	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
36.1	SG	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
52.5	*	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
76.3	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
24.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
59.2	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
1	NE	Palos Verdes, CA	COA		High abundance (944+/-101 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
21.8	NG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
27.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
15.6	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
13.4	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
15.9	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
15.9	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
70.1	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
15.5	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
36.5	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
78.2	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
78.8	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
177	*	Southern California	COA		Low abundance (6.1+/-7.2 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
20.9	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
71.4	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (11.9+/-5.36% mortality)	Rhepoxynius abronius (amphipod)	VAR			Ferraro et al. 1991
	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
31	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
31	SG	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
52.1	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
53.2	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
58.9	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
93.5	SG	Palos Verdes, CA	COA		Low abundance (415+/-94.4 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
76	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993

mmary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
	PEL								
*	Palos Verdes, CA	COA		Low abundance (2.4+/-5.65 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
*	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a
*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
*	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
*	Palos Verdes, CA	COA		Low abundance (13.8+/-11.4 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
*	Palos Verdes, CA	COA		Low abundance (5.87+/-7.06 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
*	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (82.8+/-22.2% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
*	Burrard Inlet, BC	COA	*10-d*	*Highly toxic (23% emergence)*	*Corophium volutator (amphipod)*	ADT	3.5		McLeay et al. 1991
*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
*	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
*	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
NE	Miami River, FL	COA	10-d	Not toxic (18.6+/-7.27% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			ERCO 1985
NE	Miami River, FL	COA	10-d	Not toxic (1 2+/-0.837% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			ERCO 1985
NE	Miami River, FL	COA	10-d	Not toxic (3.6+/-1.67% mortality)	Nereis virens (sandworm)	ADT			ERCO 1985
SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
*	Fraser River Estuary, BC	COA		Sediments devoid of feral clams	Macoma balthica (bivalve)		1.95		McGreer 1982
NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
NE	Southern California	COA		High abundance (88 9+/-35.4 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
*	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	Palaemonetes pugio (shrimp)				Lee & Manani 1977
NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
*	Strait of Georgia, BC	COA	24-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)		3.09		McGreer 1979
SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
NE	Palos Verdes, CA	COA		High species richness (80.8+/-13.7 S/0.1 sq.m.)	Macro benthos		2.10+/-1.15		Swartz et al. 1985a
NE	Palos Verdes, CA	COA		High density (54.5+/-9.91 N/0.1 sq.m.)	Amphipod		2.1+/-1.15		Swartz et al. 1985a
NE	Palos Verdes, CA	COA		High density (34.3+/-5.67 N/0.1 sq.m.)	Phoxocephalid		2.1+/-1.15		Swartz et al. 1985a
NE	Palos Verdes, CA	COA		High density (111+/-32 N/0.1 sq.m.)	Crustacea		2.1+/-1.15		Swartz et al. 1985a
SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
*	Curtis Creek, Baltimore, MD	COA	20-d	Significantly toxic (94.6+/-9.35% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
NE	*Baltimore Harbor, MD*	*COA*	*48-h*	*Least toxic; TLm*	*Fundulus heteroclitus (mummichog)*				Tsai et al. 1979
NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5+/-5.45% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.42+/-0.88		Swartz et al. 1986

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\ summary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

·r -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
39.4	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
222	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
173	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
38 2	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
120	*	Palos Verdes, CA	COA		Low density (0.2+/-0.14 N/0.1 sq.m.)	Echinoderm		2.64+/-0.77		Swartz et al. 1986
122	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
185	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
238	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
163	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
232	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (4% mortality)	Citharichthys stigmaeus (sanddab)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	10-d	Not significantly toxic (14% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (13% mortality)	Neanthes arenaceodentata (polycheate)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (1% mortality)	Macoma nasuta (clam)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (0% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (18% mortality)	Acartia tonsa (copepod)				Salazar & Salazar 1985
13.6	NE	Stamford, CT	COA	96-h	Not toxic (10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
267	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
i	NE	Norwalk River, CT	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
227	NE	Palos Verdes, CA	COA		High density (594+/-688 N/0.1 sq.m.)	Mollusca		2.53+/-1.27		Swartz et al. 1985a
227	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (8+/-5.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.53+/-1.27		Swartz et al. 1985a
132	NE	Hudson-Raritan Bay, NY	COA	14-d	Not toxic (increased growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
	*	Palos Verdes, CA	COA		Low species richness (19.2 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
127	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
50.4	*	Palos Verdes, CA	COA		Low density (5.3+/-3.7 N/0.1 sq.m)	Amphipod		3.13+/-0.15		Swartz et al. 1986
50.4	*	Palos Verdes, CA	COA		Low density (0.13+/-0.23 N/0.1 sq.m.)	Phoxocephalid		3.13+/-0.15		Swartz et al. 1986
	NE	Palos Verdes, CA	COA		High density (2177 N/0.1 sq.m.)	Polychaeta		3.2		Swartz et al. 1985a
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		15		Bellar et al. 1986
	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
	NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)				Salazar et al. 1980
344	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
	*	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (55% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		15		Bellar et al. 1986
	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	15		Bellar et al. 1986
	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
274	*	Palos Verdes, CA	COA		Low density (365+/-178 N/0.1 sq.m.)	Polychaeta		3.15+/-1.32		Swartz et al. 1985a
311	SG	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
222	*	Palos Verdes, CA	COA		Low density (0.03+/-0.08 N/0.1 sq.m)	Echinoderm		3.53+/-0.742		Swartz et al. 1985a

mary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
*	Palos Verdes, CA	COA		Low density (0.233+/-0.367 N/0.1 sq.m.)	Foraminifera (sponge)		3.53+/-0.742		Swartz et al. 1985a
*	Palos Verdes, CA	COA		Low density (0.3+/-0.8 N/0.1 sq.m.)	Ophiuroidea (brittle star)		3.53+/-0.742		Swartz et al. 1985a
*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
*	Palos Verdes, CA	COA		Low species richness (26.0+/-11.5 S/0.1 sq.m.)	Macro benthos		3.95+/-0.238		Swartz et al. 1985a
*	Palos Verdes, CA	COA		Low density (1.0+/-1.2 N/0.1 sq.m.)	Amphipod		3.95+/-0.238		Swartz et al. 1985a
*	Palos Verdes, CA	COA		Low density (0 N/0.1 sq.m.)	Phoxocephalid		3.95+/-0.238		Swartz et al. 1985a
*	Palos Verdes, CA	COA		Low density (8.7+/-6.01 N/0.1 sq.m.)	Crustacea		3.95+/-0.238		Swartz et al. 1985a
*	Palos Verdes, CA	COA		Low density (21.5+/-11.6 N/0.1 sq.m.)	Mollusca		4+/-0.265		Swartz et al. 1985a
*	Palos Verdes, CA	COA	10-d	Significantly toxic (21+/-6.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	4+/-0.265		Swartz et al. 1985a
*	Black Rock Harbor, CT	COA	14-d	Significantly toxic (100% mortality)	Nereis virens (sandworm)				Simmers et al. 1984
*	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
*	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	15		Bellar et al. 1986
*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Protothaca staminea (clam)				Salazar et al. 1980
NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Citharichthys stigmaeus (sanddab)				Salazar et al. 1980
NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Neanthes arenaceodentata (polychaete)				Salazar et al. 1980
NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)				Salazar et al. 1980
*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985

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summary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
.283	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
	NE	Newport, RI	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
.727	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
	NC	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
	NC	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
	NC	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
.81	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
.81	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
.81	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
.36	NC	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
.68	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
.778	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
03	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
.76	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
.66	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
737	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
.737	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
737	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
.24	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
79	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.704+/-0.17 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
26	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
	NE	Massachusetts Bay, MA	COA		High density (24 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
	SG	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 1.4 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
.37	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
.53	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
.28	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
.65	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
.00	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
.00	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.00	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992

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ımary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
SG	Savannah River Entrance Channel, GA	COA	10-d	*Significantly toxic (28.3+/-6.11% mortality)*	Mysidopsis bahia (mysid)		0 246+/-0.051	127+/-24 ug/g	Windom In Prep
NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0 344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6 73+/-2.04		Parrish 1987b
NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0 00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
NE	Massachusetts Bay, MA	COA		High density *(299+/-40.3 N/0.1 sq.m.)*	*Arthropoda*	VAR			Gilbert et al. 1976
NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq m.)	Benthic species		0 642+/-0.356	13.4+/-8.65	Carr 1992
NC	Southern California	COA		Moderate abundance (56.2+/-23 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
*	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
NE	Massachusetts Bay, MA	COA		High species richness (102+/-4.73 S/0.1 sq.m.)	*Benthic species*	VAR			Gilbert et al. 1976
NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0 349+/-0.11	1.07+/-0.66	Hall et al. 1992
NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0 47	1.5+/-1.13	Hall et al. 1992
NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0 56+/-0 47	1.5+/-1.13	Hall et al. 1992
NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
NC	Southern California	COA		Moderate species richness (72+/-3.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
NE	Southern California	COA		High abundance (191+/-70.1 N/0.1 sq.m.)	*Echinoderm*				Word & Mearns 1979
NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0 859+/-0.487	7.67+/-8.12	Carr 1992
NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0 624+/-0 197	2.07+/-1.19	EMAP Louisiana Province 1991
*	*Galveston Bay, TX*	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (11.3% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0 622	2.31+/-2.04	Hall et al. 1992
NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		*0.553+/-0.622*	*2.31+/-2.04*	*Hall et al. 1992*
NE	Southern California	COA		High abundance (148+/-58 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
NC	Southern California	COA		Moderate abundance (72.6+/-6.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
NC	Southern California	COA		Moderate abundance (75.6+/-12.7 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979

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5. A summary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ead c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-12.4	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
+/-3.66	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
+/-9.65	NC	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
+/-7.33	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
+/-7.33	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
+/-9.38	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-9.38	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-9.38	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-9.38	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-6.65	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
+/-6.65	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
+/-6.65	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
+/-10.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
+/-10.5	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
+/-8.13	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
+/-8.55	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
	NE	Massachusetts Bay, MA	COA		High density (4135 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
+/-9	NE	Fraser River Estuary, BC	COA		Sediments populated by feral clams	Macoma balthica (bivalve)		0.45		McGreer 1982
+/-13.4	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
+/-13.4	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
+/-13.4	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
+/-22.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
+/-22.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
+/-22.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
+/-12.7	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
+/-26.7	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
+/-7.96	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
+/-7.07	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-7.07	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-7.07	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-7.07	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-4.36	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
+/-4.36	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
+/-4.36	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
+/-10.3	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
+/-0.849	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
+/-19.1	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
+/-23.7	NC	Southern California	COA		Low abundance (57.6+/-13.6 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
+/-7.11	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
+/-26.3	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
+/-26.8	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
+/-26.8	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
+/-6.56	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991

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ummary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

)	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
5	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3 86		Parrish 1990
5	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7 31+/-3 86		Parrish 1990
9	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
9	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1 19+/-1 04	7864+/-11973 ug/g	Windom In Prep
9	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
8	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
9	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1 22+/-1.13	9172+/-13363 ug/g	Windom In Prep
9	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0 657	0.457+/-0.530	EMAP Louisiana Province 1991
2	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
9	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
9	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
7	NC	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 3.79+/-3.29 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
5	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0 129+/-0 054		Crocker et al. 1991
8	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0 895+/-0.453	7.85+/-8.8	Carr 1992
4	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq m.)	Polychaeta		0 848+/-0.427	9.21+/-8.61	Carr 1992
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1 71	6562 ug/g	Windom In Prep
15	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1 3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
:	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
6	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
6	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
6	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
.6	NE	Southern California	COA		High species richness (96.3+/-22.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
	NE	Palos Verdes, CA	COA		High abundance (208 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1 8	7095 ug/g	Windom In Prep
8	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
	NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1 25		Chapman et al. 1987a
2	NE	Curtis Creek, Baltimore, MD	COA	20-d	Not significantly toxic (25.4+/-17.1% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
1	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0 137+/-0 056		Crocker et al. 1991
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0 185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0 185	6.41	Hall et al. 1992
46	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1 99+/-0.562	14009+/-13434 ug/g	Windom In Prep
16	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
9.2	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0 383+/-0.279	3.61+/-2.79	Hall et al. 1992
26	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1 24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
1.5	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
7.4	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
3.6	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
0.7	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0 778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
49	NE	Palos Verdes, CA	COA		High abundance (54.6+/-5.09 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991

5. A summary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ead :.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-8.49	NE	Palos Verdes, CA	COA		High abundance (30.7+/-0.99 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
+/-13.2	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
+/-22.9	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
+/-22.9	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
+/-22.9	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
+/-14.6	NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
+/-5.79	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
	NE	Palos Verdes, CA	COA		High density (4.4 N/0.1 sq.m.)	Echinoderm		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (88 N/0.1 sq.m.)	Foraminifera (sponge)		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (132 N/0.1 sq.m.)	Ophiuroidea (brittle star)		0.9		Swartz et al. 1985a
+/-1.7	NE	Duwamish River, WA	COA	96-h	Not toxic (0-10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
+/-24	*	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
+/-5.12	NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
+/-9.55	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
+/-10.1	NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
		TEL								
+/-15.2	NE	Massachusetts Bay, MA	COA		High density (201+/-33.4 N/0.1 sq m.)	Mollusca	VAR			Gilbert et al. 1976
+/-2.83	SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
	*	Strait of Georgia, BC	COA	48-h	Significant increase in burrowing time	Macoma balthica (bivalve)		1.13		McGreer 1979
	*	United States	EqPA		EPA Chronic Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
	NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
	NE	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota				USACOE 1988
-/-8.18	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
-/-11.3	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
/-21.1	NE	Howe Sound, BC	COA	10-d	Not toxic (10.5+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
-/-21.1	NE	Howe Sound, BC	COA	10-d	Not toxic (5.83+/-5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
-/-21.1	NE	Howe Sound, BC	COA	10-d	Not toxic (96.3+/-4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
-/-34	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
-/-10.3	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
-/-31.7	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
-/-26.4	NC	Massachusetts Bay, MA	COA		Low density (7.14+/-4.23 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
-/-7.24	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
-/-8.72	NE	Palos Verdes, CA	COA		High density (20.9+/-0.23 N/0.1 sq.m.)	Amphipod		1.7+/-0.61		Swartz et al. 1986
/-8.72	NE	Palos Verdes, CA	COA		High density (11.2+/-1.64 N/0.1 sq.m.)	Phoxocephalid		1.7+/-0.61		Swartz et al. 1986

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. summary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
5 5	*	Massachusetts Bay, MA	COA		Low density (1316+/-768 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
3	*	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
5 9	*	Massachusetts Bay, MA	COA		Low density (2 76+/-2.7 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
0 9	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
6 9	SG	Massachusetts Bay, MA	COA		Low density (39.1+/-30.8 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
6 5	*	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
5 7	*	Massachusetts Bay, MA	COA		Low density (61.1+/-36.6 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
5 7	*	Massachusetts Bay, MA	COA		Low species richness (57.2+/-12.2 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
3 4	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
9 8	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
9 0	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
7 8	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
	NE	Palos Verdes, CA	COA		High density (93 4 N/0.1 sq m.)	Echinoderm		1.3+/-0.77		Swartz et al. 1986
03	*	Southern California	COA		Low abundance (35 3+/-15.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
4 6	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
4 6	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
4 5	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
0 6	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
5	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
	*	San Francisco Bay, CA	SQAV	SQTA	Significantly Toxic Triad Minimum Bioeffects	Benthic species				Chapman et al. 1987b
11	*	Southern California	COA		Low species richness (51.2+/-8.6 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
4	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
8 3	NE	Palos Verdes, CA	COA		High species richness (70.9+/-16.9 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
	NE	Massachusetts Bay, MA	COA		High density (22 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
1 7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
5 5	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
46	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.76+/-0.266 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
3 7	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
.53	NE	Palos Verdes, CA	COA		High abundance (944+/-101 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
	SG	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	SG	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
0.9	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
3 4	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
8	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
5.2	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
2 8	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
2 8	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
5 6	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
0 8	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (15+/-7.21% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
1 7	NE	Black Rock Beach, NS	COA	10-d	Not toxic (6.67+/-4.51% mortality)	Corophium volutator (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
1 7	NE	Black Rock Beach, NS	COA	10-d	Not toxic (2 33+/-1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
1.7	NE	Black Rock Beach, NS	COA	10-d	Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990

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i. A summary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

:ad .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-60.5	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
+/-36.6	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (11.9+/-5.36% mortality)	Rhepoxynius abronius (amphipod)	VAR			Ferraro et al. 1991
+/-46.6	SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
+/-63.0	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-118.0	*	Southern California	COA		Low abundance (6.1+/-7.2 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
+/-14.5	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
+/-40.6	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
+/-44.6	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
+/-48.0	SG	Palos Verdes, CA	COA		Low abundance (415+/-94.4 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
+/-13	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
+/-14.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
+/-34.9	*	Palos Verdes, CA	COA		Low abundance (2.4+/-5.65 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
+/-57	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
+/-22.4	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
+/-53.7	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
+/-18.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
-/-42.4	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
/-42.5	SG	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
-/-34.2	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
-/-102	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
	*	Strait of Georgia, BC	COA	24-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)		3.09		McGreer 1979
/-16.1	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
/-33.9	*	Palos Verdes, CA	COA		Low abundance (13.8+/-11.4 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
/-33.9	*	Palos Verdes, CA	COA		Low abundance (5.87+/-7.06 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
/-75.4	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
/-64.1	NE	Palos Verdes, CA	COA		High species richness (80.8+/-13.7 S/0.1 sq.m.)	Macro benthos		2.10+/-1.15		Swartz et al. 1985a
/-64.1	NE	Palos Verdes, CA	COA		High density (54.5+/-9.91 N/0.1 sq.m.)	Amphipod		2.1+/-1.15		Swartz et al. 1985a
/-64.1	NE	Palos Verdes, CA	COA		High density (34.3+/-5.67 N/0.1 sq.m.)	Phoxocephalid		2.1+/-1.15		Swartz et al. 1985a
/-64.1	NE	Palos Verdes, CA	COA		High density (111+/-32 N/0.1 sq.m.)	Crustacea		2.1+/-1.15		Swartz et al. 1985a
/-32.8	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
/-39.6	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
-/-49.3	*	Fraser River Estuary, BC	COA		Sediments devoid of feral clams	Macoma balthica (bivalve)		1.95		McGreer 1982
/-52.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
/-88.6	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
/-34.9	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
/-53.9	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
/-43.6	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
	*	Black Rock Harbor, CT	COA	14-d	Significantly toxic (100% mortality)	Nereis virens (sandworm)				Simmers et al. 1984
/-78.4	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
/-42.5	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
/-154	NE	Southern California	COA		High abundance (88.9+/-35.4 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979

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, summary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
[illegible]	*	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
13.7	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3+/-1.51% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			Vittor & Associates 1988
13.7	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (7.7+/-3.02% mortality)	Nereis virens (sandworm)	ADT			Vittor & Associates 1988
12.6	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
12.3	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7+/-11.4% mortality)	Nereis virens (polychaete)	ADT			Parrish 1987a
12.3	NE	Bayou La Batre, AB	COA	10-d	*Not significantly toxic (5.3+/-2.31% mortality)*	Crossostrea virginica (oyster)	ADT			Parrish 1987a
12.3	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14+/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987a
37.9	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5+/-5.45% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.42+/-0.88		Swartz et al. 1986
173	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
36.9	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
104	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
52	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
52.4	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
70	*	Palos Verdes, CA	COA		Low density (0.2+/-0.14 N/0.1 sq.m.)	Echinoderm		2.64+/-0.77		Swartz et al. 1986
		PEL								
123	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
53.2	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
56.9	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
140	NE	Tampa Bay, FL	*COA*	*48-h*	*Not significantly toxic (38.5+/-2.9% mortality)*	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
102	NE	Palos Verdes, CA	COA		High density (594+/-688 N/0.1 sq.m.)	Mollusca		2.53+/-1.27		Swartz et al. 1985a
102	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (8+/-5.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.53+/-1.27		Swartz et al. 1985a
13.8	NE	Stamford, CT	COA	96-h	Not toxic (10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
98.9	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
98.9	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
-74.7	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	*Corophium volutator (amphipod)*	*ADT*	2.8+/-1.96		McLeay et al. 1991
-74.7	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
-97.1	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
-56.2	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
-87.8	*	San Francisco Bay, CA	*COA*	*48-h*	*Highly toxic (92.3+/-5.5% mortality)*	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
-87.8	*	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
-55.3	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
	*	San Francisco Bay, CA	SQAV	SQTA	Significantly Toxic Triad Significant Bioeffects	Benthic species				Chapman et al. 1987b
-102	*	Miami River Seybold Canal, FL	COA	10-d	Significantly toxic (24.7+/-15% mortality)	Penaeus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
-155	NC	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
-80.4	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
-124	*	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (82.8+/-22.2% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
-183	NC	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			*Long & Morgan 1990*
-158	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
	*	Palos Verdes, CA	COA		Low species richness (19.2 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991

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A summary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

id +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-132	NE	Hudson-Raritan Bay, NY	COA	14-d	Not toxic (increased growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
/-165	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
/-44.5	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50, 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
	NE	Palos Verdes, CA	COA		High density (2177 N/0.1 sq.m.)	Polychaeta		3.2		Swartz et al. 1985a
/-187	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
/-177	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
/-28.8	*	Palos Verdes, CA	COA		Low density (5.3+/-3.7 N/0.1 sq.m.)	Amphipod		3.13+/-0.15		Swartz et al. 1986
/-28.8	*	Palos Verdes, CA	COA		Low density (0.13+/-0.23 N/0.1 sq.m.)	Phoxocephalid		3.13+/-0.15		Swartz et al. 1986
/-122	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
/-172	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50, 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
/-43.2	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
	*	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a
/-102	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
/-102	NE	*Pascagoula Mississippi Channel, MS*	*COA*	*10-d*	*Not significantly toxic (6.5+/-5.14% mortality)*	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
/-102	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c
/-192	*	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
/-125	*	Curtis Creek, Baltimore, MD	COA	20-d	Significantly toxic (94.6+/-9.35% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
/-120	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
/-116	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
/-135	SG	Palos Verdes, CA	COA		Low density (365+/-178 N/0.1 sq.m.)	Polychaeta		3.15+/-1.32		Swartz et al. 1985a
/-131	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
/-131	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
	*	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
	*	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
/-83.1	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
/-108	*	Palos Verdes, CA	COA		Low density (0.03+/-0.08 N/0.1 sq.m.)	Echinoderm		3.53+/-0.742		Swartz et al. 1985a
/-108	*	Palos Verdes, CA	COA		Low density (0.233+/-0.367 N/0.1 sq.m.)	Foraminifera (sponge)		3.53+/-0.742		Swartz et al. 1985a
/-108	*	Palos Verdes, CA	COA		Low density (0.3+/-0.8 N/0.1 sq.m.)	Ophiuroidea (brittle star)		3.53+/-0.742		Swartz et al. 1985a
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
-/-11	NE	Norwalk River, CT	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
-/-35.6	*	Palos Verdes, CA	COA		Low species richness (26.0+/-11.5 S/0.1 sq.m.)	*Macro benthos*		3.95+/-0.238		Swartz et al. 1985a
-/-35.6	*	Palos Verdes, CA	COA		Low density (1.0+/-1.2 N/0.1 sq.m.)	Amphipod		3.95+/-0.238		Swartz et al. 1985a
-/-35.6	*	Palos Verdes, CA	COA		Low density (0 N/0.1 sq.m.)	Phoxocephalid		3.95+/-0.238		Swartz et al. 1985a
-/-35.6	*	Palos Verdes, CA	COA		Low density (8.7+/-6.01 N/0.1 sq.m.)	Crustacea		3.95+/-0.238		Swartz et al. 1985a
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		15		Bellar et al. 1986
+/-23.2	*	Palos Verdes, CA	COA		Low density (21.5+/-11.6 N/0.1 sq.m.)	Mollusca		4+/-0.265		Swartz et al. 1985a
+/-23.2	*	*Palos Verdes, CA*	COA	*10-d*	*Significantly toxic (21+/-6.3% mortality)*	Rhepoxynius abronius (amphipod)	ADT	4+/-0.265		Swartz et al. 1985a
	*	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (55% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
+/-195	*	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984

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A summary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

‡ -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	.	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	.	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
-270	•	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0 208		Pastorok & Becker 1990
	•	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	•	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
-231	•	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
-231	•	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
	•	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	•	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		15		Bellar et al. 1986
-637	NE	Miami River, FL	COA	10-d	Not toxic (18.6+/-7.27% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			ERCO 1985
-637	NE	Miami River, FL	COA	10-d	Not toxic (1.2+/-0.837% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			ERCO 1985
-637	NE	Miami River, FL	COA	10-d	Not toxic (3.6+/-1.67% mortality)	Nereis virens (sandworm)	ADT			ERCO 1985
-1489	•	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
	•	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
	•	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
	•	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
	•	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	15		Bellar et al. 1986
	•	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	15		Bellar et al. 1986
	•	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
-2628	•	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985

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A summary of the available data on the biological effects associated with sediment-sorbed MERCURY (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

rcury .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
3	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
3	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
3	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
3	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
5	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
5	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
5	NE	Massachusetts Bay, MA	COA		High density (24 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
5 +/-0.003	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
5 +/-0.004	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
7 +/-0.006	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
7 +/-0.008	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
8 +/-0.008	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
8 +/-0.008	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
8 +/-0.009	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
9 +/-0.009	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
	*	United States	EqPA		EPA Chronic Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
+/-0.004	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
+/-0.01	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0.01	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0.01	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0.01	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0.01	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
+/-0.05	NE	Fraser River Estuary, BC	COA		Sediments populated by feral clams	Macoma balthica (bivalve)		0.45		McGreer 1982
+/-0.009	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0.009	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0.009	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0.009	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0.014	*	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	SG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	SG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
2 +/-0.004	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
2 +/-0.009	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
2 +/-0.009	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
3 +/-0.01	SG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
4 +/-0.012	NE	Massachusetts Bay, MA	COA		High density (299+/-40.3 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
5 +/-0.011	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
5 +/-0.011	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
5 +/-0.009	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992

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summary of the available data on the biological effects associated with sediment-sorbed MERCURY (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

y SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.013	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
-0.014	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
-0.016	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	*Lepidactylus dytiscus (amphipod)*		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
-0.017	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
-0.014	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
-0.014	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
-0.014	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
-0.014	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
-0.016	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
-0.016	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
-0.016	NE	Chesapeake Bay, VA, MD	COA	20-d	*Not toxic (<20% emergence)*	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
-0.016	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
-0.014	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	SG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		*0.185*	*5.58*	*Hall et al. 1992*
	SG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
	NE	*Halifax Harbour, NS*	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	NG	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		*Low diversity (1.16; SDUs)*	*Benthic species*				Winn et al. 1989
-0.011	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
-0.011	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
-0.011	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
-0.02[illegible]	NE	Massachusetts Bay, MA	COA		High species richness (102+/-4.73 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
	NE	Newport, RI	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				*Lee & Mariani 1977*
/-0.008	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
/-0.01	NE	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.42+/-0.13		Chapman et al. 1991
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	*	*Brunswick Harbor Entrance, GA*	COA	96-h	*Toxic (16% mortality)*	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
/-0.019	NE	Gulf of Mexico	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.471+/-0.18		Chapman et al. 1991
/-0.031	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
/-0.031	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
/-0.031	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
/-0.031	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		*2.83+/-0.459*	*16.3+/-9.58*	*Ward et al. 1992*
/-0.029	NE	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	0.425+/-0.128		Chapman et al. 1991
	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984

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t 6. A summary of the available data on the biological effects associated with sediment-sorbed MERCURY (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Mercury Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
05	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
05	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
.05	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
.05	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
.05	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
05	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
.05	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
05	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
.05	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
05	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
.05	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
.05	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
.05	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
05	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
.05	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
.05	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
.05	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (11.3% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
05	NE	Curtis Creek, Baltimore, MD	COA	20-d	Not significantly toxic (25.4+/-17.1% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
.05	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
05	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
05	NG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
05	NG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
05 +/-0.06	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
05 +/-0.06	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
05 +/-0.06	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
51 +/-0.027	NE	Gulf of Mexico	COA		Least toxic (6.32+/-3.68 TU/g)	Microtox (Photobacterium phosphoreum)		0.47+/-0.149		Chapman et al. 1991
52 +/-0.029	NE	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	0.443+/-0.127		Chapman et al. 1991
53 +/-0.039	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
57	NE	Massachusetts Bay, MA	COA		High density (4135 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
57 +/-0.026	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
59 +/-0.038	NE	Gulf of Mexico	COA		Not toxic (3.21+/-0.239 diversity index)	Benthic species		0.464+/-0.143		Chapman et al. 1991
06 +/-0.05	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
63 +/-0.046	SG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
64 +/-0.047	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
64 +/-0.047	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
66 +/-0.054	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
67 +/-0.051	SG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
67 +/-0.051	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
71 +/-0.054	SG	Gulf of Mexico	COA	48-h	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	LAR	0.5+/-0.18		Chapman et al. 1991
72 +/-0.204	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
76 +/-0.046	SG	Gulf of Mexico	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.5+/-0.155		Chapman et al. 1991
98	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
98	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990

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A summary of the available data on the biological effects associated with sediment-sorbed MERCURY (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ury +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-0.069	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
+/-0.051	SG	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	*Rhepoxynius abronius (amphipod)*	ADT	0.45+/-0.058		Chapman et al. 1991
+/-0.075	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (15+/-7.21% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
+/-0.049	SG	Gulf of Mexico	COA	48-h	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	LAR	0.567+/-0.153		Chapman et al. 1991
+/-0.045	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
+/-0.028	NE	Massachusetts Bay, MA	COA		High density (201+/-33.4 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
	NE	Duwamish River, WA	COA	96-h	Not toxic (0-10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
+/-0.083	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
+/-0.092	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
+/-0.092	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
+/-0.092	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
+/-0.088	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
+/-0.087	*	Massachusetts Bay, MA	COA		Low density (1316+/-768 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
		TEL								
+/-0.103	NC	Massachusetts Bay, MA	COA		Low density (7.14+/-4.23 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
+/-0.06	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
+/-0.105	*	Massachusetts Bay, MA	COA		Low density (2.76+/-2.7 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
	*	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox (Photobacterium phosphoreum)		0.4		Chapman et al. 1991
+/-0.11	SG	Massachusetts Bay, MA	COA		Low density (39.1+/-30.8 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
+/-0.105	*	Massachusetts Bay, MA	COA		Low density (61.1+/-36.6 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
+/-0.118	*	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (82.8+/-22.2% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
+/-0.105	*	Massachusetts Bay, MA	COA		Low species richness (57.2+/-12.2 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
	*	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
	NE	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota				USACOE 1988
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
+/-0.061	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	*Microtox (Photobacterium phosphoreum)*		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
+/-0.004	NE	Stamford, CT	COA	96-h	Not toxic (10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
+/-0.033	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
+/-0.105	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-0.105	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
	*	Strait of Georgia, BC	COA	48-h	Significant increase in burrowing time	Macoma balthica (bivalve)		1.13		McGreer 1979
+/-0.121	*	Curtis Creek, Baltimore, MD	COA	20-d	Significantly toxic (94.6+/-9.35% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
+/-0.09	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
+/-0.1	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
+/-0.1	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
+/-0.1	NG	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
+/-0.161	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
+/-0.197	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
+/-0.086	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990

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i. A summary of the available data on the biological effects associated with sediment-sorbed MERCURY (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ercury c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
29 +/-0.052	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
24	NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
24 +/-0.09	NG	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
47 +/-0.242	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
25 +/-0.069	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
52 +/-0.088	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
54 +/-0.221	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
56 +/-0.089	NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
58 +/-0.079	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
26 +/-0.04	NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
53 +/-0.073	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
54 +/-0.239	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
74 +/-0.073	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
74 +/-0.073	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
83 +/-0.058	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
83 +/-0.103	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
29	*	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (55% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
29 +/-0.08	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
34 +/-0.269	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
3 +/-0.1	NG	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
3 +/-0.2	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
.3 +/-0.2	NG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
3 +/-0.283	*	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
.3 +/-0.34	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
34 +/-0.15	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca ebdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
34 +/-0.314	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
31 +/-0.03	NE	Norwalk River, CT	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
37 +/-0.314	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
32	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
34 +/-0.02	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
41	NE	Massachusetts Bay, MA	COA		High density (22 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
35	NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
35 +/-0.251	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
52 +/-0.321	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
53 +/-0.195	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
37 +/-0.34	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
37 +/-0.37	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
38 +/-0.1	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
38 +/-0.1	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
).4	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
).4 +/-0.283	*	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
41	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
41	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		15		Beller et al. 1986

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summary of the available data on the biological effects associated with sediment-sorbed MERCURY (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ry /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	•	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
/-0.179	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3+/-1.51% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			Vittor & Associates 1988
/-0.179	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (7.7+/-3.02% mortality)	Nereis virens (sandworm)	ADT			Vittor & Associates 1988
/-0.24	•	Fraser River Estuary, BC	COA		Sediments devoid of feral clams	Macoma balthica (bivalve)		1.95		McGreer 1982
/-0.229	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
/-0.406	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
/-0.352	NE	Miami River, FL	COA	10-d	Not toxic (18.6+/-7.27% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			ERCO 1985
/-0.352	NE	Miami River, FL	COA	10-d	Not toxic (1.2+/-0.837% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			ERCO 1985
/-0.352	NE	Miami River, FL	COA	10-d	Not toxic (3.6+/-1.67% mortality)	Nereis virens (sandworm)	ADT			ERCO 1985
	•	Strait of Georgia, BC	COA	24-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)		3.09		McGreer 1979
/-0.367	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
/-0.364	•	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
/-0.421	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
/-0.044	SG	Miami River/Seybold Canal, FL	COA	10-d	Significantly toxic (24.7+/-15% mortality)	Pennaeus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
/-0.14	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
/-0.14	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
/-0.14	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
/-0.3	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-0.4	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	•	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
	•	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	•	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
	SG	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
	•	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
	•	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	15		Bellar et al. 1986
/-0.4	NC	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-0.4	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
/-0.409	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
/-0.61	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
/-0.705	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
/-0.429	•	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
/-0.5	SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
/-0.408	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
/-0.15	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
/-0.15	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
/-0.15	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
/-0.51	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
/-0.683	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
		PEL								
/-0.8	NG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
/-0.8	NG	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
/-0.9	NG	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990

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5. A summary of the available data on the biological effects associated with sediment-sorbed MERCURY (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Mercury Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
03 +/-0.08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
03 +/-0.08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
03 +/-0.08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
07 +/-0.463	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
07 +/-0.463	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
71 +/-0.43	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
13 +/-0.433	*	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
79 +/-0.454	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
39 +/-0.449	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
82 +/-0.21	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
82 +/-0.21	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
82 +/-0.21	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
21 +/-0.899	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
25 +/-0.895	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
88	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		15		Bellar et al. 1986
89	*	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a
9 +/-1.0	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
25 +/-0.391	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.20+/-0.269	45.3+/-21.4	Bricker et al. 1993
95 +/-0.99	*	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
37 +/-0.629	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.55+/-0.07		Word et al. 1988
92 +/-1.73	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
03 +/-0.14	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crassostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
03 +/-0.14	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
03 +/-0.14	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b
03 +/-1.87	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
09 +/-0.889	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
12 +/-0.348	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
17 +/-1.84	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
1.2	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
1.2	*	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
1.3	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
44 +/-2.08	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
1.5	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
1.6 +/-1.05	*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
1.6 +/-1.05	*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
.74 +/-2.55	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
2.1	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
2.1	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
2.1	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
2.1	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	15		Bellar et al. 1986
.46 +/-3.59	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
2.7	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (4% mortality)	Citharichthys stigmaeus (sanddab)				Salazar & Salazar 1985
2.7	NE	San Diego Bay, CA	COA	10-d	Not significantly toxic (14% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985

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A summary of the available data on the biological effects associated with sediment-sorbed MERCURY (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ury -/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (13% mortality)	Neanthes arenaceodentata (polycheate)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (1% mortality)	Macoma nasuta (clam)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (0% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (18% mortality)	Acartia tonsa (copepod)				Salazar & Salazar 1985
+/-12.5	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
+/-9.19	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
+/-9.19	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
+/-9.19	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
+/-6.7	NE	Hudson-Raritan Bay, NY	COA	14-d	Not toxic (increased growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
+/-7.5	SG	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
+/-22.8	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
	*	Laboratory	SSBA	10-d	LC10	Rhepoxynius abronius (amphipod)	ADT	0.25		Swartz et al. 1988
	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	0.25		Swartz et al. 1988
	NE	New York Harbor, NY	COA	100-d	Not toxic (<10% mortality)	Nereis virens (sandworm)	ADT			Rubinstein et al. 1983
	NE	New York Harbor, NY	COA	100-d	Not toxic (<10% mortality)	Mercenaria mercenaria (hard clam)	ADT			Rubinstein et al. 1983
	NE	New York Harbor, NY	COA	100-d	Not toxic (<10% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Rubinstein et al. 1983
+/-6.74	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7+/-11.4% mortality)	Nereis virens (polychaete)	ADT			Parrish 1987a
+/-6.74	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3+/-2.31% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987a
+/-6.74	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14+/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987a
+/-25.5	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
+/-49	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
	NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)				Salazar et al. 1980
+/-58.9	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
	NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Protothaca staminea (clam)				Salazar et al. 1980
+/-80.6	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
+/-120	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
+/-72.1	NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
+/-175	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
+/-136	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
+/-126	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
	NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Citharichthys stigmaeus (sanddab)				Salazar et al. 1980
	NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	Neanthes arenaceodentata (polychaete)				Salazar et al. 1980
	NE	San Diego Bay, CA	COA		Not toxic (<3% mortality)	M. elongata (mysid)				Salazar et,al. 1980

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/. A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

ckel :+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
+/-0.11	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
+/-0.11	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
+/-0.11	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
+/-0.491	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
+/-0.491	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
+/-0.491	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
+/-0.25	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
+/-0.354	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
+/-0.61	SG	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
+/-1.12	SG	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
+/-3.03	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
+/-2.54	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
+/-2.67	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
+/-2.67	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
+/-4.76	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.643+/-0.641	1.74+/-1.39	Hall et al. 1992
+/-2.07	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
+/-4.88	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
+/-3.59	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
+/-3.27	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-3.27	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-3.27	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-3.27	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-3.66	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-3.66	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-3.66	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-3.66	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992

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A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

...el +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-4.12	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (11.3% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
'-0 017	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (15+/-7.21% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
'-0 014	NE	Curtis Creek, Baltimore, MD	COA	20-d	Not significantly toxic (25.4+/-17.1% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al 1985
'-3.4	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
-3 4	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
-3 4	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
-3 4	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
-2 87	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2 68+/-2.3	Hall et al. 1992
-3 80	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
-3.80	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
-3 80	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
-3.8	SG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0 626+/-0.666	1.65+/-1.4	Hall et al. 1992
-1.29	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
-2 5	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
-4 55	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0 243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
-6 03	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
-4.87	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
-3.7	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
-4.5	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
-2.78	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
-2.78	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0 626+/-0.666	2.67+/-2.05	Hall et al. 1992
-2.78	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Massachusetts Bay, MA	COA		High density (24 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al 1976
-1.84	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0 383+/-0.279	3.61+/-2.79	Hall et al. 1992
-5.43	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74 6+/-85.5 ug/g	Windom In Prep
-4.51	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
-3.25	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
-6.24	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
-4.07	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
-4.07	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
-4 07	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality).	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
-4.01	SG	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (82.8+/-22.2% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
-4.41	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
-6.75	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
-6.15	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
-4.63	SG	Curtis Creek, Baltimore, MD	COA	20-d	Significantly toxic (94.6+/-9.35% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993

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7. A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

'ickel c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
: +/-4.11	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
: +/-4.11	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
: +/-4.11	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
: +/-5.4	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
: +/-4.09	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
: +/-1.87	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.704+/-0.17 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
+/-2 69	NE	Massachusetts Bay, MA	COA		High density (299+/-40.3 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
	NG	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 1.4 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
+/-7 2	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
+/-2.42	NE	Massachusetts Bay, MA	COA		High species richness (102+/-4.73 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
+/-3.89	NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
+/-4 03	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
+/-4.03	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
+/-4.03	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
+/-3.2	NE	Newport, RI	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
+/-2.28	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
+/-2.28	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
+/-2 28	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
+/-6.86	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
+/-5.75	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
+/-5.85	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
	NE	Massachusetts Bay, MA	COA		High density (4135 N/0.1 sq.m.)	Annelide	VAR			Gilbert et al. 1976
+/-0.862	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
+/-0.85	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
+/-2 83	SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
+/-7 51	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2 87+/-4 05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
+/-5 32	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1 32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
+/-5.43	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10 6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-5.43	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-6.53	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0 00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
+/-6.78	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-6.78	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-6.78	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11 2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-6.78	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-8.9	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
+/-3.0	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
+/-8.91	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
+/-4.5	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
+/-5.24	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
+/-10.3	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep

A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

:I -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
3.97	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
	•	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (55% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
11.8	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
4.89	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
5.23	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
5.38	NC	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
5.48	NC	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
5.48	NC	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
5.35	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
1.9	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
1.56	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
4.75	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7+/-11.4% mortality)	Nereis virens (polychaete)	ADT			Parrish 1987a
4.75	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3+/-2.31% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987a
4.75	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14+/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987a
5.07	SG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
5.5	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
5.8	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
3.72	NE	Massachusetts Bay, MA	COA		High density (201+/-33.4 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
	NE	Massachusetts Bay, MA	COA		High density (22 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
7.3	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
5.31	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
		TEL								
0.3	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
0.3	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
0.3	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
1.71	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.71	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
3.39	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
18	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
3.46	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
	NE	Southern California	COA		High abundance (148+/-58 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
12.3	SG	Massachusetts Bay, MA	COA		Low density (1316+/-768 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
1.65	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
	NE	Southern California	COA		High abundance (191+/-70.1 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
4.21	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
9.15	•	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
8.34	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
	NE	Duwamish River, WA	COA	96-h	Not toxic (0-10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
7.6	SG	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
3.35	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
0.849	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
	SG	Southern California	COA		Moderate abundance (72.6+/-6.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979

!. A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ckel .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-3.94	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
+/-6.48	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
+/-12.8	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
+/-15.1	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
+/-1.65	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
+/-1.65	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
+/-1.65	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b
	SG	Southern California	COA		Low abundance (6.1+/-7.2 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
	SG	Southern California	COA		Moderate abundance (56.2+/-23 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
+/-6.86	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
+/-12.1	SG	Massachusetts Bay, MA	COA		Low density (7.14+/-4.23 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
+/-11.8	*	Massachusetts Bay, MA	COA		Low density (2.76+/-2.7 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
+/-12.1	SG	Massachusetts Bay, MA	COA		Low density (39.1+/-30.8 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
+/-11.8	*	Massachusetts Bay, MA	COA		Low density (61.1+/-36.6 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
+/-12.6	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
+/-11.9	*	Massachusetts Bay, MA	COA		Low species richness (57.2+/-12.2 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
	SG	Southern California	COA		Low abundance (35.3+/-15.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
+/-22.1	SG	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
+/-10.7	NE	Black Rock Beach, NS	COA	10-d	Not toxic (6.67+/-4.51% mortality)	Corophium volutator (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
+/-10.7	NE	Black Rock Beach, NS	COA	10-d	Not toxic (2.33+/-1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
+/-10.7	NE	Black Rock Beach, NS	COA	10-d	Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
+/-13.9	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
+/-13.9	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
+/-13.8	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
+/-5.51	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
+/-6.51	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
+/-6.51	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
+/-6.51	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
+/-14.5	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
+/-14.5	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
+/-14.5	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
+/-16.5	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
+/-8.21	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
+/-8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
+/-5.4	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
	NE	Palos Verdes, CA	COA		High abundance (208 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
+/-8.6	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
+/-18.6	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		15		Bellar et al. 1986
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
+/-7.1	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
+/-8.73	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
+/-13.1	NC	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 3.79+/-3.29 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990

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A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

el /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
6.66	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
1.27	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
7.38	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisce abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al 1993
22.5	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
21.7	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
7.37	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
9.72	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
8.56	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
	*	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
4.95	NE	Palos Verdes, CA	COA		High abundance (54.6+/-5.09 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
4.95	NE	Palos Verdes, CA	COA		High abundance (30.7+/-0.99 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
6.45	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
7.36	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
5.91	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
19.9	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
5.48	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
8.38	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
8.76	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
4.4	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
7.85	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
7.85	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
9.66	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
4.99	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
4.0	NE	Fraser River Estuary, BC	COA		Sediments populated by feral clams	Macoma balthica (bivalve)		0.45		McGreer 1982
9.17	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
5.13	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
7.74	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
5.37	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
5.69	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al 1991
5.69	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al 1991
11.3	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
11.3	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
5.47	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al 1991
8.06	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
7.59	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
6.01	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
7.51	NE	Palos Verdes, CA	COA		High density (20.9+/-0.23 N/0.1 sq.m.)	Amphipod		1.7+/-0.61		Swartz et al. 1986
7.51	NE	Palos Verdes, CA	COA		High density (11.2+/-1.64 N/0.1 sq.m.)	Phoxocephalid		1.7+/-0.61		Swartz et al. 1986
9.1	NE	Stamford, CT	COA	96-h	Not toxic (10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
8.36	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
7.81	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	15		Bellar et al. 1986

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7. A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ckel :+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
+/-1.7	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
+/-7.49	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
+/-7.72	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
+/-15.6	NC	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
+/-32.2	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
+/-19.6	NC	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
	NE	Palos Verdes, CA	COA		High density (93.4 N/0.1 sq.m.)	Echinoderm		1.3+/-0.77		Swartz et al. 1986
+/-17.6	NE	Howe Sound, BC	COA	10-d	Not toxic (10.5+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
+/-17.6	NE	Howe Sound, BC	COA	10-d	Not toxic (5.83+/-5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
+/-17.6	NE	Howe Sound, BC	COA	10-d	Not toxic (96.3+/-4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
	SG	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
	SG	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
		PEL								
+/-3.18	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
+/-4.8	NE	Norwalk River, CT	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
+/-9.05	NE	Palos Verdes, CA	COA		High species richness (70.9+/-16.9 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
+/-3.03	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
+/-3.4	SG	Fraser River Estuary, BC	COA		Sediments devoid of feral clams	Macoma balthica (bivalve)		1.95		McGreer 1982
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
+/-15.9	NC	Palos Verdes, CA	COA		Low abundance (415+/-94.4 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
+/-12.1	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (11.9+/-5.36% mortality)	Rhepoxynius abronius (amphipod)	VAR			Ferraro et al. 1991
+/-1.53	NE	Palos Verdes, CA	COA		High abundance (944+/-101 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
+/-9.73	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
+/-9.73	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
+/-9.73	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c
+/-24	NC	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		15		Bellar et al. 1986
+/-9.97	SG	Palos Verdes, CA	COA		Low abundance (2.4+/-5.65 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
+/-20.2	NE	Palos Verdes, CA	COA		High species richness (80.8+/-13.7 S/0.1 sq.m.)	Macro benthos		2.10+/-1.15		Swartz et al. 1985a
+/-20.2	NE	Palos Verdes, CA	COA		High density (54.5+/-9.91 N/0.1 sq.m.)	Amphipod		2.1+/-1.15		Swartz et al. 1985a
+/-20.2	NE	Palos Verdes, CA	COA		High density (34.3+/-5.67 N/0.1 sq.m.)	Phoxocephalid		2.1+/-1.15		Swartz et al. 1985a
+/-20.2	NE	Palos Verdes, CA	COA		High density (111+/-32 N/0.1 sq.m.)	Crustacea		2.1+/-1.15		Swartz et al. 1985a
	*	Black Rock Harbor, CT	COA	14-d	Significantly toxic (100% mortality)	Nereis virens (sandworm)				Simmers et al. 1984
+/-8.12	SG	Palos Verdes, CA	COA		Low abundance (13.8+/-11.4 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
+/-8.12	SG	Palos Verdes, CA	COA		Low abundance (5.87+/-7.06 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
+/-18.6	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5+/-5.45% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.42+/-0.88		Swartz et al. 1986
+/-123	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.76+/-0.266 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
+/-19.8	SG	Palos Verdes, CA	COA		Low density (0.2+/-0.14 N/0.1 sq.m.)	Echinoderm		2.64+/-0.77		Swartz et al. 1986
+/-24.3	NE	Palos Verdes, CA	COA		High density (594+/-688 N/0.1 sq.m.)	Mollusca		2.53+/-1.27		Swartz et al. 1985a
+/-24.3	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (8+/-5.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.53+/-1.27		Swartz et al. 1985a
	*	Southern California	AETA		*Southern California AET Values*	Benthic species				Becker et al. 1990
	NE	Palos Verdes, CA	COA		High density (4.4 N/0.1 sq.m.)	Echinoderm		0.9		Swartz et al. 1985a

A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

el /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Palos Verdes, CA	COA		High density (88 N/0.1 sq.m.)	Foraminifera (sponge)		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (132 N/0.1 sq.m.)	Ophiuroidea (brittle star)		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (2177 N/0.1 sq.m.)	Polychaeta		3.2		Swartz et al. 1985a
-84	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
-90.7	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
-90.7	SG	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
-90.6	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
	SG	Palos Verdes, CA	COA		Low species richness (19.2 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
-13.7	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
-13.7	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
-6.51	SG	Palos Verdes, CA	COA		Low density (5.3+/-3.7 N/0.1 sq.m.)	Amphipod		3.13+/-0.15		Swartz et al. 1986
-6.51	SG	Palos Verdes, CA	COA		Low density (0.13+/-0.23 N/0.1 sq.m.)	Phoxocephalid		3.13+/-0.15		Swartz et al. 1986
-104	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
-27.8	SG	Palos Verdes, CA	COA		Low density (0.03+/-0.08 N/0.1 sq.m.)	Echinoderm		3.53+/-0.742		Swartz et al. 1985a
-27.8	SG	Palos Verdes, CA	COA		Low density (0.233+/-0.367 N/0.1 sq.m.)	Foraminifera (sponge)		3.53+/-0.742		Swartz et al. 1985a
-27.8	SG	Palos Verdes, CA	COA		Low density (0.3+/-0.8 N/0.1 sq.m.)	Ophiuroidea (brittle star)		3.53+/-0.742		Swartz et al. 1985a
-27.8	SG	Palos Verdes, CA	COA		Low density (365+/-178 N/0.1 sq.m.)	Polychaeta		3.15+/-1.32		Swartz et al. 1985a
-42.2	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
-5.64	NC	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
-8.33	NC	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
-5.74	NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
-5.88	NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
-7.97	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
-7.71	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
	NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
-128	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
-5.69	SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
-6.22	SG	Palos Verdes, CA	COA		Low species richness (26.0+/-11.5 S/0.1 sq.m.)	Macro benthos		3.95+/-0.238		Swartz et al. 1985a
-6.22	SG	Palos Verdes, CA	COA		Low density (1.0+/-1.2 N/0.1 sq.m.)	Amphipod		3.95+/-0.238		Swartz et al. 1985a
-6.22	SG	Palos Verdes, CA	COA		Low density (0 N/0.1 sq.m.)	Phoxocephalid		3.95+/-0.238		Swartz et al. 1985a
-6.22	SG	Palos Verdes, CA	COA		Low density (8.7+/-6.01 N/0.1 sq.m.)	Crustacea		3.95+/-0.238		Swartz et al. 1985a
-4.16	SG	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
-4.16	SG	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
-3.4	SG	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
	SG	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
/-5.03	SG	Palos Verdes, CA	COA		Low density (21.5+/-11.6 N/0.1 sq.m.)	Mollusca		4+/-0.265		Swartz et al. 1985a
/-5.03	SG	Palos Verdes, CA	COA	10-d	Significantly toxic (21+/-6.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	4+/-0.265		Swartz et al. 1985a
	SG	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a
/-53.3	*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
/-53.3	*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
/-34.5	NG	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990

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7. A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

lckel c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-35.2	NG	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-44.3	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-35.8	NG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-25.1	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-26.9	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-30.9	NC	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-30.2	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
+/-42.3	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-28.5	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
+/-28.5	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al 1988
	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
	-	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	15		Bellar et al. 1986
+/-16.3	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
	-	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	-	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster, mussel	LAR			Long & Morgan 1990
	-	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al 1990
	-	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	-	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al 1990

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summary of the available data on the biological effects associated with sediment-sorbed SILVER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

r -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
-0.007	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
-0.006	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
-0.007	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
-0.007	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
-0.014	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
-0.026	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
-0.038	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
-0.038	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
-0.038	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
-0.038	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
	•	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	15		Bellar et al. 1986
-0.026	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
-0.09	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
-0.063	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
-0.067	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
-0.078	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
-0.065	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
-0.066	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
-0.022	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
-0.067	•	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
-0.056	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
-0.017	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
-0.021	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
/-0.055	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
/-0.055	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
/-0.063	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
/-0.024	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
/-0.024	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
/-0.087	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
/-0.07	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
/-0.062	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
/-0.049	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
/-0.042	•	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
/-0.042	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
/-0.021	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
/-0.087	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
/-0.071	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
/-0.28	•	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993

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8. A summary of the available data on the biological effects associated with sediment-sorbed SILVER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Silver nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
75 +/-0.106	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
18 +/-0.099	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
.2 +/-0.1	NG	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
38 +/-0.305	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
17 +/-0.146	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
22 +/-0.246	*	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
36 +/-0.327	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
24 +/-0.198	SG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
.3 +/-0.1	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
.3 +/-0.1	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
3 +/-0.312	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
.3 +/-0.1	NG	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
.3 +/-0.1	NG	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
3 +/-0.1	NG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
17 +/-0.054	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
57 +/-0.431	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
17	NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
5	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
5	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
5	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3+/-1.51% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			Vittor & Associates 1988
5	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (7.7+/-3.02% mortality)	Nereis virens (sandworm)	ADT			Vittor & Associates 1988
5	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
5	NG	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
5	NG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
5	NG	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
5	NG	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
5	NG	Miami River/Seybold Canal, FL	COA	10-d	Significantly toxic (24.7+/-15% mortality)	Pennaeus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
5 +/-0.4	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
5 +/-0.498	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
6	-	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
6	-	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		15		Bellar et al. 1986
6	-	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
3 +/-0.159	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
8 +/-0.167	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
6 +/-0.087	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
6 +/-0.5	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
6 +/-0.8	NE	Southern California	COA		High abundance (191+/-70.1 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
6 +/-0.7	NG	Southern California	COA		Moderate abundance (56.2+/-23 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
5 +/-0.111	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
3 +/-0.358	NC	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
5 +/-0.262	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
6 +/-0.382	NC	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
6 +/-0.396	SG	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993

ummary of the available data on the biological effects associated with *sediment-sorbed SILVER (ppm)* used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ɔD	*Hit*	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.241	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	*Nephtys caecoides (polychaete)*		1.63+/-0.657		Word et al. 1988
.241	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
287	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
.287	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
.433	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
.8	NC	Southern California	COA		Moderate species richness (72+/-3.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
.0	NC	Southern California	COA		Moderate abundance (72.6+/-6.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
.137	*SG*	*Oakland Harbor, CA*	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
.146	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		*1.8+/-0.477*	*8.52+/-10.7*	*Bricker et al. 1993*
		TEL								
.645	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (4% mortality)	Citharichthys stigmaeus (sanddab)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	10-d	Not significantly toxic (14% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (13% mortality)	Neanthes arenaceodentata (polycheate)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (1% mortality)	Macoma nasuta (clam)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	96-h	*Not significantly toxic (0% mortality)*	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (18% mortality)	Acartia tonsa (copepod)				Salazar & Salazar 1985
.6	NE	Fraser River Estuary, BC	COA		Sediments populated by feral clams	Macoma balthica (bivalve)		0.45		McGreer 1982
.393	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	*Ampelisca abdita (amphipod)*	*SUBADT*		7.63+/-9.44	Long 1993
.238	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
.323	NE	Long Island Sound, NY, CT	*COA*	*48-h*	*Not significantly toxic (15.2+/-9.21% mortality)*	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
.377	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
.912	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
.9	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	*Rhepoxynius abronius (amphipod)*	ADT			Long & Morgan 1990
.391	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
.6	NE	Southern California	COA		High abundance (148+/-58 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
.1	NE	Southern California	COA		High species richness (96.3+/-22.3 S/0.1 sq.m.)	Benthic species				*Word & Mearns 1979*
.303	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
.404	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	*Amphipod*	ADT	0.144+/-0.123		Crocker et al. 1991
.389	SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
.53	*SG*	*Long Island Sound, NY, CT*	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
0.344	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	*2.18+/-0.531*	*19.1+/-12.5*	*Bricker et al. 1993*
0.876	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
0.703	NE	Long Island Sound, NY, CT	COA	48-h	*Not significantly toxic (99.3+/-0.827% normal development)*	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
0.992	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
	*	Strait of Georgia, BC	COA	24-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)		3.09		McGreer 1979
	NE	Howe Sound, BC	COA	10-d	Not toxic (10.5+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	*ADT*	*3.4+/-4.39*		McLeay et al. 1991
	NE	Howe Sound, BC	COA	10-d	Not toxic (5.83+/-5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
	NE	Howe Sound, BC	COA	*10-d*	*Not toxic (96.3+/-4.19% reburial)*	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
0.6	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
2.0	NC	Southern California	COA		Moderate abundance (75.6+/-12.7 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
0.444	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	*Ampelisca abdita (amphipod)*	*SUBADT*	*2.35+/-1.05*	10.5+/-13.4	Bricker et al. 1993
1.06	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990

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8. A summary of the available data on the biological effects associated with sediment-sorbed SILVER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Silver nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5 +/-1.12	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
6 +/-0.411	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
9 +/-0.342	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
1	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
.1	NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
1 +/-0.98	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
1 +/-0.302	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
3 +/-1.11	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
3 +/-1.94	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
4 +/-0.946	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
7 +/-1.07	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
9 +/-1.28	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
.2	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
2 +/-1.7	NC	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
3 +/-1.06	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
8 +/-1.42	SG	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
3 +/-1.8	NC	Southern California	COA		Low abundance (57.6+/-13.6 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
3 +/-1.8	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
1 +/-1.7	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
4	SG	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
4 +/-1.85	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
5 +/-1.28	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
5 +/-1.49	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
4 +/-0.988	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
8 +/-1.37	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
7 +/-2.2	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
7 +/-2.6	NC	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
2 +/-0.554	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
7		*PEL*								
8 +/-0.55	NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
8 +/-1.46	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
8 +/-1.46	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
6 +/-1.83	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
6 +/-1.03	NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
1 +/-1.3	*	Fraser River Estuary, BC	COA		Sediments devoid of feral clams	Macoma balthica (bivalve)		1.95		McGreer 1982
2 +/-3.9	*	Southern California	COA		Low abundance (35.3+/-15.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
5 +/-1.38	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
9 +/-1.51	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
3	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
7 +/-2.36	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
4	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
4 +/-1.63	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
5 +/-4.1	*	Southern California	COA		Low species richness (51.2+/-8.6 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979

. summary of the available data on the biological effects associated with sediment-sorbed SILVER (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

er /-SD	Hit	Area	Analysis Type	Test Type	*End-Point Measured*	*Species*	Life Stage	TOC (%)	AVS (umol/g)	Reference
-1 58	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
	*	Strait of Georgia, BC	COA	48-h	Significant increase in burrowing time	Macoma balthica (bivalve)		1.13		McGreer 1979
-2 69	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
-1 18	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
-2 54	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
-1 47	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
-1 43	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
-4 5	*	Southern California	COA		Low abundance (6.1+/-7.2 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
-5 6	NE	*Southern California*	COA		High abundance (88.9+/-35.4 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
-0.993	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
-0 968	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al 1993
	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
	-	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	15		Bellar et al. 1986
-3.56	SG	San Francisco Bay, CA	COA	*10-d*	*Moderately toxic (28.3+/-7.51% mortality)*	*Amphipod*	ADT	2.01+/-0.98		Chapman et al. 1987a
	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		15		Bellar et al. 1986
	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
	-	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
-2.5	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			*Long & Morgan 1990*
-2 52	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
-2 52	*	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
	*	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
	*	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
	*	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a
	-	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	-	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990

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ble 9. A summary of the available data on the biological effects associated with sediment-sorbed TRIBUTYLTIN (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

Tributyltin Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.004 +/-0.0004	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.004 +/-0.0004	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.004 +/-0.0004	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.004 +/-0.0004	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.05 +/-0.03	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
0.223 +/-0.259	NC	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
0.294 +/-0.576	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
0.294 +/-0.576	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
0.312 +/-0.637	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
0.78	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (4% mortality)	Citharichthys stigmaeus (sanddab)				Salazar & Salazar 1985
0.78	NE	San Diego Bay, CA	COA	10-d	Not significantly toxic (14% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
0.78	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (13% mortality)	Neanthes arenaceodentata (polycheate)				Salazar & Salazar 1985
0.78	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (1% mortality)	Macoma nasuta (clam)				Salazar & Salazar 1985
0.78	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (0% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
0.78	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (18% mortality)	Acartia tonsa (copepod)				Salazar & Salazar 1985
1	NE	Laboratory	SSBA	96-h ST	Not toxic (0% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Clark et al. 1987
1	NE	Laboratory	SSBA	10-d ST	Not toxic (0% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Clark et al. 1987
1.53 +/-0.198	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
1.54 +/-0.179	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
1.59	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
1.6	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
1.6	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
1.6	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
1.6	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
1.6	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
1.6	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
1.6	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
1.6	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
1.6	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
1.6	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
1.6	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
1.6	NG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
1.7 +/-0.203	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
1.8 +/-0.286	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
1.8 +/-0.286	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
1.8 +/-0.286	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
2.5	NC	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
2.5	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
2.5	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
2.5	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
3.33 +/-2.5	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
3.44 +/-2.65	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
3.44 +/-2.65	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep

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. A summary of the available data on the biological effects associated with sediment-sorbed TRIBUTYLTIN (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

utyltin c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-2.83	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
+/-3.06	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
+/-4.33	*	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
+/-9.07	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
+/-7.52	SG	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
	*	Laboratory	SSBA	96-h ST	Highly toxic (100% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Clark et al. 1987
	NE	Laboratory	SSBA	96-h FT	Not toxic (0% mortality)	*Palaemonetes pugio (grass shrimp)*	ADT			Clark et al. 1987
+/-8.69	SG	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
+/-10.7	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
+/-9.21	SG	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
+/-16.3	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
+/-16.3	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
+/-9.2	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
+/-14.3	NC	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
	NE	Laboratory	SSBA	10-d FT	Not toxic (0% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Clark et al. 1987
+/-7.07	SG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
+/-11.6	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-11.6	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-8.88	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
+/-7.21	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
+/-11.3	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxio (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
	*	Laboratory	SSBA	10-d FT	LC50	Palaemonetes pugio (grass shrimp)	ADT			Clark et al. 1987
	*	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
	*	Laboratory	SSBA	96-h FT	Highly toxic (100% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Clark et al. 1987
	*	Laboratory	SSBA	10-d FT	Highly toxic (100% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Clark et al. 1987

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ble 10. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

Zinc onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
2	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
2 5 +/-1 91	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
3	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
3.2	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
3.2	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
3.2	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
.56 +/-2.69	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
.56 +/-2.69	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
.56 +/-2.69	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
.98 +/-2.53	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
4 +/-1.41	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
4.6	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
5.8	NC	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
.83 +/-2.57	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
6	SG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
.11 +/-3.11	SG	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
7.5 +/-4.95	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
3.3	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
72 +/-4 32	SG	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
).2 +/-4.25	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
11 +/-9.76	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
1.1	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
1.3 +/-7.91	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
1.6 +/-8.42	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.7 +/-8.37	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
1.9 +/-3.36	SG	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
2.8 +/-8.39	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
4.1 +/-8.3	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
7.6 +/-14.3	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
1.5 +/-26.2	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
2.3 +/-29 7	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
3.1 +/-21.5	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
4.3 +/-6.24	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
26	NE	Massachusetts Bay, MA	COA		High density (24 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
6.7 +/-15.5	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
27 +/-1.41	NE	Massachusetts Bay, MA	COA		High density (299+/-40.3 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
27 +/-23.7	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
28 +/-7.56	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
8.9 +/-10.5	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
29	NE	Massachusetts Bay, MA	COA		High density (22 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
9.7 +/-23.8	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
9.7 +/-23.8	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992

. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
23 8	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
23 8	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
3 08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
3 08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
3 08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
1 68	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
1 68	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
1 68	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
22 3	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
22 3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
22 3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
22 3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
3 14	NE	Massachusetts Bay, MA	COA		High species richness (102+/-4.73 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
2 5	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
1	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.704+/-0.17 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
4 3	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
3 1	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
3 1	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
3	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
3 5	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
1 6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
3 9	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (11.3% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
8 5	NE	Black Rock Beach, NS	COA	10-d	Not toxic (6.67+/-4.51% mortality)	Corophium volutator (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
8 5	NE	Black Rock Beach, NS	COA	10-d	Not toxic (2.33+/-1.53% mortality)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
8 5	NE	Black Rock Beach, NS	COA	10-d	Not toxic (100% reburial)	Rhepoxynius abronius (amphipod)	ADT/JUV	0.24+/-0.18		Nicol & Doe 1990
74	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
8 6	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NG	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Massachusetts Bay, MA	COA		High density (4135 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
0.3	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
0 3	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
0.3	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
5.5	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5.5	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1 6	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
	SG	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 1.4 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
17 5	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
18 5	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
8.2	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
2 8	NE	Southern California	COA		High abundance (191+/-70.1 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979

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·le 10. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Zinc ·nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.1 +/-22.2	NC	Southern California	COA		Moderate species richness (72+/-3.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
.7 +/-23.5	NE	Southern California	COA		High abundance (148+/-58 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
8 +/-21.6	NE	Curtis Creek, Baltimore, MD	COA	20-d	Not significantly toxic (25.4+/-17.1% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
.6 +/-27.7	NC	Southern California	COA		Moderate abundance (72.6+/-6.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
·2	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
.6 +/-23.1	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
·3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
1 +/-5.51	*	*Brunswick Harbor Entrance, GA*	*COA*	*48-h*	*Significantly toxic (14.6+/-18.9% normal development)*	*Arbacia punctulata (sea urchin)*		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
.1 +/-27.5	NC	Southern California	COA		Moderate abundance (75.6+/-12.7 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
.1 +/-35.1	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
.4 +/-21.5	NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
.3 +/-31.7	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
.9 +/-34.2	NC	Southern California	COA		Moderate abundance (56.2+/-23 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
3 +/-3	NE	Newport, RI	COA	96-h	Not toxic (0% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
.7 +/-30.9	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
9 +/-52.3	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
4	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
4	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
6 +/-27.9	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
1 +/-99.4	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
1 +/-120	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
6 +/-32.2	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.6 +/-32.2	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
6 +/-32.2	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.6 +/-32.2	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8 +/-18.9	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
8 +/-18.9	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
.2 +/-53.8	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
1 +/-38.9	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
·5 +/-19	NE	Fraser River Estuary, BC	COA		Sediments populated by feral clams	Macoma balthica (bivalve)		0.45		McGreer 1982
·6 +/-4.24	*NE*	*Mississippi River, MS, LA*	*COA*	*10-d*	*Not significantly toxic (7.8+/-1.63% mortality)*	*Ampelisca abdita (amphipod)*		*1.15+/-1.04*	*2.31+/-0.651*	*EMAP Louisiana Province 1991*
·6 +/-26.8	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
.8 +/-5.4	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
.9 +/-6.05	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
.9 +/-6.05	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
.9 +/-6.05	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
.4 +/-42.5	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
.7 +/-42.9	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
.8 +/-43.7	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
.8 +/-43.7	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
3 +/-106	NE	Southern California	COA		High species richness (96.3+/-22.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
.7 +/-16.8	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
.7 +/-16.8	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b

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!0. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ac +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-16.8	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
/-45.3	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
/-6.2	NE	Duwamish River, WA	COA	96-h	Not toxic (0-10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
/-70.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
/-70.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
/-70.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
/-45.8	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
/-80.5	NC	Southern California	COA		Low abundance (57.6+/-13.6 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
	NE	Laboratory	SSBA	72-h	LC08	Eohaustorius sencillus (amphipod)				Oakden et al. 1984b
-39.1	NE	Curtis Creek, Baltimore, MD	COA	10-d	Not significantly toxic (15+/-7.21% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
	NE	Laboratory	SSBA	72-h	LC05	Rhepoxynius abronius (amphipod)				Oakden et al. 1984b
-14.1	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
-48.1	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
-15.8	NE	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.42+/-0.13		Chapman et al. 1991
-22.2	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
-52.4	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
-110	NE	Massachusetts Bay, MA	COA		High density (201+/-33.4 N/0.1 sq m.)	Mollusca	VAR			Gilbert et al. 1976
	NE	Palos Verdes, CA	COA		High abundance (208 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
-26.6	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
-47.1	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
-60.8	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
-58.7	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
-88.2	*	Massachusetts Bay, MA	COA		Low density (1316+/-768 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
-59.3	SG	Massachusetts Bay, MA	COA		Low density (39.1+/-30.8 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
-146	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
-146	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
-146	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
-146	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
-63.7	*	Massachusetts Bay, MA	COA		Low density (7.14+/-4.23 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
-63.6	*	Massachusetts Bay, MA	COA		Low density (2.76+/-2.7 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
-40.6	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
63.6	*	Massachusetts Bay, MA	COA		Low density (61.1+/-36.6 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
-64	*	Massachusetts Bay, MA	COA		Low species richness (57.2+/-12.2 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
	NE	Palos Verdes, CA	COA		High density (4.4 N/0.1 sq m.)	Echinoderm		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (88 N/0.1 sq m.)	Foraminifera (sponge)		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (132 N/0.1 sq m.)	Ophiuroidea (brittle star)		0.9		Swartz et al. 1985a
-162	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
-162	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
-57.2	NC	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Significantly toxic (mean ET50; burrowing time 3.79+/-3.29 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
-51.3	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
-23.3	NE	Palos Verdes, CA	COA		High abundance (54.6+/-5.09 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
23.3	NE	Palos Verdes, CA	COA		High abundance (30.7+/-0.99 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
-48.8	NE	Howe Sound, BC	COA	10-d	Not toxic (10.5+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991

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ıle 10. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Zinc ›nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.6 +/-48.8	NE	Howe Sound, BC	COA	10-d	Not toxic (5.83+/-5.48% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
·.6 +/-48.8	NE	Howe Sound, BC	COA	10-d	Not toxic (96.3+/-4.19% reburial)	Rhepoxynius abronius (amphipod)	ADT	3.4+/-4.39		McLeay et al. 1991
)0	NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
)2 +/-174	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
)2 +/-174	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
)2 +/-174	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
)2 +/-174	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
)2 +/-88.5	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
)3 +/-9.9	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
)5	NE	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota				USACOE 1988
)6 +/-156	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
)6 +/-26.3	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
)6 +/-26.3	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
)6 +/-26.3	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
)6 +/-57	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
)7	NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
)7 +/-122	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
)7 +/-13.6	NG	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
)8 +/-78.9	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
)9	NC	Strait of Georgia, BC	COA	48-h	Significant increase in burrowing time	Macoma balthica (bivalve)		1.13		McGreer 1979
(0 +/-8.52	NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
(2 +/-73.8	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
!2 +/-73.8	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
!2 +/-73.8	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b
(4 +/-21.7	NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
(4 +/-72.1	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
(5 +/-25.7	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
16 +/-71.4	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
16 +/-71.4	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
16 +/-71.4	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
21 +/-187	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
21 +/-187	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
21 +/-187	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
21 +/-28.1	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
22 +/-29.4	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
23 +/-20.9	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
23 +/-53	SG	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
4		TEL								
24 +/-46.1	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
26	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
26	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
26 +/-18.4	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
26 +/-32.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993

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0. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ıc /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-32.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
/-53.7	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
/-44.2	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
	NE	Palos Verdes, CA	COA		High density (93.4 N/0.1 sq.m.)	Echinoderm		1.3+/-0.77		Swartz et al. 1986
	•	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
/-131	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
/-131	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
/-32.5	NE	Palos Verdes, CA	COA		High density (20.9+/-0.23 N/0.1 sq.m.)	Amphipod		1.7+/-0.61		Swartz et al. 1986
/-32.5	NE	Palos Verdes, CA	COA		High density (11.2+/-1.64 N/0.1 sq.m.)	Phoxocephalid		1.7+/-0.61		Swartz et al. 1986
/-77.7	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-58.9	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
/-87	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
/-59.8	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
/-141	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
/-72.6	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
/-51.4	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
/-62	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
	•	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
	•	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
/-48.7	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
/-66.2	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
/-4.8	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidita (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
/-91	SG	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-197	•	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
/-130	•	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (82.8+/-22.2% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
	•	Laboratory	SSBA	10-d	LC10	Rhepoxynius abronius (amphipod)	ADT	0.25		Swartz et al. 1988
/-63.4	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
/-86.6	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
/-24.6	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
/-56	SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
/-250	•	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
/-52.7	•	Fraser River Estuary, BC	COA		Sediments devoid of feral clams	Macoma balthica (bivalve)		1.95		McGreer 1982
/-34.7	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
/-90.6	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	•	Strait of Georgia, BC	COA	24-h	Significantly toxic (avoidance)	Macoma balthica (bivalve)		3.09		McGreer 1979
/-92	•	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-69	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
/-234	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
/-88.1	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (46.7+/-11.4% mortality)	Nereis virens (polychaete)	ADT			Parrish 1987a
/-88.1	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (5.3+/-2.31% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987a
/-88.1	NE	Bayou La Batre, AB	COA	10-d	Not significantly toxic (14+/-9.17% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987a

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ble 10. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Zinc onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
77 +/-96.1	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
80	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
80 +/-67.5	NE	Palos Verdes, CA	COA		High species richness (70.9+/-16.9 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
181 +/-6.08	NE	Palos Verdes, CA	COA		High abundance (944+/-101 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
182 +/-384	*	Southern California	COA		Low abundance (35.3+/-15.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
182 +/-74.1	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
185 +/-335	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
186 +/-156	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
186 +/-36.7	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
187 +/-142	*	Curtis Creek, Baltimore, MD	COA	20-d	Significantly toxic (94.6+/-9.35% mortality)	Leptocheirus plumulosus (amphipod)	JUV			McGee et al. 1993
188	*	Laboratory	SSBA	72-h	Significantly toxic (74% avoidance)	Rhepoxynius spp.				Oakden et al. 1984a
188	NE	Laboratory	SSBA	72-h	Not significantly toxic (4% mortality)	Rhepoxynius spp.				Oakden et al. 1984a
188 +/-480	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
188 +/-132	NE	Palos Verdes, CA	COA		High species richness (80.8+/-13.7 S/0.1 sq.m.)	Macro benthos		2.10+/-1.15		Swartz et al. 1985a
188 +/-132	NE	Palos Verdes, CA	COA		High density (54.5+/-9.91 N/0.1 sq.m.)	Amphipod		2.1+/-1.15		Swartz et al. 1985a
188 +/-132	NE	Palos Verdes, CA	COA		High density (34.3+/-5.67 N/0.1 sq.m.)	Phoxocephalid		2.1+/-1.15		Swartz et al. 1985a
188 +/-132	NE	Palos Verdes, CA	COA		High density (111+/-32 N/0.1 sq.m.)	Crustacea		2.1+/-1.15		Swartz et al. 1985a
189 +/-273	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
189 +/-115	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
190	*	United States	EqPA		EPA Chronic Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
190	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
190 +/-78.5	SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
191 +/-45.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
193 +/-79.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
194 +/-42	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
197 +/-415	*	Southern California	COA		Low species richness (51.2+/-8.6 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
198 +/-59.2	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
202 +/-101	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
203 +/-37.7	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
205 +/-89.8	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
205 +/-93.1	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
205 +/-93.1	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
206 +/-81.6	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
207 +/-84.7	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
211 +/-342	*	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
211 +/-39.6	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
212 +/-243	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
213 +/-64.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
213 +/-64.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
213 +/-64.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c
216 +/-56.4	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
216 +/-81	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
217 +/-203	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990

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0. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ıc /-SD	HH	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-373	NE	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	0.443+/-0.127		Chapman et al. 1991
/-231	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	483+/-2.23	Hall et al. 1992
/-0.3	*	Los Angeles, CA	COA	96-h	Highly toxic (>50% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
/-140	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
/-80.1	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
/-171	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
/-77.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
/-444	*	Southern California	COA		Low abundance (6.1+/-7.2 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
/-82.9	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
/-82.9	*	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
/-64	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
/-82.4	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
/-351	NE	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	0.425+/-0.128		Chapman et al. 1991
/-99.5	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
/-195	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (11.9+/-5.36% mortality)	Rhepoxynius abronius (amphipod)	VAR			Ferraro et al. 1991
/-201	NE	Hudson-Raritan Bay, NY	COA	14-d	Not toxic (increased growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
/-72.2	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
/-289	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
/-71.9	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al 1993
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		15		Bellar et al. 1986
/-198	*	Palos Verdes, CA	COA		Low abundance (2.4+/-5.65 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
		PEL								
	*	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a
	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	0.25		Swartz et al. 1988
/-38.9	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
/-248	SG	Palos Verdes, CA	COA		Low abundance (415+/-94.4 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
/-768	NE	Chesapeake Bay, MD, VI; Delaware Bay, DE	COA		Not significantly toxic (mean ET50; burrowing time 0.76+/-0.266 h)	Mya arenaria (clam)	1-2 cm			Phelps 1990
/-35.9	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
/-204	*	Palos Verdes, CA	COA		Low abundance (13.8+/-11.4 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al 1991
/-204	*	Palos Verdes, CA	COA		Low abundance (5.87+/-7.06 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al 1991
/-335	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
/-282	NE	Palos Verdes, CA	COA		High density (594+/-688 N/0.1 sq.m.)	Mollusca		2.53+/-1.27		Swartz et al 1985a
/-282	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (8+/-5.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.53+/-1.27		Swartz et al. 1985a
	*	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
	*	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
	*	Black Rock Harbor, CT	COA	14-d	Significantly toxic (100% mortality)	Nereis virens (sandworm)				Simmers et al. 1984
	NE	Palos Verdes, CA	COA		High density (2177 N/0.1 sq.m.)	Polychaeta		3.2		Swartz et al. 1985a
	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
/-52.6	NE	Stamford, CT	COA	96-h	Not toxic (10% mortality)	Palaemonetes pugio (shrimp)				Lee & Mariani 1977
/-592	NE	Southern California	COA		High abundance (88.9+/-35.4 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979

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10. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Zinc c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	Curtis Creek, Baltimore, MD	COA	10-d	Significantly toxic (55% mortality)	Hyalella azteca (amphipod)	JUV			McGee et al. 1993
+/-234	NE	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
+/-783	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
+/-504	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
+/-612	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
+/-311	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5+/-5.45% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.42+/-0.88		Swartz et al. 1986
	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
+/-472	NC	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.45+/-0.058		Chapman et al. 1991
+/-657	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
+/-652	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
+/-252	SG	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
+/-315	*	Palos Verdes, CA	COA		Low density (0.2+/-0.14 N/0.1 sq.m.)	Echinoderm		2.64+/-0.77		Swartz et al. 1986
5	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5	*	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5	*	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
3	NC	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox (Photobacterium phosphoreum)		0.4		Chapman et al. 1991
5 +/-372	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
2 +/-757	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
5 +/-332	SG	Palos Verdes, CA	COA		Low density (365+/-178 N/0.1 sq.m.)	Polychaeta		3.15+/-1.32		Swartz et al. 1985a
0	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
6 +/-280	*	Palos Verdes, CA	COA		Low density (0.03+/-0.08 N/0.1 sq.m.)	Echinoderm		3.53+/-0.742		Swartz et al. 1985a
6 +/-280	*	Palos Verdes, CA	COA		Low density (0.233+/-0.367 N/0.1 sq.m.)	Foraminifera (sponge)		3.53+/-0.742		Swartz et al. 1985a
6 +/-280	*	Palos Verdes, CA	COA		Low density (0.3+/-0.8 N/0.1 sq.m.)	Ophiuroidea (brittle star)		3.53+/-0.742		Swartz et al. 1985a
1 +/-85.3	*	Laboratory	SSBA	72-h	LC50	Rhepoxynius spp.				Oakden et al. 1984a
5	SG	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
0 +/-925'	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
6 +/-8.6	NE	Norwalk River, CT	COA	96-h	Not toxic (0% mortality)	*Palaemonetes pugio (shrimp)*				Lee & Mariani 1977
0 +/-186	*	Palos Verdes, CA	COA		Low density (5.3+/-3.7 N/0.1 sq.m.)	Amphipod		3.13+/-0.15		Swartz et al. 1986
0 +/-186	*	Palos Verdes, CA	COA		Low density (0.13+/-0.23 N/0.1 sq.m.)	Phoxocephalid		3.13+/-0.15		Swartz et al. 1986
1	*	Palos Verdes, CA	COA		Low species richness (19.2 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
2 +/-115	*	Palos Verdes, CA	COA		Low species richness (26.0+/-11.5 S/0.1 sq.m.)	Macro benthos		3.95+/-0.238		Swartz et al. 1985a
2 +/-115	*	Palos Verdes, CA	COA		Low density (1.0+/-1.2 N/0.1 sq.m.)	Amphipod		3.95+/-0.238		Swartz et al. 1985a
2 +/-115	*	Palos Verdes, CA	COA		Low density (0 N/0.1 sq.m.)	Phoxocephalid		3.95+/-0.238		Swartz et al. 1985a
2 +/-115	*	Palos Verdes, CA	COA		Low density (8.7+/-6.01 N/0.1 sq.m.)	Crustacea		3.95+/-0.238		Swartz et al. 1985a
38 +/-394	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979

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I. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

c /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
394	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Leiostomus xantharus (spot)				Tsai et al. 1979
139	*	Palos Verdes, CA	COA		Low density (21.5+/-11.6 N/0.1 sq.m.)	Mollusca		4+/-0.265		Swartz et al. 1985a
139	*	Palos Verdes, CA	COA	10-d	Significantly toxic (21+/-6.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	4+/-0.265		Swartz et al. 1985a
	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	15		Bellar et al. 1986
	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
1600	NE	Gulf of Mexico	COA		Not toxic (3.21+/-0.239 diversity index)	Benthic species		0.464+/-0.143		Chapman et al. 1991
1373	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
1678	NE	Gulf of Mexico	COA		Least toxic (6.32+/-3.68 TU/g)	Microtox (Photobacterium phosphoreum)		0.47+/-0.149		Chapman et al. 1991
1227	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB'	1.87+/-0.208		Pastorok & Becker 1990
2230	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
2230	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
2229	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
1966	NE	Gulf of Mexico	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.471+/-0.18		Chapman et al. 1991
	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		15		Bellar et al. 1986
	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	15		Bellar et al. 1986
1940	*	Gulf of Mexico	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.5+/-0.155		Chapman et al. 1991
2098	*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
2098	*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
2219	*	Gulf of Mexico	COA	48-h	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	LAR	0.5+/-0.18		Chapman et al. 1991
2287	*	Gulf of Mexico	COA	48-h	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	LAR	0.567+/-0.153		Chapman et al. 1991
6626	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
6624	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
7561	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990

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1. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

aphthene ıc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-0.058	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
+/-0.021	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
+/-0.05	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
+/-0.025	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
+/-0.028	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
+/-0.033	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
+/-0.035	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
+/-0.163	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
+/-0.07	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
+/-0.106	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
+/-0.161	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
+/-0.16	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
+/-0.078	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
+/-0.229	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
+/-0.187	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
+/-0.336	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
+/-0.197	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
+/-0.441	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
+/-0.184	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
+/-0.499	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
+/-0.499	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
5 +/-1.21	SG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
1	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
1	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
1	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
1	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
1	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
1	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
7 +/-1.05	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
9 +/-0.665	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
2 +/-1.52	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
1 +/-0.707	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
2 +/-1.82	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
4 +/-1.51	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
3 +/-1.75	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
6 +/-1.86	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
8 +/-1.06	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8 +/-1.06	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8 +/-1.06	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8 +/-1.06	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4 +/-3.95	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992

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A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

hthene +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-1.6	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
/-2.5	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
/-2.15	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
/-3.83	NC	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
/-4.92	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
/-13.1	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
	NC	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
/-12.8	*	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
/-13	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
/-13.2	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
/-13.2	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
/-14.2	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
/-1	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
/-1	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
/-14.2	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
/-1.59	NC	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
/-15.9	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
/-1.02	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992

le 11. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

cenaphthene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
1.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
5	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
.71		*TEL*								
5.92 +/-11.8	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
7.28 +/-2.76	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
7.34 +/-19.9	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
8.7 +/-4.36	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
8.8 +/-5.3	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
9	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster, mussel	LAR			Long & Morgan 1990
9	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
9.38 +/-4.21	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al 1993
9.95 +/-5.42	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
10.2 +/-6.73	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
10.4 +/-4.63	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
11.8 +/-8.35	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
11.9 +/-7.88	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
12.2 +/-6.17	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
12.5	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
12.5	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
13.3 +/-7.31	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
13.7 +/-15.4	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
13.7 +/-16.5	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
13.7 +/-27.8	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992

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.. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

phthene .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-14.7	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
+/-17.4	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
+/-18.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
+/-21.1	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
+/-21.1	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
+/-15.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-15.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-22	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
+/-27.6	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
+/-29.2	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
+/-20.4	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
+/-26.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
+/-31.4	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
+/-33.4	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
+/-25.6	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
+/-25.6	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
+/-25.6	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
+/-44.4	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
+/-48.3	*	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
+/-39.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
+/-19	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
+/-49.9	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
+/-41.2	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
+/-41.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
+/-81.2	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
+/-59.4	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
+/-64.7	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	*	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
+/-41.8	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
+/-70	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
+/-102	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep

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: 11. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

:naphthene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
2.5 +/-43	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
63	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
7.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
8.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
0.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
0.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
1.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
80	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
80	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
80	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
80	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
5.9 +/-97	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
1.9		*PEL*								
0.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
0.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
.92 +/-130	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
2.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
2.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
6.6 +/-127	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
119 +/-105	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
127 +/-117	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
150	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
160	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
175 +/-187	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
210 +/-212	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
230 +/-220	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
247 +/-147	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
247 +/-147	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
283 +/-140	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
283 +/-140	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
293 +/-73.8	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
306 +/-604	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
350 +/-45.8	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
390	SG	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
390	SG	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
486 +/-714	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987

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A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

hthene +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
-1049	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
-469	SG	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
-814	*	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
-1030	*	United States	EqPA		Sediment Quality Criteria					Hansen et al. 1991d
-4271	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
-4271	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
-4271	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
-4271	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
-4271	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
-4271	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
-8532	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
-9146	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
-24392	NE	Eagle Harbor, WA	COA	10-d	Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
-8915	SG	Eagle Harbor, WA	COA	10-d	Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
-24017	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
-23838	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
-26866	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
	*	United States	EqPA		Chronic Marine Sediment Safe Level Criteria					Pavlou 1987
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
-31046	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
-46621	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
-48678	*	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990

le 12. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHYLENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

:enaphthylene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.04	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.04	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.048 +/-0.01	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.055 +/-0.007	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.062 +/-0.026	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.065 +/-0.025	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.072 +/-0.033	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.083 +/-0.032	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.115 +/-0.092	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.235 +/-0.086	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
0.44 +/-0.339	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
0.535 +/-0.7	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
0.7 +/-0.448	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
0.777 +/-0.806	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
0.83 +/-0.313	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
0.869 +/-0.696	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
1.08 +/-0.72	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
1.19 +/-0.16	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
1.27 +/-0.113	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
1.35 +/-1.72	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
1.48 +/-1.9	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
1.7 +/-1.55	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
1.75 +/-1.86	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.75 +/-1.86	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.87 +/-0.983	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
1.92 +/-2.55	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
1.99 +/-2.03	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
1.99 +/-2.03	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2 +/-1.17	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
2.26 +/-2.18	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
2.45 +/-4.94	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
2.61 +/-3.09	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
2.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
2.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
2.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
2.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
2.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
2.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
2.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
2.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
2.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
2.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992

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12. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHYLENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

aphthylene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
34 +/-3.96	NC	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
59 +/-4.04	NC	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
83 +/-4.71	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
99 +/-9.68	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
03 +/-10.8	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
14 +/-5.72	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
41 +/-9.73	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
41 +/-9.73	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992

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ıble 12. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHYLENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Acenaphthylene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
4.41 +/-9.55	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
4.68 +/-10.5	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
4.97 +/-10.4	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
5	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
5	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
5	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
5	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
5	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
5.55 +/-11.6	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
5.87		***TEL***								
6.2 +/-5.59	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
6.2 +/-5.59	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
6.2 +/-5.59	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
6.2 +/-5.59	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
6.89 +/-7.93	*	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
7.25 +/-8.22	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
7.52 +/-10.5	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
8.4 +/-10.1	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
9.83 +/-13.8	*	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
20	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
21 +/-31	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
21.4 +/-43.4	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
21.4 +/-43.4	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
26 +/-35.9	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
26.7 +/-35.4	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
36.8 +/-13.5	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
37	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	!		Bellar et al. 1986
>37	-	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		!		Bellar et al. 1986
>37	-	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	!		Bellar et al. 1986
41.3 +/-14.5	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
43	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		!		Bellar et al. 1986
43.4 +/-17	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
43.9 +/-12.7	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
44	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
44	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
44.4 +/-14.1	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
45.8 +/-19.2	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
47.4	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		!		Neff et al. 1987
50.4 +/-13.5	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
50.9 +/-14.9	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993

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2. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHYLENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

aphthylene nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
6 +/-26 2	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
:0	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
.0	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
.0	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
:4	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
7 +/-18.4	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
3 +/-20.1	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	*Significantly toxic (28.3+/-6.11% mortality)*	*Mysidopsis bahia (mysid)*		*0.246+/-0.051*	*127+/-24 ug/g*	*Windom In Prep*
'0 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
4 +/-56.2	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
7 +/-57.7	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
.5 +/-48.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
'5 +/-58.2	NE	Long Island Sound, NY, CT	COA	48-h	*Not significantly toxic (99.3+/-0.627% normal development)*	*Mulinia lateralis (bivalve)*	*LAR*	*1.43+/-0.738*	*14.7+/-24*	*Bricker et al. 1993*
.7 +/-166	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
.4 +/-158	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
.7 +/-72.2	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
:0	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
:0	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
:0	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
:0 +/-10	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
:0 +/-164	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
.1 +/-53.8	NC	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
.4 +/-62.6	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
.4 +/-62.6	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
39 +/-60.9	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
.3 +/-58.5	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
00	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
00	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
00 +/-63.3	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
01 +/-187	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
02 +/-135	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
02 +/-116	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993

ıle 12. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHYLENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ıcenaphthylene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
110 +/-160	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
112 +/-131	SG	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
120	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
120	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
122 +/-148	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
127 +/-92 9	*NE*	*Burrard Inlet, BC*	*COA*	*10-d*	*Not toxic (4.5+/-3.02% emergence)*	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
127 +/-92 9	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
127 +/-60	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
128		***PEL***								
129 +/-2750	SG	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
131 +/-131	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
131 +/-131	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
131 +/-131	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
132 +/-152	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	*2.23+/-1.04*	*25.4+/-25.5*	*Bricker et al. 1993*
139 +/-114	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
150 +/-219	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
158 +/-127	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
159 +/-176	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
>160	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
>160	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al 1990
167 +/-115	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
168 +/-186	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
179 +/-201	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
194 +/-184	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
195 +/-158	SG	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
207 +/-209	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
211 +/-207	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
236 +/-202	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
237 +/-308	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
250 +/-210	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
253 +/-220	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
253 +/-262	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
297 +/-236	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
470 +/-691	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
470 +/-691	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
548 +/-870	*	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
>560	-	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
>560	-	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
590	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
610 +/-773	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
640	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988

. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHYLENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

›hthylene :.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	•	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
+/-1420	•	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
	•	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	•	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
	•	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
	•	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
	•	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985

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e 13. A summary of the available data on the biological effects associated with sediment-sorbed ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

nthracene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
ι.03	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
065 +/-0.007	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
065 +/-0 013	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
065 +/-0.021	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
095 +/-0 073	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
115 +/-0.065	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0 811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
).16 +/-0.68	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
163 +/-0.096	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
).35 +/-0.453	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
).57 +/-0.113	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
).77 +/-0.365	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
1.12 +/-0.765	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.12 +/-0.77	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.31 +/-0.752	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
1.31 +/-0.752	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
1.54 +/-0.919	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0 939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
1 57 +/-2.18	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
1.73 +/-0 974	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
1.76 +/-1.75	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
1.94 +/-1.5	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
2 04 +/-2.30	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
2.69 +/-4.34	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
2.92 +/-0.834	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
2.98 +/-0.6	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
3.04 +/-3.3	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
3.2 +/-3.53	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
3.67 +/-2.41	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
3 83 +/-2.64	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1 63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
3.83 +/-6.58	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
3.86 +/-5.1	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
4.17 +/-5 75	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
4 33 +/-3.7	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0 934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
4.45 +/-4.73	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
4.57 +/-7.11	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992

3. A summary of the available data on the biological effects associated with sediment-sorbed ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

racene .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6:41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
+/-15	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
+/-15.5	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992

le 13. A summary of the available data on the biological effects associated with sediment-sorbed ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

nthracene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5.99 +/-15.7	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
5.99 +/-15.7	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
7.76 +/-16.9	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
9.14 +/-18.8	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
10	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
11 +/-14.9	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
12.5 +/-22.7	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
13.3 +/-8.3	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
13.6 +/-9.71	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
13.6 +/-9.71	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
13.6 +/-9.71	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
13.6 +/-9.71	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
14.9 +/-31.8	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
15.4 +/-7.5	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
16.9 +/-30.9	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
18.2 +/-17.8	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
20 +/-31.4	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
21 +/-39.3	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
24	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
29.1 +/-4.37	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
34.3 +/-41.2	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
34.8 +/-49.4	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
34.8 +/-49.4	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
35.9 +/-52.2	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
36.8 +/-11.5	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
42.5 +/-16.8	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
43 +/-17.3	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
43 +/-26	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
44.1 +/-14.4	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
46.1 +/-19.5	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
46.3 +/-18.5	NG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
6.9		*TEL*								
50 +/-14.2	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
51.3 +/-24.8	NC	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
52.5 +/-20.2	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
54.7 +/-43.6	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
54.7 +/-43.6	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
55.4 +/-47.7	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
56	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
56 +/-130	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
59.3 +/-23	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
59.7 +/-43.4	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993

3. A summary of the available data on the biological effects associated with sediment-sorbed ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

racene .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
+/-72	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
+/-58.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
+/-63.4	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
+/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
+/-67.6	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
+/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
+/-80.3	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
+/-69.9	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
+/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
+/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
+/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
+/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
+/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
+/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
+/-117	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
+/-117	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
+/-84.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-84.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-77.8	SG	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
+/-119	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
+/-74.8	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
ı	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
ı	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
ı	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
ı	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
+/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
+/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
+/-140	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
)	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
)	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
+/-124	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990

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le 13. A summary of the available data on the biological effects associated with sediment-sorbed ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

nthracene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
104 +/-124	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
109 +/-153	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendrastet excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
110 +/-257	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
119 +/-277	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
120 +/-269	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
126 +/-149	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
130	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
139 +/-177	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
145 +/-162	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
148 +/-148	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
150	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
150	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
150	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
150	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
150	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
150	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
163	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		1		Neff et al. 1987
166 +/-177	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
166 +/-177	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
166 +/-177	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
169 +/-213	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
170 +/-188	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
179 +/-184	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
180 +/-191	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
184 +/-347	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
190	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
202 +/-142	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
208 +/-208	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
219 +/-201	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
220 +/-200	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
225 +/-131	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
226 +/-268	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
227 +/-198	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
237 +/-455	*	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
241 +/-265	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
245		*PEL*								
260	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
260	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
265 +/-228	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
266 +/-270	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
267 +/-204	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993

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I. A summary of the available data on the biological effects associated with sediment-sorbed ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

racene .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-321	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
+/-207	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
+/-208	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
+/-355	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
+/-353	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
+/-370	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
+/-719	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
+/-719	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
+/-549	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
+/-1043	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
	*	Puget Sound, WA	SQG		Low Abundance Threshold Concentration	Praxillella gracilis (polycheata)		3.0		Tetra Tech 1986
	*	Puget Sound, WA	SQG		Low Abundance Threshold Concentration	Euphilomedes producta (ostracoda)		7.0		Tetra Tech 1986
+/-809	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
+/-1498	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
+/-558	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	*	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
+/-1582	NC	Eagle Harbor, WA	COA	10-d	Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
+/-5389	NE	Eagle Harbor, WA	COA	10-d	Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
+/-3492	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
+/-3492	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
+/-4031	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
+/-6464	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
+/-6976	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
+/-9462	*	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
+/-13470	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
+/-13460	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
+/-4730	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-4730	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-4730	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-4730	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-4730	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985

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ble 13. A summary of the available data on the biological effects associated with sediment-sorbed ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
7371 +/-4730	•	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
7597 +/-7264	•	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
9436 +/-15005	•	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
9800 +/-15107	•	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
1000	•	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
3000	•	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
4110 +/-16780	•	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
5567 +/-24642	•	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
4000	•	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
3000	•	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990

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t. A summary of the available data on the biological effects associated with sediment-sorbed FLUORENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

iorene ıc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
›	NC	Mobile Bay, AL	COA	.	Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
5 +/-0 049	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
I +/-0 044	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
5 +/-0 049	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
3 +/-0.116	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
4 +/-0 084	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
3 +/-0 143	SG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
5 +/-0 184	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
3 +/-0 232	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		-1.64+/-0.4	1.39+/-0.17	Carr 1992
5 +/-0 24	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
3 +/-0 849	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
4 +/-0 44	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
4 +/-0 437	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
: +/-0 622	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
! +/-0 551	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
7 +/-1.38	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
4 +/-1 06	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
3 +/-1.9	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
I +/-1.05	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
5 +/-1.06	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
7	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
5 +/-0 254	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
3 +/-1.18	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3 +/-1.18	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
I +/-2 96	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
2 +/-1 57	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
2 +/-1.43	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
I +/-5.11	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
3 +/-10 2	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
3 +/-9 93	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0 00203 sq.m.)	Amphipoda		0 859+/-0.487	7.67+/-8.12	Carr 1992
5 +/-4.92	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
3 +/-10 2	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
5 +/-11	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
2 +/-10.3	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
2 +/-10.3	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
4 +/-3.44	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
7 +/-6.42	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
4 +/-3.3	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
4 +/-3.9	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
5 +/-4.29	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
4 +/-11.4	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
9 +/-3 11	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992

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ole 14. A summary of the available data on the biological effects associated with sediment-sorbed FLUORENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Fluorene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
4.59 +/-3.11	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4.59 +/-3.11	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4.59 +/-3.11	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.57+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992.
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
4.95	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
4.95	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992

. A summary of the available data on the biological effects associated with sediment-sorbed FLUORENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

orene :+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	*Chesapeake Bay, VA, MD*	*COA*	*20-d*	*Significantly toxic (0.003 mg/day growth)*	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
+/-6.53	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
+/-12.4	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
+/-5.99	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
+/-4.02	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
+/-4.5	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-15.4	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
+/-16.3	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
+/-1.77	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
+/-8.24	SG	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
+/-21.4	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
	*	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
+/-4.43	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
+/-22.5	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-7.08	NE	Long Island Sound, NY, CT	COA	10-d	*Not significantly toxic (19.3+/-5.86% mortality)*	*Ampelisca abidta (amphipod)*	*SUBADT*	*1.82+/-0.225*	*6.3+/-6.2*	Bricker et al. 1993
+/-6.61	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
+/-7.87	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
+/-6.9	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
+/-39.3	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
	*	*California*	AETA		California AET Values	Benthic species				Becker et al. 1990
	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
+/-30	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-8.86	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
2 +/-29.3	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
2 +/-29.3	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
5 +/-7.02	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
1 +/-7.82	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
		TEL								
2	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
3 +/-13.9	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
4 +/-20.4	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
6 +/-22.8	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
6 +/-26.2	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993

14. A summary of the available data on the biological effects associated with sediment-sorbed FLUORENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Fluorene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
24.9 +/-10.3	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
25.2 +/-25.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
26 +/-27.[illegible]	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
28 +/-37.4	*	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
29.1 +/-48.3	NC	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
29.5 +/-21.4	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
31 +/-39.4	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
31.3 +/-36.2	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
32.5 +/-29	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
32.5 +/-29	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
32.9 +/-30.1	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
33.3 +/-76.7	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
34	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
34	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
34	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
34	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
34	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
34	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
34.3 +/-45.3	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
34.7 +/-64.0	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
34.8 +/-32.1	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
36	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
36	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
36	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
38.3 +/-20.2	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
38.3 +/-20.2	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
38.9 +/-34.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
39.2 +/-49.3	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
42.6 +/-50.8	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
43	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
46.9 +/-21.8	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
47 +/-21.2	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
47 +/-21.2	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
47.5 +/-21.7	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
49.6 +/-61.6	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
50	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
50 +/-93.3	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
50 +/-93.3	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
50.9 +/-41.1	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
58.4 +/-39	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
58.4 +/-39.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
58.8 +/-65.3	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
59	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987

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A summary of the available data on the biological effects associated with sediment-sorbed FLUORENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

rene +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-65.4	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
+/-69.3	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
+/-108	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
+/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
+/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
+/-37.8	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
+/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
+/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
+/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
+/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
+/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
+/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
+/-96.8	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
+/-35	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
+/-43.5	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
+/-76.1	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
+/-132	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
	NE	Tampa Bay, FL	COA		*Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)*	*Microtox (Photobacterium phosphoreum)*		1.89+/-0.902		Long 1993
	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
+/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
+/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		1		Neff et al. 1987
+/-165	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
+/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
+/-113	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
+/-119	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
		PEL								
+/-167	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
+/-167	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
+/-167	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
+/-131	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
+/-210	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
+/-231	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
+/-231	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991

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ble 14. A summary of the available data on the biological effects associated with sediment-sorbed FLUORENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Fluorene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
160	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		†		Pavlou et al. 1987
160 +/-208	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
162 +/-105	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
167 +/-240	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
187 +/-234	NC	Eagle Harbor, WA	COA	10-d	Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
197 +/-191	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
200 +/-260	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
210	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
210	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
210	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
210	*	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
230	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		†		WDE 1989
235 +/-206	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
290 +/-219	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
320 +/-220	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
353 +/-746	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
396	NE	Laboratory	SSBA	~4-m	No significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
500	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
500	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
540	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
540	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
640	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
707 +/-1341	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
1000	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
1017 +/-4679	NE	Eagle Harbor, WA	COA	10-d	Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
3324 +/-8573	*	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
3600	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
3805 +/-8840	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
4013 +/-4938	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
4013 +/-4938	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
4013 +/-4938	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
4013 +/-4938	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
4013 +/-4938	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
4013 +/-4938	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
4338 +/-9495	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
7000	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		†		Bolton et al. 1985
7303 +/-10320	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
8485 +/-13901	*	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
10186 +/-24872	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
11438 +/-24689	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
13527 +/-18106	NE	Laboratory	SSBA	~4-m	No significant change in kidney MFO induction	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
14600	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
14600	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990

4. A summary of the available data on the biological effects associated with sediment-sorbed FLUORENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

uorene ıc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0 +/-27810	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
1 +/-65559	*	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
2 +/-32084	*	Puget Sound, WA	COA	10-d	Significantly toxic (80 8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
8 +/-21387	NE	Laboratory	SSBA	~4-m	No significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
7 +/-48148	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
0	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
0	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
3 +/-252275	*	Laboratory	SSBA	~4-m	Significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
7 +/-265181	*	Laboratory	SSBA	~4-m	Significant increase in kidney MFO induction	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
5 +/-229668	*	Laboratory	SSBA	~4-m	Significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988

le 15. A summary of the available data on the biological effects associated with sediment-sorbed 2-METHYLNAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

ethylnaphthalene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.44	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.75 +/-0.28	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.872 +/-0.354	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.902 +/-0.796	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
1.05 +/-0.978	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
1.05 +/-0.339	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
1.5 +/-0.658	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
1.62 +/-1.02	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
1.75	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
1.75	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
1.75	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
1.75	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
1.75	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
1.75	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
1.75 +/-0.546	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
1.82 +/-0.577	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
1.84 +/-0.955	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
1.88 +/-2.04	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
2.05 +/-1.23	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
2.65 +/-0.93	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2.65 +/-0.93	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2.76 +/-0.014	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
2.95 +/-0.323	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
4.31 +/-2.65	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4.31 +/-2.65	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4.31 +/-2.65	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4.31 +/-2.65	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4.39 +/-4.85	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992

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A summary of the available data on the biological effects associated with sediment-sorbed 2-METHYLNAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

naphthalene ic.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
.6	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
.6	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
.6	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
.6	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
.6	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
.6	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
.6	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
1.6	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
1.6	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
1.6	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
1.6	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
1.6	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
1.6	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
1.6	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
1.6	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
1.6	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
1.6	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
1.6	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
5.1 +/-6.76	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
05 +/-6.77	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
18 +/-8.69	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
23 +/-6	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
8.2 +/-11.6	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
8.2 +/-11.6	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
.57 +/-10.7	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
9.9 +/-4.85	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
1.3 +/-6.81	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
2.7 +/-5.25	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
6.4 +/-33.3	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
6.8 +/-3.86	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
0.2 +/-6.8	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990

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ıle 15. A summary of the available data on the biological effects associated with sediment-sorbed 2-METHYLNAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Iethylnaphthalene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
20.2		*TEL*								
23.5 +/-5.36	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
23.7 +/-3.5	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
23.9 +/-3.69	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
25	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
25.1 +/-5.4	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
25.4 +/-7.03	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
25.5 +/-22.7	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
27	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
28.2 +/-7.91	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
28.5 +/-20.9	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
28.7 +/-18.5	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
28.8 +/-21.2	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
30.1 +/-8.67	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
30.5 +/-33.2	NC	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
30.5 +/-8.64	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
30.6 +/-3.67	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
31.6 +/-25	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
31.7 +/-30.8	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
32.3 +/-41.2	NC	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
32.5 +/-28.5	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
33.8 +/-27.1	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
34.1 +/-7.68	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
34.2 +/-33.2	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
34.9 +/-35.7	SG	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
35.1 +/-22.5	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
35.1 +/-6.79	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
35.4 +/-31.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
35.4 +/-31.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
38.5 +/-35.4	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
45	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
45	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
45	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
45	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
47.4 +/-63.1	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
48.7 +/-67.5	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
52.4 +/-63.6	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
56.9 +/-71.3	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
64.9 +/-154	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
66.4 +/-76.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
67	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep

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5. A summary of the available data on the biological effects associated with sediment-sorbed 2-METHYLNAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ylnaphthalene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
58.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
70	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
70	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
70 +/-10.5	NC	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
70.5 +/-67.9	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
72.1 +/-11.1	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
72.2 +/-11.5	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
73.4 +/-86	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
73.8 +/-11.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
73.8 +/-11.3	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
74.2 +/-13.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
75.6 +/-81.9	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
77.1 +/-58.5	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
85	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
95.2 +/-90.3	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
98.3 +/-41.2	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
102 +/-114	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
102 +/-108	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
102 +/-98.2	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
114 +/-97	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
120 +/-139	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
126 +/-100	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
127 +/-99.8	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
130	-	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
130	-	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
130	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
151 +/-97.2	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
165 +/-121	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
168 +/-169	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
175 +/-89.9	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
201		*PEL*								
207 +/-169	SG	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
213 +/-129	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
326 +/-313	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
380	*	Puget Sound, WA	SQG		Low Abundance Threshold Concentration	Praxillella gracilis (polycheata)		3.0		Tetra Tech 1986

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ble 15. A summary of the available data on the biological effects associated with sediment-sorbed 2-METHYLNAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

›lethylnaphthalene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
380	*	Puget Sound, WA	SQG		Low Abundance Threshold Concentration	Euphilomedes producta (ostracoda)		7.0		Tetra Tech 1986
546 +/-490	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
565	*	Puget Sound, WA	SQG		Low Abundance Threshold Concentration	Nucula tenuis (pelecypoda)		4.0		Tetra Tech 1986
640	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
670	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
670	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
670	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
920 +/-2192	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
1052 +/-1213	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
1052 +/-1213	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
1052 +/-1213	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
1052 +/-1213	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
1052 +/-1213	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
1052 +/-1213	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
1062 +/-2350	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
1400	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
1900	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
2728 +/-6771	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
2987 +/-6717	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
3965 +/-7598	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
5932 +/-8856	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
7709 +/-13242	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
23000	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990

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6. A summary of the available data on the biological effects associated with sediment-sorbed NAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

thalene .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
+/-0.24	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
+/-0.544	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
+/-0.775	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
+/-0.304	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
+/-0.17	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
+/-1.14	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
+/-0.43	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
+/-0.433	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
+/-0.747	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
+/-0.961	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
+/-0.265	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
+/-0.342	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
+/-0.792	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
+/-0.774	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
+/-0.66	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
+/-1.08	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
+/-0.426	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
+/-1.81	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
+/-0.718	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992

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ible 16. A summary of the available data on the biological effects associated with sediment-sorbed NAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Naphthalene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
2.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
2.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
2.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
2.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
2.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
2.33 +/-1.84	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
2.33 +/-0.442	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
2.36 +/-1.19	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
2.36 +/-2.06	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
2.51 +/-1.16	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2.51 +/-1.16	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2.68 +/-1.81	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
2.71 +/-2.01	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
2.71 +/-1.84	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
2.71 +/-1.84	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
2.72 +/-3.25	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
2.75 +/-1.99	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
2.96 +/-2.14	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
2.98 +/-1.62	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
3.05 +/-1.32	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
3.81 +/-3.61	*	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
4.09 +/-4.71	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
4.19 +/-0.276	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
4.46 +/-0.52	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
4.54 +/-5.15	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991

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16. A summary of the available data on the biological effects associated with sediment-sorbed NAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ithalene c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
;	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
;	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
;	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
! +/-6.26	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
t -/-4.71	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
! +/-3.29	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
: -/-3.29	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
: -/-3.29	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
: +/-3.29	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
) -/-4.64	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
-/-16.1	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-5.78	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
+/-5.37	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
+/-7.2	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
+/-6.8	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
+/-6.7	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
+/-8.05	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
-/-35.9	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
-/-35.9	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
-/-35.9	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
-/-14.3	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
+/-14.3	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
	SG	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
-/-6.33	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
-/-9.92	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
-/-10.3	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
		TEL								
+/-6.92	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
+/-8.71	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
+/-6.19	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
+/-9.6	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
+/-9.38	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
+/-24.9	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
+/-32.1	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
+/-9.31	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
-/-29.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993

16. A summary of the available data on the biological effects associated with sediment-sorbed NAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

phthalene nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
2.7 +/-38	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
3.1 +/-26 2	NC	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
3.3 +/-8.18	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al 1993
5.2 +/-38.2	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
5.2 +/-38.2	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
48 +/-24.7	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
3 1 +/-33.6	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
51	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
3.4 +/-40.0	NC	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
3 4 +/-37.6	NC	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
7 9 +/-50.6	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
59 +/-66.4	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
9.5 +/-38.1	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
60 +/-107	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al 1990
60 +/-107	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
1.6 +/-77.0	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
3.2 +/-57.2	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
64 +/-45.8	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
5.2 +/-53.5	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
5.1 +/-72.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al 1993
7.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
3.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
70	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
70	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
70	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
0.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
0 6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
1.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
7.3 +/-181	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
8.3 +/-123	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
8.9 +/-94.4	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
79	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
0.5 +/-88.0	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
6.2 +/-82.3	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
0.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
0.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep

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A summary of the available data on the biological effects associated with sediment-sorbed NAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

alene /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-76.4	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
/-97	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
/-95.9	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
/-73.5	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
/-15.6	SG	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
/-116	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
/-92	SG	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
/-106	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
/-110	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
/-32.4	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-105	SG	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
/-155	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
/-117	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
/-110	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
/-152	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
/-114	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
/-115	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
/-134	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster, mussel	LAR			Long & Morgan 1990
	-	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
/-191	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
/-191	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
/-112	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
/-107	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
/-201	NC	Eagle Harbor, WA	COA	10-d	Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
/-326	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
		PEL								
	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		1		Neff et al. 1987
/-682	NE	Eagle Harbor, WA	COA	10-d	Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989

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ble 16. A summary of the available data on the biological effects associated with sediment-sorbed NAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

laphthalene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
500	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
505 +/-681	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
505 +/-681	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
510 +/-499	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
513 +/-403	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
522 +/-247	NC	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
561 +/-561	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
593 +/-505	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
594 +/-424	*	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
617 +/-322	SG	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
663 +/-739	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
720	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
>930	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
>930	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
>930	-	California	AETA		California AET Values	Benthic species				Becker et al. 1990
>930	-	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
973 +/-1041	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
990	NE	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
100	*	Puget Sound, WA	SQG		Low Abundance Threshold Concentration	Praxillella gracilis (polycheata)		3.0		Tetra Tech 1986
300	*	Puget Sound, WA	SQG		Low Abundance Threshold Concentration	Euphilomedes producta (ostracoda)		7.0		Tetra Tech 1986
400	*	Puget Sound, WA	SQG		Low Abundance Threshold Concentration	Nucula tenuis (pelecypoda)		4.0		Tetra Tech 1986
500	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
500	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
501 +/-2064	*	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
564 +/-1735	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
100	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)	.			PTI 1988
100	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
100	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
163 +/-4847	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
280 +/-2497	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
280 +/-2497	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
280 +/-2497	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
280 +/-2497	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
280 +/-2497	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
280 +/-2497	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
100	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
475 +/-5199	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
700	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
164 +/-15231	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
351 +/-15111	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
500	NE	Laboratory	SSBA	~4-m	No significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
080 +/-17076	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990

A summary of the available data on the biological effects associated with sediment-sorbed NAPHTHALENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

...alene +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
/-19838	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
/-29855	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
/-4313	*	Laboratory	SSBA	~4-m	Significant increase in kidney MFO induction	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
/-4313	*	Laboratory	SSBA	~4-m	Significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
/-4313	*	Laboratory	SSBA	~4-m	Significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
/-46241	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990

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ıble 17. A summary of the available data on the biological effects associated with sediment-sorbed PHENANTHRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

Phenanthrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.36	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.635 +/-0.417	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.705 +/-0.343	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.892 +/-0.22	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.923 +/-0.3	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.94 +/-0.085	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
1.01 +/-0.116	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
1.07 +/-0.127	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
3.38 +/-4.26	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
3.6 +/-4.53	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
3.7 +/-1.36	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
3.78 +/-0.912	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
4.32 +/-1.67	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
4.32 +/-1.67	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
4.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
4.6	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
4.6	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992

7. A summary of the available data on the biological effects associated with sediment-sorbed PHENANTHRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

nthrene :+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
+/-1.6	NE	Laboratory	SSBA	~4-m	No significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
+/-5.01	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
+/-3.81	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
+/-1.2	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
+/-5.26	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
+/-1.35	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
+/-6.1	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
+/-5.79	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
+/-10.1	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
+/-17.5	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
+/-12.6	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
+/-9.34	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
+/-9.34	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
[illegible] +/-18.7	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
[illegible] +/-18.8	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
[illegible] +/-10	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
5	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
3 +/-12.7	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3 +/-12.7	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3 +/-12.7	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3 +/-12.7	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
6 +/-20.5	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
5 +/-46.2	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
0	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990

ble 17. A summary of the available data on the biological effects associated with sediment-sorbed PHENANTHRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

'henanthrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
20.5 +/-17.9	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
21 +/-20	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
21.7 +/-47.2	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
22 +/-23	SG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
22.2 +/-48	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
22.2 +/-48	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
24.4 +/-51.6	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
27 +/-34.4	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
28.1 +/-19.4	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
28.2 +/-57.6	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
37.7 +/-70.8	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
39.4 +/-47.6	NE	Laboratory	SSBA	~4-m	No significant change in kidney MFO induction	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
48.1 +/-99.2	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
50.6 +/-53.9	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
52.3 +/-97.3	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
62.1 +/-97.8	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
64.6	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
66.2 +/-57.5	NE	Laboratory	SSBA	~4-m	No significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
67.8 +/-122	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
86.7		*TEL*								
88	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
90	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
94 +/-53.7	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
100	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
100	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
100 +/-28	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993

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7. A summary of the available data on the biological effects associated with sediment-sorbed PHENANTHRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

nthrene :+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom in Prep
	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
+/-11.5	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
+/-164	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
+/-164	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
+/-30.7	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-120	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
+/-54	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
+/-49.1	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
+/-65.5	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
+/-68	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
+/-85.6	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
+/-90.4	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
+/-110	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
+/-95	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
+/-325	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
+/-53.8	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
+/-92.9	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
+/-149	SG	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-136	SG	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
+/-169	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
+/-169	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-193	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
+/-93.4	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
	SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	SG	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990

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ɔle 17. A summary of the available data on the biological effects associated with sediment-sorbed PHENANTHRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

henanthrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
235 +/-203	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
238 +/-214	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
240	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
240	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
240 +/-227	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
242	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
244 +/-200	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
244 +/-200	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
246 +/-199	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
249 +/-242	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
261 +/-291	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
267 +/-155	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
270	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
270	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
290	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
291 +/-246	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
291 +/-246	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
294 +/-233	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
297	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
308 +/-258	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
312 +/-246	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
316 +/-582	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
318 +/-291	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
320	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
37 +/-364	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
68	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		1		Neff et al. 1987
69 +/-329	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
74 +/-461	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
83 +/-332	*	Laboratory	SSBA	~4-m	Significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
84 +/-267	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
08 +/-501	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
08 +/-501	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
10 +/-498	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
13 +/-402	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
17 +/-246	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
18 +/-241	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
21 +/-363	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
53 +/-477	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
75	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
78	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
33 +/-630	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
34 +/-198	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993

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7. A summary of the available data on the biological effects associated with sediment-sorbed PHENANTHRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

nthrene .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-318	*	Laboratory	SSBA	~4-m	Significant increase in kidney MFO induction	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
+/-228	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	*	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
+/-549	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
		PEL								
+/-750	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
	*	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
+/-350	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
	*	Laboratory	SSBA	~4-m	Significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
+/-953	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
+/-1395	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
+/-1395	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
+/-949	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
+/-1654	*	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
	*	United States	EqPA		Interim Marine Sediment Quality Criteria (FCV)	Benthic community		1		EPA 1988
+/-1430	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
+/-1547	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
+/-2528	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
+/-2526	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
+/-2545	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
+/-1530	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
+/-1600	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
+/-665	*	United States	EqPA		Sediment Quality Criteria					Hansen et al. 1991c
+/-2920	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
+/-2693	*	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
	NC	Eagle Harbor, WA	COA	10-d	Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
	NE	Eagle Harbor, WA	COA	10-d	Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
+/-20580	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
+/-22172	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990

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able 17. A summary of the available data on the biological effects associated with sediment-sorbed PHENANTHRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Phenanthrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
11656 +/-14472	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
11656 +/-14472	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
11656 +/-14472	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
11656 +/-14472	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
11656 +/-14472	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
11656 +/-14472	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
14000	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
14000	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
23652 +/-53103	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
27082 +/-52754	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
33603	*	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
35916 +/-58952	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
45903 +/-64909	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
53733 +/-66465	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
54667 +/-100062	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
1800	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
1800	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
0000	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
4000	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990

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3. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL LOW MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

LMWPAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
4	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
5 +/-5.74	NE	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.42+/-0.13		Chapman et al. 1991
2 +/-413	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
6 +/-4.75	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
5 +/-1.11	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
8 +/-6 08	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
3 +/-1	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
7 +/-1 52	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
1 +/-2.9	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		.1.64+/-0.4	1.39+/-0.17	Carr 1992
9 +/-2.86	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
6 +/-3.09	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
3 +/-9.11	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
3 +/-4.31	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
3 +/-5.29	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
3 +/-5.29	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
2 +/-8.2	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
2 +/-19.9	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
5 +/-12 3	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
9 +/-34	NE	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	0.443+/-0.127		Chapman et al. 1991
9 +/-11.9	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
5 +/-29 5	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
2 +/-10 7	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
4 +/-10.5	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
5 +/-45 8	NE	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	0.425+/-0.128		Chapman et al. 1991
7 +/-1 93	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
3 +/-1.62	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
)	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
)	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
4 +/-53.8	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992

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ble 18. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL LOW MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

otal LMWPAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
34.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
34.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
34.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
35.5 +/-57.6	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
36.3 +/-16.6	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
36.3 +/-16.6	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
38.9 +/-78.7	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
39.8 +/-44.6	NC	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.45+/-0.058		Chapman et al. 1991
41.7	SG	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
44.8 +/-82.1	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
45	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
45.7 +/-83.5	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
45.7 +/-83.5	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
50 +/-89.7	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992

8. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL LOW MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

LMWPAHs nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
4 +/-67.8	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
8 +/-38 1	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.8 +/-38.1	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8 +/-38 1	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.8 +/-38.1	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.8 +/-58.9	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
2 +/-99 3	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
0	NC	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox (Photobacterium phosphoreum)		0.4		Chapman et al. 1991
8 +/-64 5	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
1 +/-70 8	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
9 +/-43	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
3 +/-48 6	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
3 +/-118	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
5 +/-71.4	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
7 +/-146	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
7 +/-102	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
8 +/-142	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
3 +/-66.3	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
2 +/-180	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
7 +/-161	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
5 +/-96	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
7 +/-173	SG	Galveston Bay; TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
) +/-45 2	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
3 +/-49 5	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
)	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster, mussel	LAR			Long & Morgan 1990
1 +/-41.0	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
5 +/-359	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
5 +/-359	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
) +/-162	NC	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
7	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
3 +/-705	NE	Gulf of Mexico	COA		Not toxic (3.21+/-0.239 diversity index)	Benthic species		0.464+/-0.143		Chapman et al. 1991
		TEL								
)	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
)	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
3 +/-739	NE	Gulf of Mexico	COA		Least toxic (6.32+/-3.68 TU/g)	Microtox (Photobacterium phosphoreum)		0.47+/-0.149		Chapman et al. 1991
2 +/-72 1	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
5 +/-220	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
) +/-98	NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
7	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
7	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
5 +/-77	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
3	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985

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able 18. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL LOW MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Total LMWPAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
358	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
358	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
358	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
358	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
358	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
361 +/-281	NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
371 +/-102	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
376 +/-83	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
383 +/-302	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
391 +/-104	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
395 +/-136	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
407	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		!		Beller et al. 1986
418 +/-99.1	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
435 +/-135	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
440	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
454 +/-869	NE	Gulf of Mexico	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.471+/-0.18		Chapman et al. 1991
465 +/-770	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
480	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
482 +/-163	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
500	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
500	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
509 +/-310	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
510 +/-28	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
516 +/-425	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
521 +/-495	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
524 +/-461	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
530	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
532 +/-845	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
538 +/-483	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
540 +/-23.1	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
547 +/-23.1	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
547 +/-326	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
552 +/-912	*	Gulf of Mexico	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.5+/-0.155		Chapman et al. 1991
557 +/-768	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
560	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
560	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
560 +/-130	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
564 +/-70.7	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
568 +/-79.3	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
570 +/-75.6	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
571 +/-84.1	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
578 +/-97.2	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep

18. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL LOW MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

LMWPAHs onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
579 +/-77.2	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
590 +/-95	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
594 +/-600	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
596 +/-823	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
610	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
624 +/-951	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
633 +/-745	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
638 +/-542	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
638 +/-542	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
661 +/-887	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
666 +/-515	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
80	NE	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota				USACOE 1988
82 +/-838	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
24 +/-194	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
24 +/-194	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8 00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
39 +/-710	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
43 +/-205	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
43 +/-205	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
55 +/-1005	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
00	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
00	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
05 +/-1063	*	Gulf of Mexico	COA	48-h	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	LAR	0.5+/-0.18		Chapman et al. 1991
52 +/-823	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
72 +/-118	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
33	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
33	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
10	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
10	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
12	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
12	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
20 +/-2280	*	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
39 +/-943	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
19 +/-943	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
36 +/-1172	*	Gulf of Mexico	COA	48-h	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	LAR	0.567+/-0.153		Chapman et al. 1991
55 +/-1326	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
54 +/-1030	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
33 +/-1196	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
35 +/-1054	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
98 +/-1590	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
00 +/-1312	*	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
51 +/-1239	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
72 +/-1038	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993

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Table 18. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL LOW MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Total LMWPAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1376 +/-1042	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
1408 +/-878	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
1408 +/-1515	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
1430	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
1442		*PEL*								
1602 +/-1411	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
1643 +/-1030	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
1800 +/-1002	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
1824 +/-1993	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
1952 +/-2042	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
1985 +/-2707	NE	Puget Sound, WA	COA	28-d	Not significantly toxic (1.44+/-1.74% mortality)	Dendraster excentricus (sand dollar)	JUV			Casillas et al. 1992
1985 +/-2707	NE	Puget Sound, WA	COA	28-d	Not significantly toxic (0.055+/-0.024% growth mm/d)	Dendraster excentricus (sand dollar)	JUV			Casillas et al. 1992
2003 +/-1405	SG	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
2031 +/-1316	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
2050 +/-2360	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
2100	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
2100	*	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
2100	NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
2192	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
2196	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
2280 +/-1195	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
2280 +/-1195	SG	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
2650 +/-2540	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
2761	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
2761	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
2800	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
2890 +/-2650	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
2960	*	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a
3139	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
3143	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
3160	*	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
3160	*	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
3609	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
3700	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
3835 +/-4851	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
5200	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
5200	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
6100	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
6977 +/-8437	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
8390	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
8390	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
9910	*	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987

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A summary of the available data on the biological effects associated with sediment-sorbed TOTAL LOW MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

MWPAHs c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NC	Eagle Harbor, WA	COA	10-d	Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
	NE	Eagle Harbor, WA	COA	10-d	Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	*	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
+/-51703	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
+/-55721	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-136404	NE	Puget Sound, WA	CDA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
+/-135428	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
+/-151987	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
	*	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
+/-173451	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
+/-260204	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
+/-717388	*	Puget Sound, WA	COA	28-d	Significantly toxic (69.5+/-33.3% mortality)	Dendraster exentricus (sand dollar)	JUV			Casillas et al. 1992
+/-717388	*	Puget Sound, WA	COA	28-d	Significantly toxic (0.013+/-0.006% growth mm/d)	Dendraster exentricus (sand dollar)	JUV			Casillas et al. 1992
	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990

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able 19. A summary of the available data on the biological effects associated with sediment-sorbed BENZ(a)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

enz(a)anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.02	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.095 +/-0.021	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.103 +/-0.015	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.11	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.218 +/-0.137	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.265 +/-0.132	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.32 +/-0.297	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.376 +/-0.166	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.387 +/-0.23	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.905 +/-0.601	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
1.96 +/-1.09	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
2.95 +/-2.18	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
2.95 +/-2.18	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
3.24 +/-1.33	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
3.44 +/-3.16	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3.44 +/-3.16	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3.79 +/-2	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
4.08 +/-5.24	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
4.08 +/-5.59	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
4.1 +/-5.76	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
4.48 +/-4.68	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
4.78 +/-3.88	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
<5	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
<5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
8.42 +/-18.6	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
8.62 +/-11.2	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.91% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992

. A summary of the available data on the biological effects associated with sediment-sorbed BENZ(a)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

anthracene :.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41.	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
3 +/-10.5	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
9 +/-12.4	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
8 +/-2.51	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
3 +/-9.42	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
9 +/-3.23	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
2 +/-20	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
6 +/-9.12	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
8 +/-14.6	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
1 +/-6.03	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
4 +/-17.1	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
5 +/-10.1	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
4 +/-63.3	SG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
8 +/-64.2	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992

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: 19. A summary of the available data on the biological effects associated with sediment-sorbed BENZ(a)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

:(a)anthracene :onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
21.4 +/-65.3	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
21.4 +/-65.3	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
24.2 +/-70.4	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
29.3 +/-78.6	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
30.1 +/-25	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
30.1 +/-25	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
30.1 +/-25	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
30.1 +/-25	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
45.3 +/-96.7	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
45.3 +/-18.9	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
59.6 +/-129	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
60	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
60.2 +/-53.8	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
60.5 +/-137	*	Galveston Bay, TX	CQA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
66.2 +/-135	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
71	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
71	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
71	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
71	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
71	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
74.8		***TEL***								
77.3 +/-135	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
80	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
85.9 +/-170	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
87	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
95 +/-83.5	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
95 +/-83.5	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991

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). A summary of the available data on the biological effects associated with sediment-sorbed BENZ(a)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

anthracene c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
)0	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
)0	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
)7	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
)7	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
9 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
0	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
0	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
0	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
0 +/-153	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
7 +/-178	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
9 +/-15.2	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
0	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
0	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
7 +/-31.8	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
0 +/-26.7	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
6 +/-27.5	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
4 +/-45.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
0 +/-100	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
4 +/-258	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
4 +/-258	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
9 +/-92	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
3 +/-127	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
) +/-111	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
3 +/-117	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
)	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
) +/-64.5	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
5 +/-247	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
5 +/-242	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
5 +/-242	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
5 +/-242	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
5 +/-191	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
5 +/-218	SG	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
) +/-186	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
1	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		1		Neff et al. 1987
5 +/-88.3	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
7 +/-210	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
) +/-233	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
5 +/-238	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
)	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
) +/-180	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
) +/-258	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
7 +/-367	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993

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ble 19. A summary of the available data on the biological effects associated with sediment-sorbed BENZ(a)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

nz(a)anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
335 +/-246	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
354 +/-313	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
354 +/-313	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
355 +/-362	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
364 +/-327	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
366 +/-447	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
385 +/-295	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
390 +/-267	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
390 +/-267	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
393 +/-353	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
415 +/-7.1	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
420	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
420	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
436 +/-492	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
450	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
450 +/-385	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
476 +/-437	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
485 +/-848	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
505 +/-478	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
520 +/-523	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
520 +/-432	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
543 +/-646	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
548 +/-472	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
549 +/-384	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
553 +/-462	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
575 +/-568	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
590 +/-428	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
599 +/-436	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
<641 +/-536	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<641 +/-536	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
663 +/-701	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
693		*PEL*								
701 +/-423	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
705 +/-353	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
751 +/-704	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
752 +/-600	SG	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
787 +/-525	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
801 +/-866	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
832 +/-770	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
<853 +/-401	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
923 +/-1160	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
931 +/-1323	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985

. A summary of the available data on the biological effects associated with sediment-sorbed BENZ(a)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

nthracene ±+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
3 +/-829	SG	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
1 +/-2054	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
1 +/-2054	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
3 +/-1220	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
+/-1290	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
+/-2344	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
+/-2706	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
+/-2770	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
+/-4157	NE	Eagle Harbor, WA	COA	10-d	Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
+/-2955	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-2955	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-2955	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-2955	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-2955	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-2955	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-7221	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
+/-7101	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
+/-7924	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
+/-9984	*	Eagle Harbor, WA	COA	10-d	Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
+/-8749	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
+/-12606	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
+/-8941	*	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
+/-17533	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990

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ble 20. A summary of the available data on the biological effects associated with sediment-sorbed BENZO(a)PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

enzo(a)pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.02	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.14 +/-0.057	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.17 +/-0.063	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.2 +/-0.071	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.215 +/-0.212	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.263 +/-0.183	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.315 +/-0.375	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.466 +/-0.247	*	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.537 +/-0.317	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.77 +/-0.622	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
1.71 +/-1.12	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
2.98 +/-2.69	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
2.98 +/-2.69	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
3.43 +/-4.54	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
3.88 +/-1.39	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
3.9 +/-3.48	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3.9 +/-3.48	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
4.09 +/-5.26	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
4.37 +/-2.33	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
4.56 +/-5.4	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
<5	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
<5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
5.08 +/-4.49	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
5.56 +/-7.83	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
6.25 +/-10.4	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
7.6	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992

0. A summary of the available data on the biological effects associated with sediment-sorbed BENZO(a)PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

a)pyrene .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
-/-11.3	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
	SG	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
+/-15.2	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
-/-0.931	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
+/-1.32	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
+/-12.6	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
-/-10.9	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
+/-13.8	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
-/-36.4	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
-/-16.8	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
-/-37	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
-/-37.7	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
-/-37.7	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
-/-17.8	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991

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ıle 20. A summary of the available data on the biological effects associated with sediment-sorbed BENZO(a)PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

nzo(a)pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
15 +/-7.47	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
15 +/-21.7	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
15.3 +/-40.7	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
15.8 +/-8.67	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
18.9 +/-45.1	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
27.1 +/-55.8	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
28.1 +/-25.8	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
28.1 +/-25.8	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
28.1 +/-25.8	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
28.1 +/-25.8	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
30	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
32 +/-29.4	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
36.5 +/-79.5	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
39.9 +/-78	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
41	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
41	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
41	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
41	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
41	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
41	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
44 +/-78.4	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
49.3 +/-7.04	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
50.1 +/-99	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
63.1 +/-96.4	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
88.8		*TEL*								
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
107	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986

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). A summary of the available data on the biological effects associated with sediment-sorbed BENZO(a)PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

a)pyrene :+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	•	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
+/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
+/-61.4	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-23.9	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
+/-173	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
	•	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
+/-18.1	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
+/-38.5	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
+/-30.8	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
+/-147	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
+/-147	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
+/-30.2	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
+/-57	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
+/-98.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
+/-101	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
+/-81	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
+/-269	•	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
+/-110	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
+/-52	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
+/-79.4	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
+/-232	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
+/-219	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
+/-405	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
+/-405	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
+/-241	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
+/-244	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
+/-276	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
+/-245	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
+/-328	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
+/-328	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
+/-328	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
+/-385	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
+/-297	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-297	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-449	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
+/-423	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
+/-294	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
+/-343	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990

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Table 20. A summary of the available data on the biological effects associated with sediment-sorbed BENZO(a)PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Benzo(a)pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
397	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		1		Neff et al. 1987
399 +/-400	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
400 +/-447	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
404 +/-428	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
423 +/-465	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
429 +/-382	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
430	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
430	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
432 +/-344	SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
449 +/-446	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
453	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Beller et al. 1986
465 +/-471	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
466 +/-435	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
486 +/-484	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
500 +/-457	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
501 +/-418	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
509 +/-354	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
531 +/-459	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
553 +/-454	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
553 +/-454	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
596 +/-593	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
600 +/-515	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
622 +/-579	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
625 +/-531	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
628 +/-496	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
637 +/-501	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
640	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
640	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
641 +/-660	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
680	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
684 +/-464	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
699 +/-608	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
703 +/-839	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
720 +/-561	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
722 +/-562	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
743 +/-803	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
753 +/-501	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
763		***PEL***								
800 +/-100	NE	Laboratory	SSBA	10-d	No significant mortality	Rhepoxynius abronius (amphipod)	ADT	0.9		Plesha et al. 1988
<824 +/-617	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<824 +/-617	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
865 +/-929	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993

20. A summary of the available data on the biological effects associated with sediment-sorbed BENZO(a)PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

)(a)pyrene ıc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
;7 +/-559	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
0 +/-1322	*	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
1 +/-505	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
0	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
1 +/-338	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
7 +/-353	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
0 +/-955	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
1 +/-1872	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
2 +/-1643	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
0 +/-1020	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
1 +/-1620	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
4 +/-898	NC	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
)	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
)	-	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
)	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
3 +/-2415	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
3 +/-2415	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
+/-1170	NC	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
+/-1121	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-1121	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-1121	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-1121	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-1121	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-1121	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
+/-2438	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
+/-2737	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
+/-2371	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
+/-1993	NE	Eagle Harbor, WA	COA	10-d	Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
+/-2640	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
+/-4982	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
+/-2803	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
+/-2475	NC	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
+/-7113	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
+/-600	*	Laboratory	SSBA	10-d	Significant mortality	Rhepoxynius abronius (amphipod)	ADT	0.9		Plesha et al. 1988
+/-3315	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991

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ıble 20. A summary of the available data on the biological effects associated with sediment-sorbed BENZO(a)PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

lenzo(a)pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5335 +/-6488	*	Eagle Harbor, WA	COA	10-d	Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
6300	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
6800	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
:10853 +/-15341	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
18000	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
21700	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
21700	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
45000	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
16000	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
.50000	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
50000	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985

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·21. A summary of the available data on the biological effects associated with sediment-sorbed CHRYSENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

:hrysene ınc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
)5	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
.2 +/-0.071	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
ı8 +/-0.076	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
ı5 +/-0.106	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
ı9 +/-0.156	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
'5 +/-0.357	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
ı7 +/-0.283	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
;8 +/-0.265	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
;9 +/-0.366	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (7.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
:1 +/-0.057	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
2 +/-1.08	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
:3 +/-1.37	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
8 +/-3.28	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
8 +/-3.28	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
8 +/-4.64	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
1 +/-3.85	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
2 +/-2.45	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
9 +/-6.36	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
5	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
4 +/-6.24	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
5 +/-7.35	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
9 +/-6.32	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
9 +/-6.32	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992

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le 21. A summary of the available data on the biological effects associated with sediment-sorbed CHRYSENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Chrysene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
7.25	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
7.25	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
7.25	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
7.25	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
7.25	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
7.25	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
7.25	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
7.25	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
7.25	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
7.25	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
8.56 +/-0.007	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
9.19 +/-1.09	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
11.3 +/-15.2	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
13.6 +/-30.7	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
13.9 +/-20.1	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
14 +/-14.7	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
14.3 +/-15.2	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
15.8 +/-20.1	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
15.8 +/-13.3	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
16.6 +/-17.3	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
16.7 +/-41.5	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
17 +/-10.4	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
17.3 +/-10.9	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
20.5 +/-57.6	SG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
22 +/-58.4	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992

_ A summary of the available data on the biological effects associated with sediment-sorbed CHRYSENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ysene .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
-/-59.4	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
+/-59.4	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
+/-63.9	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
+/-71.1	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
+/-25.6	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-25.6	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
-/-25.6	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
-/-25.6	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
-/-116	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
-/-113	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
-/-93.5	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
/-17.4	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
/-143	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
/-37	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
/-125	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
/-125	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
/-120	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
		TEL								
/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
/-226	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985

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able 21. A summary of the available data on the biological effects associated with sediment-sorbed CHRYSENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Chrysene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
140	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
140	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
140	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
140	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
140	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
162 +/-12	*	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
164 +/-95	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
167 +/-188	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
175 +/-16.6	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
187	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)*	LAR	1		Beller et al. 1986
187	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Beller et al. 1986
190	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
190	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
210 +/-27.4	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
211 +/-26.4	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
219 +/-24	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
230 +/-52.5	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
240 +/-348	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
240 +/-348	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
<251 +/-265	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
<251 +/-265	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<251 +/-265	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
256 +/-114	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
263 +/-231	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
275 +/-247	*	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
279 +/-150	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
280 +/-250	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
281 +/-67.1	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al 1993
286 +/-217	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al 1993
286 +/-157	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al 1993
318 +/-212	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al 1993
319 +/-88.7	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al 1993
320	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
327 +/-249	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al 1993
328 +/-267	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
341 +/-284	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
358 +/-365	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
368 +/-466	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
378 +/-549	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
384	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		1		Neff et al 1987
401 +/-449	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al 1993
403 +/-281	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al 1993

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. A summary of the available data on the biological effects associated with sediment-sorbed CHRYSENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ysene .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-571	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-385	SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-512	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
/-349	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
/-345	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
/-410	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
/-410	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
/-512	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
/-357	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
/-424	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
/-671	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-399	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
/-729	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
/-236	NC	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
/-284	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
/-611	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
/-487	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
/-469	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
/-469	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
/-524	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
/-451	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
/-438	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
	*	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
/-516	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
/-386	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
/-389	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
/-259	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
/-719	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
/-773	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
/-362	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
/-732	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
		PEL								
/-922	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
/-1738	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
/-1738	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
/-1604	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
/-1604	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
/-691	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985

Table 21. A summary of the available data on the biological effects associated with sediment-sorbed CHRYSENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Chrysene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
946 +/-900	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
989 +/-731	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
1016 +/-558	NC	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
1028 +/-972	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
1100	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
<1163 +/-2007	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
1197 +/-1824	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
1200	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
1218 +/-1286	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
1260 +/-1350	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
1363 +/-1970	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
1400	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
1533 +/-845	NC	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
1679 +/-847	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
1700	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster, mussel	LAR			Long & Morgan 1990
1700 +/-1350	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
1756 +/-2634	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
1770 +/-1470	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
2100	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
2100	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
2100	*	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
2305 +/-3286	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
2530 +/-4113	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
2800	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
3165 +/-4535	NE	Eagle Harbor, WA	COA	10-d	Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
3233 +/-6004	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
3300	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
3300	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
4225 +/-6832	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
4400	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
4590 +/-6681	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
5387 +/-3805	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
5387 +/-3805	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
5387 +/-3805	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
5387 +/-3805	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
5387 +/-3805	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
5387 +/-3805	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
5842 +/-7366	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
6700	*	Puget Sound, WA	AETA	-	PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
8517 +/-7813	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
9200	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
9200	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988

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Table 21. A summary of the available data on the biological effects associated with sediment-sorbed CHRYSENE (ppb) used to support the derivation of *sediment quality guidelines for marine and estuarine ecosystems* (continued).

Chrysene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
9203 +/-10972	*	Eagle Harbor, WA	COA	10-d	Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
10574 +/-7337	*	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
11400 +/-10967	NE	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
<17303 +/-24462	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
23000	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
34600	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
34600	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
115000	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
115000	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
144000	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990

Table 22. A summary of the available data on the biological effects associated with sediment-sorbed DIBENZO(a,h)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

Dibenzo(a,h)-anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.03	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.03 +/-0.014	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.05 +/-0.026	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.07 +/-0.014	*	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.11 +/-0.067	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.115 +/-0.106	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.17 +/-0.107	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.23 +/-0.192	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.254 +/-0.14	*	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.32 +/-0.325	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
0.557 +/-0.29	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
<0.8 +/-0.3	NC	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
0.88 +/-0.85	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
0.88 +/-0.85	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
0.9 +/-0.73	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
0.9 +/-0.726	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
0.93 +/-1.27	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
1.02 +/-0.798	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
1.06 +/-1.28	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
1.25 +/-0.706	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
1.29 +/-1.26	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
1.49 +/-1.05	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
1.77 +/-2.52	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
1.83 +/-2.5	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
1.86 +/-2.58	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
<1.9 +/-2.1	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<1.9 +/-2.1	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
1.93 +/-0.09	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
1.97 +/-2.35	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
1.99 +/-0.007	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
2.44 +/-3.02	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
2.57 +/-5.86	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
2.61 +/-3.49	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
2.81 +/-2.49	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
2.89 +/-1.05	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
2.95 +/-6.08	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
2.99 +/-6.19	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
2.99 +/-6.19	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
2.99 +/-4.05	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
<3	NC	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<3	NC	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990

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Table 22. A summary of the available data on the biological effects associated with sediment-sorbed DIBENZO(a,h)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Dibenzo(a,h)-anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
3.05 +/-3.31	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
3.3 +/-6.65	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
3.36 +/-1.71	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
3.87 +/-7.34	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
3.93 +/-3.45	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3.93 +/-3.45	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3.93 +/-3.45	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3.93 +/-3.45	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
<4 +/-1.4	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
4.16 +/-8.95	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
4.43 +/-4.18	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
4.67 +/-1.25	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
<5	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
<5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
5.02 +/-6.71	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
6.22		*TEL*								
6.27 +/-12.6	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
6.99 +/-12.3	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
7.68 +/-12.2	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
8.3	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
8.3	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
8.3	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
8.3	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
8.3	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
8.3	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992

Table 22. A summary of the available data on the biological effects associated with sediment-sorbed DIBENZO(a,h)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Dibenzo(a,h)-anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
8.9	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
8.9	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
9.31 +/-15.3	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
15	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
15	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
15.4 +/-15.2	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
17	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
20.5 +/-4.34	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
23.5 +/-2.7	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
23.9 +/-36.4	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
24.1 +/-4.69	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
24.3 +/-3.75	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993

Table 22. A summary of the available data on the biological effects associated with sediment-sorbed DIBENZO(a,h)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Dibenzo(a,h)-anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
25.2 +/-3.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
25.5 +/-6	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
29 +/-12.7	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
29.1 +/-12.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
30 +/-34.6	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
30 +/-34.6	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
30.1 +/-6.23	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
33.1 +/-8.87	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
36.7 +/-29.8	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
37.8 +/-34.5	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
38.2 +/-58.6	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
38.2 +/-58.6	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
38.3 +/-32	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
40.5 +/-30.6	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
41	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
41.7 +/-46	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
43.6 +/-47.4	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
43.9 +/-49.6	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
44.3 +/-31.6	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
45 +/-38.9	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
45 +/-38.9	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
47.4 +/-21.7	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
47.4 +/-21.7	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
47.4 +/-22.5	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
47.5 +/-21.7	NG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
48.9 +/-58.2	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
49.2 +/-48.3	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
54.5 +/-58.3	NC	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
54.7 +/-54.3	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
54.8 +/-40.6	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
55.8 +/-57	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
57.4 +/-76.7	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
61.6 +/-79.6	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
63	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
63	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
63.3 +/-64.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
63.4 +/-80.1	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
66 +/-45.7	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988

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Table 22. A summary of the available data on the biological effects associated with sediment-sorbed DIBENZO(a,h)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Dibenzo(a,h)-anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
66.9 +/-51	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
70.9 +/-66.8	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-139	NG	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
72.5 +/-71.3	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
72.5 +/-89.6	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
72.5 +/-89.6	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
72.5 +/-78.5	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
73.3 +/-110	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
79.6 +/-87.5	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
80	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
84.4 +/-59.7	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
84.5 +/-74.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
85.2 +/-74.4	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
86.8 +/-75.7	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
86.9 +/-84.6	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
88.5 +/-77.5	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.5 +/-123	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
95 +/-100	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
96 +/-109	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
97.2 +/-70	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
98.6 +/-101	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
101 +/-57.9	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
102 +/-77.4	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
102 +/-78	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
120	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990

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Table 22. A summary of the available data on the biological effects associated with sediment-sorbed DIBENZO(a,h)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Dibenzo(a,h)-anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
120	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
>120	-	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
121 +/-76.8	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
135		*PEL*								
136 +/-77.2	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
143 +/-174	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
183 +/-344	*	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
<188 +/-230	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
<188 +/-230	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<188 +/-230	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
194 +/-192	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
200	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
200	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
201 +/-184	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
208 +/-207	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
217 +/-88.1	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
230	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
230	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
230	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
230	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
230	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
230	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
260	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster, mussel	LAR			Long & Morgan 1990
262 +/-239	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
263 +/-413	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
274 +/-199	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
274 +/-199	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
274 +/-199	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
274 +/-199	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
274 +/-199	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
274 +/-199	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
300	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
>300	-	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
>300	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
304 +/-145	SG	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
330	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
331 +/-164	SG	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
350 +/-170	SG	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
360 +/-298	NE	Eagle Harbor, WA	COA	10-d	Least toxic (13+/-7% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
399 +/-252	SG	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
420	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990

Table 22. A summary of the available data on the biological effects associated with sediment-sorbed DIBENZO(a,h)ANTHRACENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Dibenzo(a,h)-anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
427 +/-190	•	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
540	•	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
797 +/-723	•	Eagle Harbor, WA	COA	10-d	Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
970	•	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
1200	•	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
12000	•	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
12000	•	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
35000	•	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987

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Table 23. A summary of the available data on the biological effects associated with sediment-sorbed FLUORANTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

Fluoranthene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.16	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.375 +/-0.035	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.473 +/-0.121	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.473 +/-0.347	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.505 +/-0.445	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.57 +/-0.071	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.593 +/-0.333	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.787 +/-0.395	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.806 +/-0.288	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
2.69 +/-0.594	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
3.56 +/-1.21	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
<5	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
<5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
5.04 +/-3.10	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5.04 +/-3.10	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992

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Table 23. A summary of the available data on the biological effects associated with sediment-sorbed FLUORANTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Fluoranthene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
5.5 +/-2.31	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
7.37 +/-4.27	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
7.7 +/-8.62	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
8.02 +/-8.59	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
8.47 +/-7.18	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
8.49 +/-10.8	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
<10	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
10.1 +/-1.98	*	Laboratory	SSBA	10-d	LC10	Rhepoxynius abronius (amphipod)		0.338+/-0.04		DeWitt et al. 1992
11.6 +/-16.2	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
13.6 +/-16.2	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.87% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
13.6 +/-16.2	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
14.7 +/-1.15	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)		0.338+/-0.04		DeWitt et al. 1992
14.8 +/-5.46	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
15.9 +/-35.1	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
17.5 +/-6.1	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
18 +/-15.8	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
20.2 +/-38	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
20.6 +/-12	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
21.2 +/-30.5	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
25.8 +/-34.6	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
27.4 +/-27.8	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
27.9 +/-35.7	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
29.4 +/-19.0	*	Laboratory	SSBA	10-d	LC99	Rhepoxynius abronius (amphipod)		0.338+/-0.04		DeWitt et al. 1992
30.5 +/-33.5	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
32.6 +/-27.1	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991

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Table 23. A summary of the available data on the biological effects associated with sediment-sorbed FLUORANTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Fluoranthene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
33.2 +/-29.7	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
39	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
39.3 +/-130	SG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
42.2 +/-132	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
43.4 +/-134	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
43.4 +/-134	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
49 +/-145	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
59.8 +/-162	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
77.6 +/-61	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
77.6 +/-61	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
77.6 +/-61	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
77.6 +/-61	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
90 +/-200	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
107 +/-113	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
110	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
113		***TEL***								
113	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
124 +/-285	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
131 +/-70.3	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
136 +/-107	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
137 +/-279	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
153 +/-307	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
155 +/-279	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
167	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
170	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nyman 1991

Table 23. A summary of the available data on the biological effects associated with sediment-sorbed FLUORANTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Fluoranthene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
179 +/-351	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
198 +/-134	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
220	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
220	NE	Puget Sound, WA	COA		Not toxic (17.3% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
220	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
220	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
220	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
220	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
260	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
279 +/-23.5	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
>290	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
329 +/-55.7	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
337 +/-51	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
338 +/-347	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
339 +/-423	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
348 +/-52	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
360 +/-20.2	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
360 +/-20.2	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
371 +/-111	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
380 +/-528	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
380 +/-528	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
382 +/-8.24	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
390	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
400 +/-480	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
401 +/-250	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
407 +/-402	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
420	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
435 +/-233	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
437 +/-118	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
451 +/-562	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
462 +/-272	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
472 +/-287	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
489 +/-492	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
497 +/-145	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
500	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
509 +/-481	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
523 +/-416	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
539 +/-842	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
547 +/-437	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
<548 +/-167	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
<548 +/-167	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<548 +/-167	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990

Table 23. A summary of the available data on the biological effects associated with sediment-sorbed FLUORANTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Fluoranthene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
554 +/-490	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
562 +/-505	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
572 +/-880	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
574 +/-527	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
580	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
580	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
584 +/-789	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
585 +/-490	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
585 +/-490	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
600	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
626 +/-904	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
630	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
630 +/-356	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
644	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		1		Neff et al. 1987
650 +/-636	SG	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
653 +/-725	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
682 +/-1043	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
690 +/-666	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
690 +/-666	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
691 +/-519	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
696 +/-539	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
703 +/-524	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
725 +/-610	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
738 +/-772	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
794 +/-1210	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
799 +/-949	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
815 +/-676	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
869 +/-795	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
869 +/-537	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
916 +/-473	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
921 +/-462	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
923 +/-865	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
925 +/-864	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
945 +/-762	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
971 +/-988	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
972 +/-866	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
1009 +/-328	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
1046 +/-655	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
1056 +/-1308	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
1077 +/-407	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
1331 +/-654	*	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
1352 +/-595	SG	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987

Table 23. A summary of the available data on the biological effects associated with sediment-sorbed FLUORANTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Fluoranthene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1367 +/-1499	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
1387 +/-1531	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
1494		*PEL*								
1500	NE	Laboratory	SSBA	10-d	Not significantly toxic	Rhepoxynius abronius (amphipod)	ADT	0.18		Swartz et al. 1990
1545 +/-231	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
1545 +/-231	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
1578 +/-1201	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
1600	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
1600	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
1655 +/-2029	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
1700	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
1829 +/-1943	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
1950 +/-2008	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
<1986 +/-93.3	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
<1986 +/-93.3	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
2000	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster, mussel	LAR			Long & Morgan 1990
2050 +/-260	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
2360 +/-3330	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
2500	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
<2647 +/-108	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
2730 +/-3440	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
2737 +/-1617	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
2900	*	Laboratory	SSBA	10-d	LC10	Rhepoxynius abronius (amphipod)	ADT	0.25		Swartz et al 1988
3000	*	Laboratory	SSBA	10-d	Not significantly toxic	Corophium spinicorne (amphipod)	ADT	0.18		Swartz et al 1990
3000	NE	Laboratory	SSBA	10-d	Not significantly toxic	Rhepoxynius abronius (amphipod)	ADT	0.31		Swartz et al. 1990
3000	NE	Laboratory	SSBA	10-d	Not significantly toxic	Rhepoxynius abronius (amphipod)	ADT	0.48		Swartz et al 1990
3100	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al 1987
3400	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	0.18		Swartz et al 1990
3600	*	United States	EqPA		EPA Chronic Marine EP Threshold	Aquatic biota		1		Lyman et al 1987
3600	*	United States	EqPA		Chronic Marine Sediment Safe Level Criteria					Pavlou 1987
3700	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
>3700	-	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al 1990
>3700	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al 1990
3740 +/-3570	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
3980 +/-3810	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
4200	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	0.25		Swartz et al 1988
5100	*	Laboratory	SSBA	10-d	LC50	Corophium spinicorne (amphipod)	ADT	0.18		Swartz et al 1990
5100 +/-350	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT			DeWitt et al. 1989
5100	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al 1991
5100	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al 1991
6300	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
6500	*	Laboratory	SSBA	10-d	LC100	Rhepoxynius abronius (amphipod)	ADT	0.18		Swartz et al 1990

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Table 23. A summary of the available data on the biological effects associated with sediment-sorbed FLUORANTHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Fluoranthene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
6500	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	0.31		Swartz et al. 1990
6500	NE	Laboratory	SSBA	10-d	Not significantly toxic	Corophium spinicorne (amphipod)	ADT	0.31		Swartz et al. 1990
8504 +/-16500	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
8889 +/-15596	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
8895 +/-10337	NC	Eagle Harbor, WA	COA	10-d	Moderately toxic (41+/-9% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
9000	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
10700	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	0.48		Swartz et al. 1990
10700 +/-675	*	Laboratory	SSBA	10-d	LC50	Eohaustorius estuarius (amphipod)	ADT			DeWitt et al. 1989
11800 +/-575	*	Laboratory	SSBA	10-d	LC50	Eohaustorius estuarius (amphipod)	ADT			DeWitt et al. 1989
12080 +/-51889	*	*Eagle Harbor, WA*	*COA*	*10-d*	*Least toxic (13+/-7% mortality)*	*Rhepoxynius abronius (amphipod)*	ADT			CH2M Hill 1989
13400 +/-5650	*	United States	EqPA		Sediment Quality Criteria					Hansen et al. 1991e
<13600	*	Laboratory	SSBA	10-d	LC50	Corophium spinicorne (amphipod)	ADT	0.31		Swartz et al. 1990
13600	*	Laboratory	SSBA	10-d	LC100	Rhepoxynius abronius (amphipod)	ADT	0.31		Swartz et al. 1990
15523 +/-15185	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
15523 +/-15185	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
15523 +/-15185	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
15523 +/-15185	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
15523 +/-15185	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
15523 +/-15185	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
18802 +/-38307	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
21171 +/-37887	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
24000	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
27739 +/-42182	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
30000	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
<37303 +/-10320	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
41300 +/-46742	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
50800 +/-69151	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
71988 +/-95713	*	Eagle Harbor, WA	COA	10-d	Highly toxic (95.5+/-8.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			CH2M Hill 1989
74600	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
74600	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
130000	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
386000	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990

Table 24. A summary of the available data on the biological effects associated with sediment-sorbed PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

Pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.29	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.545 +/-0.342	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.555 +/-0.049	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.64 +/-0.309	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.713 +/-0.184	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.832 +/-0.353	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.833 +/-0.492	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.87	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.915 +/-0.94	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
<5	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
<5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<5	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992

Table 24. A summary of the available data on the biological effects associated with sediment-sorbed PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
5.3	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
5.76 +/-2.63	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
8.89 +/-9.19	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
9.2 +/-7.79	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
9.98 +/-2.53	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
10.5 +/-3.09	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
11.2 +/-15.4	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
12.8 +/-5.25	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
12.8 +/-5.25	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
15.2 +/-12.1	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
15.2 +/-12.1	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
18.9 +/-9.99	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
19.4 +/-15.7	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
19.4 +/-9.57	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
20.3 +/-6.94	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
20.4 +/-15.8	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
22.1 +/-11.8	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
23.3 +/-26.4	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
26.5 +/-25.7	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
28.2 +/-31.7	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
29.2 +/-21.8	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
36.7 +/-36.2	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
42.3 +/-64.2	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
46.3 +/-53	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
46.9 +/-61.5	SG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
47.7 +/-105	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
50.8 +/-44	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
53.2 +/-108	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
54.4 +/-110	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992

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Table 24. A summary of the available data on the biological effects associated with sediment-sorbed PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
54.4 +/-110	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
59.3 +/-118	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
68.9 +/-131	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
72 +/-88.8	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
75.7 +/-63.6	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
75.7 +/-63.6	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
75.7 +/-63.6	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
75.7 +/-63.6	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
81.2 +/-74.6	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.2 +/-160	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
93	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
93	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
93	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
93	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
93	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
93	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
113 +/-232	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
124 +/-98	NE	Laboratory	SSBA	~4-m	No significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
131 +/-228	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
138 +/-221	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
150 +/-51	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
153		***TEL***								
156 +/-287	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
173	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
184 +/-318	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
216 +/-102	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990

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Table 24. A summary of the available data on the biological effects associated with sediment-sorbed PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
220	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
260	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
271 +/-25.5	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
287	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
305 +/-49	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
314 +/-46.1	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
317 +/-400	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
328 +/-47.6	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
335 +/-44.7	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
348 +/-77.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
350	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
353 +/-362	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
384 +/-160	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
394 +/-241	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
419 +/-207	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
421 +/-220	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
423 +/-102	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
430	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
434 +/-442	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
438 +/-322	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
446 +/-645	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
446 +/-645	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
<476 +/-504	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
<476 +/-504	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<476 +/-504	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
478 +/-132	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
>487	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
490	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
490	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
490	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
501 +/-358	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
501 +/-386	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
519 +/-437	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
523 +/-444	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
527 +/-446	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
527 +/-446	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
532 +/-372	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
597 +/-434	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
610 +/-570	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
612 +/-668	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
616 +/-483	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
638 +/-461	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
649 +/-589	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993

Table 24. A summary of the available data on the biological effects associated with sediment-sorbed PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
649 +/-589	NE	*Long Island Sound, NY, CT*	COA	48-h	*Not significantly toxic (99+/-0.862% normal development)*	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
662 +/-522	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
665	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		1		Neff et al. 1987
696 +/-544	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
700	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
700	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
701 +/-866	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	*Rhepoxynius abronius (amphipod)*	*ADT*			Long & Morgan 1990
724 +/-939	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
743 +/-902	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
773 +/-892	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
777 +/-908	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
792 +/-610	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
806 +/-975	SG	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			*Long & Morgan 1990*
828 +/-740	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
830 +/-806	*	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
>840	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
850	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
854 +/-951	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
865 +/-719	NC	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
892 +/-821	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
896 +/-870	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
910 +/-657	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
910 +/-683	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
920 +/-954	*NE*	*Oakland Harbor, CA*	*COA*	*10-d*	*Not significantly toxic (23.3+/-6.14% mortality)*	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
941 +/-793	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
969 +/-942	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
969 +/-942	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
978 +/-996	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
979 +/-581	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
987 +/-1122	NE	Laboratory	SSBA	~4-m	No significant change in kidney MFO induction	*Pseudopleuronectes americanus (flounder)*	ADT			Payne et al. 1988
988 +/-581	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
1068 +/-405	NC	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
1078 +/-806	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
1110 +/-904	*	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
1111 +/-1105	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
1115 +/-399	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
1148 +/-543	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
1165 +/-1003	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
1246 +/-1322	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
1278 +/-2197	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
1346 +/-838	SG	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
1384 +/-1051	NE	Laboratory	SSBA	~4-m	No significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
1396 +/-1621	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987

Table 24. A summary of the available data on the biological effects associated with sediment-sorbed PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (µmol/g)	Reference
1398		*PEL*								
1439 +/-1050	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry.wt/ml)	*Microtox (Photobacterium phosphoreum)*		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
1442 +/-1383	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
<1486 +/-1082	NE	Halifax Harbour, NS	COA	*10-d*	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
<1486 +/-1082	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay *et al. 1990*
1538 +/-1501	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
1580 +/-1489	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	*Mulinia lateralis (bivalve)*	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
1820 +/-2252	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
1900	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
1900	*	Puget Sound, WA	SQG		Low Abundance Threshold Concentration	Praxillella gracilis (polycheata)		3.0		Tetra Tech *1986*
1900	*	Puget Sound, WA	SQG		Low Abundance Threshold Concentration	Euphilomedes producta (ostracoda)		7.0		Tetra Tech 1986
1980 +/-283	*	Laboratory	SSBA	~4-m	Significant change in liver somatic indices	Pseudopleuronectes americanus *(flounder)*	ADT			Payne et al. 1988
<1980 +/-540	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
2180	*	Laboratory	SSBA	*~4-m*	*Significant increase* in kidney MFO induction	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
2188 +/-776	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan *1990*
2600	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
2600	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	*ADT*			Long & Morgan 1990
2600	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
2600	*	California	AETA	*10-d*	*California AET Values*	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
2930 +/-3330	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
3300	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
3300	*	Puget Sound, WA	SQG		Low Abundance Threshold Concentration	Nucula tenuis (pelecypoda)		4.0		Tetra Tech 1986
3395 +/-5748	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
3395 +/-5748	NE	Burrard Inlet, BC	COA	*10-d*	Not toxic *(97.2+/-2.84% reburial)*	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
3400	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
3930 +/-3410	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
4160 +/-3640	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
4520 +/-6478	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
5963 +/-10429	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
7204 +/-11200	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
7300	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
10000	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
11377 +/-9095	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
11377 +/-9095	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
11377 +/-9095	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
11377 +/-9095	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
11377 +/-9095	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
11377 +/-9095	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
12000	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
12000	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
13648 +/-24109	NE	Puget Sound, WA	COA	2-d	*Not significantly toxic (2.09+/-1.73% abnormal* chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
15117 +/-23685	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
16000	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988

able 24. A summary of the available data on the biological effects associated with sediment-sorbed PYRENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
16000	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
19690 +/-26032	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
29067 +/-27707	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
33303 +/-47090	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
36767 +/-40249	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
49500	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
49500	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
66600	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
66600	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
81000	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
30000	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990

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5. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL HIGH MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

MW PAHs ıc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
2	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
8 +/-0.042	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
8 +/-0.422	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
2 +/-0.587	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
6 +/-5.87	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
1	NC	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox (Photobacterium phosphoreum)		0.4		Chapman et al. 1991
5 +/-5.65	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
3 +/-7.21	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
3 +/-12.7	NC	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.45+/-0.058		Chapman et al. 1991
) +/-15.4	*	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
5 +/-13	NE	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.42+/-0.13		Chapman et al. 1991
3 +/-16	NE	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	0.425+/-0.128		Chapman et al. 1991
ι +/-20.9	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
3 +/-2.55	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
+/-16.8	NE	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	0.443+/-0.127		Chapman et al. 1991
+/-14.5	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
+/-34.4	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
+/-34.4	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
+/-26.8	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
+/-32.1	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
+/-76.6	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992

able 25. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL HIGH MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

otal HMW PAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
73.7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
73.7	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
73.7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
73.7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
73.7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
73.7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
73.7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
73.7	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
73.7	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
74.5 +/-61.6	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
74.5 +/-61.6	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
75.9 +/-82.2	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
77 +/-108	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
80.6 +/-72.9	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
86.9 +/-59.8	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
121 +/-188	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
145 +/-200	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
161 +/-26.9	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
165 +/-36.9	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
183 +/-144	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
189 +/-196	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
198 +/-557	NE	Gulf of Mexico	COA		Not toxic (3.21+/-0.239 diversity index)	Benthic species		0.464+/-0.143		Chapman et al. 1991
212 +/-186	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
214 +/-544	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992

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15. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL HIGH MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

HMW PAHs nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
16 +/-298	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
17 +/-584	NE	Gulf of Mexico	COA		Least toxic (6.32+/-3.68 TU/g)	Microtox (Photobacterium phosphoreum)		0.47+/-0.149		Chapman et al. 1991
17 +/-272	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
27 +/-154	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
33 +/-553	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
36 +/-68.2	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
38 +/-563	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
38 +/-563	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
38 +/-247	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
63 +/-606	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
66 +/-110	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
01 +/-696	NE	Gulf of Mexico	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.471+/-0.18		Chapman et al. 1991
12 +/-673	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
42 +/-753	SG	Gulf of Mexico	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.5+/-0.155		Chapman et al. 1991
60 +/-285	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	*Rhepoxynius abronius (amphipod)*		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
50 +/-285	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
50 +/-285	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
50 +/-285	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
54 +/-821	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
97 +/-922	*	*Gulf of Mexico*	COA	48-h	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	LAR	0.5+/-0.18		Chapman et al. 1991
40	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
54 +/-1172	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
65	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
08 +/-26	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86 6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
15 +/-26	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28 3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
32 +/-82.4	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
37 +/-91.3	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
39 +/-97.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
41 1134	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
43 +/-84.2	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
48 +/-112	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	*Mysidopsis bahia (mysid)*		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
49 +/-89.6	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
54 +/-427	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
55		*TEL*								
56 +/-1059	*	Gulf of Mexico	COA	48-h	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	LAR	0.567+/-0.153		Chapman et al. 1991
70 +/-206	NE	*Puget Sound, WA*	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
27 +/-1144	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
63 +/-1455	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
86	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
86	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
86	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985

ble 25. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL HIGH MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

tal HMW PAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
786	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
786	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
786	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
788 +/-446	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
800	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
815 +/-219	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
815 +/-219	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
826	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
836 +/-231	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
836 +/-231	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
900	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
900	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
981 +/-133	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
1084 +/-665	NC	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
1100 +/-1132	NE	Jetty Island Pier, Everett Marina, WA	COA	10-d	Not toxic (12.3+/-2.87% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.08+/-0.66		Hart Crowser & Associates Inc. 1986
1133	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
1160	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
1200	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
1200	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swain & Nijman 1991
1345 +/-459	NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
1421 +/-1729	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
1480 +/-1630	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
1536 +/-1410	NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
1700	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
1700	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
1729 +/-211	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
1740	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
1740	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
1800	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
1927 +/-3325	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
1996	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
2016 +/-197	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
2050 +/-49	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
2085 +/-3696	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
2085 +/-353	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
2123 +/-292	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
2225 +/-449	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
2330 +/-615	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
2373 +/-1836	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
2394 +/-947	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
2473 +/-3695	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993

5. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL HIGH MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of *sediment quality guidelines* for marine and estuarine ecosystems (continued).

MW PAHs c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
3 +/-3695	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
2 +/-3201	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
5 +/-4113	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
4 +/-3478	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
4 +/-601	NE	*Long Island Sound, NY, CT*	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
0 +/-1328	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	*Mulinia lateralis* (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
6 +/-2631	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
0	NE	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota				USACOE 1988
7 +/-1391	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
1 +/-2757	*	Jetty Island Pier, Everett Marina, WA	COA	10-d	Toxic (19.5+/-0.707% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.15+/-0.071		Hart Crowser & Associates Inc. 1986
3 +/-3867	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
1 +/-2228	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
1	*	Southern California	COA	10-d	*Significantly toxicity* (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
0	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
3 +/-826	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (*25.9+/-5.01% mortality*)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
8 +/-2469	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	*Bricker et al. 1993*
8	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
8	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
8	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
0 +/-2240	NE	*Tampa Bay, FL*	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
4 +/-2800	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	*Microtox* (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
0 +/-2020	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
1 +/-2628	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
0	.	*Puget Sound, WA*	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
34 +/-3013	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
52 +/-4052	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
34 +/-3897	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
30 +/-3161	SG	Long Island Sound, NY, CT	COA	48-h	*Significantly* toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
39 +/-3807	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
39 +/-3807	NE	Oakland Harbor, CA	COA	10-d	*Not significantly toxic (0.2+/-0.6% mortality)*	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
54 +/-4547	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	*Bricker et al. 1993*
02 +/-3726	NE	*Long Island Sound, NY, CT*	COA	48-h	*Not significantly toxic (6.48+/-10.1% mortality)*	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
02 +/-3726	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
40 +/-3204	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
00 +/-3650	NE	*Long Island Sound*, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
46 +/-4299	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
52 +/-5323	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
14 +/-3900	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
81 +/-3867	SG	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
65 +/-4800	NE	Commencement Bay, WA	COA	10-d	*Least toxic (12.5+/-4.5% mortality)*	*Rhepoxynius abronius (amphipod)*	ADT			Tetra Tech 1985
00	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990

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ble 25. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL HIGH MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

tal HMW PAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5200	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
5323 +/-4169	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
5660 +/-5673	*	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
5698 +/-5777	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
5838 +/-4042	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
6178 +/-6439	SG	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
6201 +/-4660	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
6255 +/-4648	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
6421 +/-5170	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
6477	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
6479	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
6651 +/-6556	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
6676		PEL								
6847 +/-6314	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
6906 +/-4347	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
6932 +/-4312	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
7447	NC	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
7914 +/-8341	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
8176 +/-4079	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
8314 +/-3529	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
8500	NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
8620	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
8791 +/-7782	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
9042 +/-9573	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
9133 +/-6617	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
9374 +/-8691	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
9455 +/-4313	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
9457 +/-4312	*	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
9457 +/-4312	SG	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
9600	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
9794 +/-12821	*	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
10083	NC	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
11000	-	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
11000	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
11230	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
11459 +/-14895	NE	Puget Sound, WA	COA	28-d	Not significantly toxic (1.44+/-1.74% mortality)	Dendraster excentricus (sand dollar)	JUV			Casillas et al. 1992
11459 +/-14895	NE	Puget Sound, WA	COA	28-d	Not significantly toxic (0.055+/-0.024% growth mm/d)	Dendraster excentricus (sand dollar)	JUV			Casillas et al. 1992
11460	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
11485	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
11485	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
11950	*	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a

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25. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL HIGH MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

HMW PAHs nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
00	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
50	*	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
50	*	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
00 +/-15400	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
40	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
00	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
70 +/-16830	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
19 +/-35247	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
14 +/-37939	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
0	*	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
0	*	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
6	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
6	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
5	*	Puget Sound, WA	COA		Toxic (19+/-6.19% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
5	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
5	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
5	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-82648	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
[illegible]	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
+/-81035	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
+/-89485	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
[illegible]	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
[illegible]	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
+/-95536	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
+/-136898	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
[illegible]	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
+/-15700	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
[illegible]	*	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
+/-429690	*	Puget Sound, WA	COA	28-d	Significantly toxic (69.5+/-33.3% mortality)	Dendraster exentricus (sand dollar)	JUV			Casillas et al. 1992
+/-429690	*	Puget Sound, WA	COA	28-d	Significantly toxic (0.013+/-0.006% growth mm/d)	Dendraster exentricus (sand dollar)	JUV			Casillas et al. 1992
[illegible]	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
[illegible]	*	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990

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le 26. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

Total PAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
12.7	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
35.9 +/-4.07	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
38.8 +/-7.28	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
41.4 +/-17.4	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
44 +/-7.64	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
49.2 +/-3.79	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
51.7 +/-38.6	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
52.1 +/-30	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
59.9 +/-39.6	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
59.9 +/-39.6	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
67.3 +/-19.4	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
68.6 +/-24.5	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
70.9 +/-35.6	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
<80	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
<80	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (3% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
84 +/-39.7	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
87.2 +/-87.6	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
97.4 +/-111	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
<100	NE	Sidney Tar Pond, NS	COA	10-d	Not significantly toxic (4% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
108	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
108	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992

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ı. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

al PAHs xc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
8	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
8	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
8	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
8	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
ı1 +/-239	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
30 +/-256	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
39 +/-249	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
33 +/-136	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
10 +/-65	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
10 +/-65	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
10 +/-65	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
10 +/-86.3	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
21 +/-115	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
35 +/-248	NE	Laboratory	SSBA	~4-m	No significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
53 +/-619	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
78 +/-630	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
83 +/-641	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
83 +/-641	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
94 +/-374	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
13 +/-690	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
71 +/-766	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
93 +/-107	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
04 +/-279	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
04 +/-279	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
07 +/-148	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
17 +/-321	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992

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ıle 26. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Total PAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
417 +/-321	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
417 +/-321	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
417 +/-321	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
454 +/-393	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
537 +/-510	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
538 +/-932	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
551 +/-255	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
569 +/-464	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
630 +/-1317	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
634 +/-372	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
727 +/-1276	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
788 +/-1179	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
803 +/-601	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
806 +/-302	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
845 +/-1295	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
866 +/-1635	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
923 +/-696	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
941 +/-429	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
999 +/-1051	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
1020	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
1095	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03,	19 ug/g	Windom In Prep
1144	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
1144	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
1144	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
1144	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
1144	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
1144	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
1148 +/-49.1	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
1162 +/-49.1	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
1196 +/-153	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
1204 +/-170	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
1210 +/-181	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1213 +/-160	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1226 +/-209	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
1228 +/-166	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
1539 +/-413	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1539 +/-413	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1579 +/-436	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
1579 +/-436	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
1684		TEL								
1700	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
1700	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
1853 +/-251	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep

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. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

l PAHs c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-249	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
+/-3961	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
7 +/-291	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
7 +/-420	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
+/-1837	NE	Burrard Inlet, BC	COA	10-d	Not toxic (4.5+/-3.02% emergence)	Rhepoxynius abronius (amphipod)	ADT	2.66+/-2.15		McLeay et al. 1991
+/-1837	NE	Burrard Inlet, BC	COA	10-d	Not toxic (5.21+/-3.61% emergence)	Corophium volutator (amphipod)	ADT	3.18+/-2.1		McLeay et al. 1991
+/-370	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
+/-49	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
	*	Eagle Harbor, WA	COA	4-d	LC50	Rhepoxynius abronius (amphipod)	ADT			Swartz et al. 1989
+/-501	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
+/-4054	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
+/-4054	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
+/-1023	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
+/-616	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
5 +/-1458	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
+/-694	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
+/-1508	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
3 +/-4337	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
3 +/-4039	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-2710	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
5 +/-986	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
7 +/-4520	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
3 +/-2889	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
	*	San Francisco Bay, CA	SQAV	SQTA	Significantly Toxic Triad Minimum Bioeffects	Benthic species				Chapman et al. 1987b
2 +/-3927	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
3 +/-3259	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
4 +/-3040	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
0 +/-2360	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
0 +/-2110	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
2 +/-3494	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
6 +/-3524	SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
2 +/-4908	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
7 +/-5025	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
3 +/-4204	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (6.8+/-7.31% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
3 +/-4204	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (0.7+/-1.63% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
6 +/-4172	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (8.5+/-6.06% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
9 +/-3471	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
0 +/-4266	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
0 +/-4266	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
6 +/-5360	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
4 +/-90579	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
7 +/-3716	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993

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e 26. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Total PAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5140 +/-4344	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
5140 +/-4877	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
5185 +/-6047	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
5566 +/-4700	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
6312 +/-5091	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
6753 +/-7080	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
7365 +/-5679	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
7440 +/-5672	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
7761 +/-21968	NE	Mississippi Sound, MS	COA	96-h	Not significantly toxic (7.3+/-8.7% mortality)	Mysidopsis almyra (mysid)		2.51+/-3.16		Lytle & Lytle 1985
7787 +/-6390	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
8060 +/-8071	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
8145 +/-7887	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
8282 +/-5369	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
8305 +/-5329	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
8364 +/-7087	*	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
9096 +/-9537	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
~9500	*	San Francisco Bay, CA	SQAV	SQTA	Significantly Toxic Triad Significant Bioeffects	Benthic species				Chapman et al. 1987b
:9795 +/-10916	NE	Halifax Harbour, NS	COA	20-d	Not significantly toxic (1+/-2% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
9819 +/-5086	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
:9845 +/-10861	NE	Halifax Harbour, NS	COA	10-d	Not significantly toxic (5.2+/-3.5% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
10114 +/-4508	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
10200 +/-9950	NE	Forth Estuary	COA		High meiofaunal density (3757+/-1804/10 sq.cm.)	various				Long 1987
10541 +/-7495	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
10615 +/-9772	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
11326 +/-10705	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
11735 +/-5499	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
11800 +/-9700	SG	Forth Estuary	COA		Moderate meiofaunal density (1335+/-396/10 sq.cm.)	various				Long 1987
11924 +/-25733	NE	Mississippi Sound, MS	COA	96-h	Not significantly toxic (15.2+/-6.74% mortality)	Gammarus mucronatus (amphipod)	ADT	2.90+/-3.42		Lytle & Lytle 1985
12325 +/-10425	NC	Hampton Roads Harbor, VA	COA	96-h	Moderately toxic (8.8+/-1.8% mortality)	Palaemonetes pugio (shrimp)	ADT			Alden & Butt 1987
12793 +/-11171	*	Halifax Harbour, NS	COA	10-d	Significantly toxic (61.7+/-12.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
13033 +/-21225	NE	Burrard Inlet, BC	COA	10-d	Not toxic (8.9+/-2.99% mortality)	Corophium volutator (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
13033 +/-21225	NE	Burrard Inlet, BC	COA	10-d	Not toxic (97.2+/-2.84% reburial)	Rhepoxynius abronius (amphipod)	ADT	2.8+/-1.96		McLeay et al. 1991
13422	NE	Elizabeth River, VA	COA	96-h	No significant change in respiration rate	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
13656	NE	Elizabeth River, VA	COA	96-h	Not significantly toxic (4.5+/-3.24% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
13855 +/-19014	NE	Laboratory	SSBA	~4-m	No significant change in kidney MFO induction	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
15000	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
16200 +/-17700	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
6771		*PEL*								
16921 +/-20976	NE	Hampton Roads Harbor, VA	COA	96-h	Least toxic (2.2+/-1.8% mortality)	Palaemonetes pugio (shrimp)				Alden & Butt 1987
17253 +/-23850	NE	Burrard Inlet, BC	COA	10-d	Not toxic (7.9+/-5.12% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.64+/-2.14		McLeay et al. 1991
18300 +/-5515	NE	Bayou Casotte, MS	COA	96-h	Not significantly toxic	Mysidipsis almyra (mysid shrimp)		2.77		Lytle & Lytle 1983
19993	SG	Elizabeth River, VA	COA	96-h	Significant decrease in respiration rates	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
21467 +/-31160	NE	Hudson-Raritan Bay, NY	COA	14-d	Not toxic (increased growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984

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A summary of the available data on the biological effects associated with sediment-sorbed TOTAL PAHs (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

PAHs .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-18200	•	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
+/-19410	•	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
+/-22130	NE	Laboratory	SSBA	~4-m	No significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
+/-31882	•	Elizabeth River, VA	COA	96-h	Significantly toxic (50.7+/-39% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Alden & Butt 1987
+/-42181	•	Hampton Roads Harbor, VA	COA	96-h	Highly toxic (70+/-20.3% mortality)	Palaemonetes pugio (shrimp)				Alden & Butt 1987
+/-68844	•	Mississippi Sound, MS	COA	96-h	Significantly toxic (81.4+/-19.6% mortality)	Gammarus mucronatus (amphipod)	ADT	4.54+/-3.52		Lytle & Lytle 1985
+/-59921	•	Mississippi Sound, MS	COA	96-h	Significantly toxic (76.7+/-21.3% mortality)	Mysidopsis almyra (mysid)		4.85+/-3.83		Lytle & Lytle 1985
+/-46084	•	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
	•	Burrard Inlet, BC	COA	10-d	Highly toxic (23% emergence)	Corophium volutator (amphipod)	ADT	3.5		McLeay et al. 1991
	•	Burrard Inlet, BC	COA	10-d	Highly toxic (30.5% emergence)	Rhepoxynius abronius (amphipod)	ADT	3.5		McLeay et al. 1991
+/-85601	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
	•	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
	•	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
	•	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
	•	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
	•	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
	•	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
+/-57900	•	Forth Estuary	COA		Low meiofaunal density (112+/-123/10 sq.cm.)	various				Long 1987
+/-217012	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
+/-214430	•	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
+/-239056	•	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
	•	Mississippi Sound, MS	AETA		Mississippi AET	Gammarus mucronatus (amphipod)				Lytle & Lytle 1985
	•	Mississippi Sound, MS	AETA		Mississippi AET	Mysidopsis almyra (mysid)		3.91+/-1.29		Lytle & Lytle 1985
+/-306960	NE	Sidney Tar Pond, NS	COA	20-d	Not significantly toxic (8+/-5.66% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
+/-261387	•	Laboratory	SSBA	~4-m	Significant change in liver somatic indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
+/-266104	•	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
+/-393802	•	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
+/-274658	•	Laboratory	SSBA	~4-m	Significant increase in kidney MFO induction	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
+/-236527	•	Laboratory	SSBA	~4-m	Significant change in spleen condition indices	Pseudopleuronectes americanus (flounder)	ADT			Payne et al. 1988
	•	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Corophium volutator (amphipod)	ADT			Tay et al. 1990
	•	Sidney Tar Pond, NS	COA	10-d	Significantly toxic (100% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tay et al. 1990
+/-696924	NE	Bayou Casotte, MS	COA	96-h	Not significantly toxic	Gammarus mucronatus (amphipod)		2.1		Lytle & Lytle 1983
	•	Bayou Casotte, MS	COA	96-h	Significantly toxic	Gammarus mucronatus (amphipod)		2.61		Lytle & Lytle 1983
	•	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
+/-223446	•	Bayou Casotte, MS	COA	96-h	Significantly toxic	Mysidipsis almyra (mysid shrimp)		2.72		Lytle & Lytle 1983
	•	Sidney Tar Pond, NS	COA	20-d	Significantly toxic (52% mortality)	Neanthes sp. (polychaete)	JUV			Tay et al. 1990
	•	Elizabeth River, VA	COA	28-d	High toxicity (100% fin erosion)	Leiostomus xanthurus (spot)				Hargis et al. 1984
	•	Elizabeth River, VA	COA	28-d	Significantly toxic (56% mortality)	Leiostomus xanthurus (spot)				Hargis et al. 1984

le 27. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL POLYCHLORINATED BIPHENYLS (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

Total PCBs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.3	NE	Massachusetts Bay, MA	COA		High density (4135 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
0 64	*	United States	EqPA		EPA Chronic Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
664 +/-0.563	NE	Massachusetts Bay, MA	COA		High density (201+/-33.4 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
1	NE	Puget Sound, WA	COA		Not toxic (10% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
1	NE	Puget Sound, WA	COA		Not toxic (17.5% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
1	NE	Puget Sound, WA	COA		Not toxic (0% occurrence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
1	NE	Puget Sound, WA	COA		Not toxic (5% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
1	NE	Puget Sound, WA	COA		Not toxic (0% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
1	NE	Puget Sound, WA	COA		Not toxic (32.5% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
1	NE	Massachusetts Bay, MA	COA		High density (24 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
1.47 +/-1.46	NE	Massachusetts Bay, MA	COA		High species richness (102+/-4.73 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
2.05 +/-1.48	NE	Massachusetts Bay, MA	COA		High density (299+/-40.3 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
2.5	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
2.5	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
2.5	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
3.3	NE	Massachusetts Bay, MA	COA		High density (22 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al 1976
3.47 +/-3.83	SG	Massachusetts Bay, MA	COA		Low density (7.14+/-4.23 N/0.1 sq.m.)	Rhynchocoela	VAR			Gilbert et al. 1976
3.53 +/-3.81	*	Massachusetts Bay, MA	COA		Low density (2.76+/-2.7 N/0.1 sq.m.)	Echinodermata	VAR			Gilbert et al. 1976
3.54 +/-3.86	SG	Massachusetts Bay, MA	COA		Low density (61.1+/-36.6 N/0.1 sq.m.)	Arthropoda	VAR			Gilbert et al. 1976
3.62 +/-3.87	*	Massachusetts Bay, MA	COA		Low species richness (57.2+/-12.2 S/0.1 sq.m.)	Benthic species	VAR			Gilbert et al. 1976
3.76 +/-3.86	*	Massachusetts Bay, MA	COA		Low density (39.1+/-30.8 N/0.1 sq.m.)	Mollusca	VAR			Gilbert et al. 1976
5	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
5.15 +/-6.5	*	Massachusetts Bay, MA	COA		Low density (1316+/-768 N/0.1 sq.m.)	Annelida	VAR			Gilbert et al. 1976
5.25 +/-2.31	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
5.67 +/-2.89	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
7.5 +/-2.89	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
7.5 +/-2.89	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
7.5 +/-3.54	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
3.86 +/-8.3	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
9	*	Puget Sound, WA	AETA	15-min	1986 Puget Sound AET	Microtox (Photobacterium phosphoreum)		1		Bellar et al. 1986
10 +/-7.75	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
10.4 +/-0.1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
10.4 +/-0.1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
10.4 +/-0.1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
10.8 +/-11.8	NC	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
11.1	NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
11.5 +/-10.7	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992

A summary of the available data on the biological effects associated with sediment-sorbed TOTAL POLYCHLORINATED BIPHENYLS (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

PCBs +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
-12.7	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
-12.1	*	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
-12.2	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
-12.4	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
-12.4	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
-8.66	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
-13.1	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
-5.77	*	Puget Sound, WA	COA		Toxic (71.6+/-14.6% prevalence of idiopathic degeneration/necrosis)	Parophrys vetulus (English sole)				Malins et al. 1985
-5.77	*	Puget Sound, WA	COA		Toxic (51.4+/-21.1% prevalence of steatosis and hemosiderosis)	Parophrys vetulus (English sole)				Malins et al. 1985
-5.77	*	Puget Sound, WA	COA		Toxic (19+/-6.15% prevalence of hepatocellular regenerative foci)	Parophrys vetulus (English sole)				Malins et al. 1985
-5.77	*	Puget Sound, WA	COA		Toxic (26.7+/-6.43% prevalence of hepatic neoplasms)	Parophrys vetulus (English sole)				Malins et al. 1985
-5.77	*	Puget Sound, WA	COA		Toxic (88+/-3.65% prevalence of hepatic idiopathic lesions)	Parophrys vetulus (English sole)				Malins et al. 1985
-5.77	*	Puget Sound, WA	COA		Toxic (44.2+/-8.5% prevalence of hepatic cellular alterations)	Parophrys vetulus (English sole)				Malins et al. 1985
-0.125	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
-0.149	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
-0.219	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
-13.9	NC	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
-0.093	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
-0.115	SG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
-0.76	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
-0.277	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
-7.07	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
-0.219	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
/-2.02	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
/-1.99	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
/-1.45	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
/-1.45	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
/-15.2	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
/-3.79	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
/-4.39	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
/-0.399	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
/-0.382	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
/-2.16	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
/-7.37	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
/-7.99	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3+/-1.51% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			Vittor & Associates 1988
	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
/-20	NE	Southern California	COA		High abundance (191+/-70.1 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
/-5.76	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
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ble 27. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL POLYCHLORINATED BIPHENYLS (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Total PCBs Conc. +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
21.7 +/-19.1	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
22.7 +/-11.7	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
25	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (4% mortality)	Citharichthys stigmaeus (sanddab)				Salazar & Salazar 1985
25	NE	San Diego Bay, CA	COA	10-d	Not significantly toxic (14% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
25	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (13% mortality)	Neanthes arenaceodentata (polycheate)				Salazar & Salazar 1985
25	NE	San Diego Bay, CA	COA	20-d	Not significantly toxic (1% mortality)	Macoma nasuta (clam)				Salazar & Salazar 1985
25	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (0% mortality)	Acanthomysis sculpta (mysid)				Salazar & Salazar 1985
25	NE	San Diego Bay, CA	COA	96-h	Not significantly toxic (18% mortality)	Acartia tonsa (copepod)				Salazar & Salazar 1985
25.4 +/-10.6	NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
25.7 +/-16.3	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
26 +/-17.3	NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
26.5 +/-14.9	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
26.9 +/-19.9	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
28.3 +/-27.1	NE	Commencement Bay, WA	COA	48-h	Least toxic (15.1+/-3.1% abnormality)	Oyster	LAR			Tetra Tech 1985
28.3 +/-24.1	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
28.4 +/-20.6	SG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Lousiana Province 1991
30	NE	Burrard Inlet, BC	SQO		Sediment Quality Objectives	Aquatic biota				Swan & Nijman 1991
30 +/-50	SG	Southern California	COA		Moderate abundance (56.2+/-23 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
36.6	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		1		Neff et al. 1987
37 +/-19	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
37 +/-17.6	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
38 +/-31.6	NC	Commencement Bay, WA	COA	10-d	Highly toxic (78.5+/-19.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
47.6 +/-43.9	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
54	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
54.3 +/-89.3	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
54.7 +/-82.6	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
56	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
60 +/-70	NC	Southern California	COA		Moderate abundance (72.6+/-6.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
60.5 +/-87.8	NE	Commencement Bay, WA	COA	10-d	Least toxic (12.5+/-4.5% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
70	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
73	*	Puget Sound, WA	AETA	48-h	1986 Puget Sound AET	Crassostrea gigas (oyster)	LAR	1		Bellar et al. 1986
73	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
79.5 +/-60.8	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
80 +/-140	NE	Southern California	COA		Moderate abundance (75.6+/-12.7 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
80 +/-100	NE	Southern California	COA		High abundance (148+/-58 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
88	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
88	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
93.7 +/-147	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
100	*	San Francisco Bay, CA	SQAV	SQTA	Significantly Toxic Triad Minimum Bioeffects	Benthic species				Chapman et al. 1987b
101 +/-153	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990

A summary of the available data on the biological effects associated with sediment-sorbed TOTAL POLYCHLORINATED BIPHENYLS (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

PCBs +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-59.1	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
/-127	*	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
	*	Puget Sound, WA	SQG		Chemical Criteria	Benthic community		1		WDE 1989
/-171	NC	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
	*	Puget Sound, WA	AETA	15-min	1988 Puget Sound AET	Microtox (Photobacterium phosphoreum)				PTI 1988
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
/-124	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
/-125	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	*Rhepoxynius abronius (amphipod)*	*ADT*	*1.47+/-0.306*		Pastorok & Becker 1990
/-262	*	Commencement Bay, WA	COA	48-h	Moderately toxic (23+/-2.3% abnormality)	Oyster	LAR			Tetra Tech 1985
/-218	*	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
/-260	*	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	San Francisco Bay, CA	SQAV	SQTA	Significantly Toxic Triad Significant Bioeffects	Benthic species				Chapman et al. 1987b
/-430	NC	Southern California	COA		Low abundance (57.6+/-13.6 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
/-99.9	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-99.9	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
/-99.9	*	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
/-232	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
/-171	NE	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
/-154	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
	*	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
	*	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
/-160	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
/-160	NE	Baltimore Harbor, MD	COA	48-h	Least toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
		PEL								
/-230	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
	*	Miami River Seybold Canal, FL	COA	10-d	Significantly toxic (24.7+/-15% mortality)	Pennaeus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
/-272	NE	Puget Sound, WA	COA	28-d	Not significantly toxic (1.44+/-1.74% mortality)	Dendraster exentricus (sand dollar)	JUV			Casillas et al. 1992
/-272	NE	Puget Sound, WA	COA	28-d	Not significantly toxic (0.055+/-0.024% growth mm/d)	Dendraster exentricus (sand dollar)	JUV			Casillas et al. 1992
/-376	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
	*	San Francisco Bay, CA	COA	48-h	*Highly toxic (66.8% abnormal)*	*Mussel*	*LAR*	3.59		*Chapman et al. 1987a*
/-161	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
/-540	NE	Southern California	COA		High species richness (96.3+/-22.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
/-556	NC	Commencement Bay, WA	COA	10-d	Moderately toxic (26+/-5.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Tetra Tech 1985
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
+/-217	NC	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
+/-502	NE	Hudson-Raritan Bay, NY	COA	14-d	Not toxic (increased growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
+/-456	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
+/-490	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990

ıle 27. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL POLYCHLORINATED BIPHENYLS (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Total PCBs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
360	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
368 +/-695	*	Commencement Bay, WA	COA	48-h	Highly toxic (44.5+/-19% abnormality)	Oyster	LAR			Tetra Tech 1985
380	NE	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota				USACOE 1988
388 +/-475	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
400 +/-600	SG	Southern California	COA		Moderate species richness (72+/-3.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
477 +/-524	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
480 +/-724	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
490 +/-413	NE	Miami River, FL	COA	10-d	Not toxic (18.6+/-7.27% mortality)	Penaeus aztecus aztecus (brown shrimp)	ADT			ERCO 1985
490 +/-413	NE	Miami River, FL	COA	10-d	Not toxic (1.2+/-0.837% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			ERCO 1985
490 +/-413	NE	Miami River, FL	COA	10-d	Not toxic (3.6+/-1.67% mortality)	Nereis virens (sandworm)	ADT			ERCO 1985
590	SG	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
592 +/-617	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
638 +/-512	*	Hudson-Raritan Bay, NY	COA	14-d	Significantly toxic (reduced growth rate)	Chromadorina germanica (nematode)				Tietjen & Lee 1984
817 +/-795	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
838 +/-930	*	Puget Sound, WA	COA	28-d	Significantly toxic (69.5+/-33.3% mortality)	Dendraster exentricus (sand dollar)	JUV			Casillas et al. 1992
838 +/-930	*	Puget Sound, WA	COA	28-d	Significantly toxic (0.013+/-0.006% growth mm/d)	Dendraster exentricus (sand dollar)	JUV			Casillas et al. 1992
911 +/-8.06	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
960	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
960	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
000	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
000 +/-2400	*	Southern California	COA		Low abundance (35.3+/-15.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
100	*	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
100 +/-800	*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Fundulus heteroclitus (mummichog)				Tsai et al. 1979
100 +/-800	*	Baltimore Harbor, MD	COA	48-h	Most toxic; TLm	Leiostomus xanthurus (spot)				Tsai et al. 1979
110 +/-2610	NC	Southern California	COA		Low species richness (51.2+/-8.6 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
167 +/-2434	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
300 +/-2700	*	Southern California	COA		Low abundance (6.1+/-7.2 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
596 +/-2777	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
773 +/-2948	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)°	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
260 +/-3530	NE	Southern California	COA		High abundance (88.9+/-35.4 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
500	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
100	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
700	*	Laboratory	SSBA	10-d	LC10	Rhepoxynius abronius (amphipod)	ADT	0.25		Swartz et al. 1988
800	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	0.25		Swartz et al. 1988
600 +/-29256	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
600 +/-29256	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
600 +/-29256	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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A summary of the available data on the biological effects associated with sediment-sorbed ALDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

in -/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
-0.015	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
-0.014	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
-0.049	SG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
-0.031	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
'-0.03	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
-0.03	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
-0.028	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
	*	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
/-0 4	NC	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
	NG	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
/-0 35	NC	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
/-0 4	NC	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993

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le 28. A summary of the available data on the biological effects associated with sediment-sorbed ALDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Aldrin :onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
).21	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
).21	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
).21	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
).21	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
).21	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
).21	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
).21	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
).21	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
).21	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
).21	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
).21	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
).21	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
).21	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
).21	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
).21	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
).21	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
).26 +/-0.45	*	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
0.3	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
0.3 +/-0.684	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
304	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
304	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
304	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
304	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
304	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
304	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
304	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
304	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
304	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
304	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
304	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992

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:. A summary of the available data on the biological effects associated with sediment-sorbed ALDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

drin .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
+/-0.752	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
+/-0.76	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
+/-0.984	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
+/-1.06	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
+/-1.06	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
+/-1.14	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
+/-1.19	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
+/-1.2	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
+/-1.23	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
+/-1.0	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-1.39	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
+/-1.44	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
+/-0.236	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.236	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.236	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.236	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-1.65	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
+/-1.74	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-1.74	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-1.84	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
+/-1.34	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-1.97	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993

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: 28. A summary of the available data on the biological effects associated with sediment-sorbed ALDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Aldrin anc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
54 +/-1.97	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
1 1.3	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
1	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
1	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
1	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
08 +/-2.13	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
16 +/-0.048	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
16 +/-0.072	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
1.2 +/-0.283	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
1.2 +/-0.193	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
1.2 +/-0.206	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.2 +/-0.191	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
23 +/-0.19	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
23 +/-0.236	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
24 +/-0.184	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
25 +/-2.33	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
54 +/-1.17	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
.8 +/-1.43	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
36 +/-0.268	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
38 +/-1.51	NC	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
.9	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
.9	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
2 +/-1.51	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
17 +/-1.94	NC	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
17 +/-1.66	NC	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
18 +/-1.71	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
22 +/-1.54	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
25 +/-1.78	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
46 +/-1.72	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
:.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
:.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
:.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
:.5	SG	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
3 +/-2.29	SG	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
43 +/-5.84	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
1.5 +/-2.19	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993

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ι. A summary of the available data on the biological effects associated with sediment-sorbed ALDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

:rin .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-1.47	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
+/-6.63	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
+/-7.13	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
	NE	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
	*	New York State	EqPA		New York State Sediment Criteria Value			1		Newell 1989
+/-589	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
+/-589	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
+/-589	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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: 29. A summary of the available data on the biological effects associated with sediment-sorbed CHLORDANE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

hlordane onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.1	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
0.1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
0.1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
0.1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
).12	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
212 +/-0.047	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
225 +/-0.121	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
228 +/-0.053	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
247 +/-0.133	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUB ADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
255 +/-0.106	SG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
297 +/-0.046	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
0.3	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
301 +/-0.045	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
306 +/-0.048	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
316 +/-0.03	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
316 +/-0.03	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
) 33	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
).33	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
).33	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
).33	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
).33	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
).33	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
).33	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
).33	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
).33	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
).33	SG	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
445 +/-0.163	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
).45 +/-0.163	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
453 +/-0.214	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
.462 +/-0.452	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
0.5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
0.5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
0.5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
0.5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
0.5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
0.5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
0.5 +/-1.0	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
.529 +/-0.714	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
.558 +/-0.429	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
0.6	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
0.6 +/-0.294	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
.627 +/-0.414	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUB ADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993

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A summary of the available data on the biological effects associated with sediment-sorbed CHLORDANE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

dane +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-0.289	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
+/-0.289	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
+/-0.289	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
+/-0.565	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUB ADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
+/-0.705	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-0.705	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-0.54	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUB ADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
+/-0.526	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
+/-0.741	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
+/-0.734	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
+/-0.895	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
+/-1.4	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-1.4	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-0.336	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
+/-2.14	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
+/-2.07	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
+/-0.596	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
+/-2.49	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
+/-0.99	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
+/-0.896	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
+/-1.48	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUB ADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
+/-2.92	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
+/-1.28	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
+/-1.21	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
+/-1.45	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
+/-1.18	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
+/-1.14	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
+/-1.37	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
+/-2.35	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
+/-3.44	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelsca abdita (amphipod)	SUB ADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
+/-3.51	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
+/-3.31	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUB ADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
	NC	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
		TEL								
+/-3.86	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
+/-3.27	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
+/-3.5	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/- 3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980

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9. A summary of the available data on the biological effects associated with sediment-sorbed CHLORDANE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ordane c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al 1992
.5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al 1992
.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992

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A summary of the available data on the biological effects associated with sediment-sorbed CHLORDANE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

dane +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
+/-3.99	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUB ADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
+/-3.42	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
+/-3.96	SG	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
+/-1.81	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUB ADT	1.63+/-0.596		Long 1993
+/-2.96	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
+/-4.45	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
+/-6.25	*	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-4.76	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
+/-6.3	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-5.18	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUB ADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
+/-6.19	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
+/-5.24	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
+/-6.6	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-5.94	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
+/-12.5	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
+/-3.5	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
		PEL								
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
	NG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
	NG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
	NG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
	NG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
	NG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
	NG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
	NG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
	NG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
	NG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
	NG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
	NG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
+/-5.58	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993

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: 29. A summary of the available data on the biological effects associated with sediment-sorbed CHLORDANE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

hlordane ›nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
:.37 +/-4.12	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
:.77 +/-7.78	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUB ADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
;.04 +/-8.09	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
;.33 +/-5.86	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
6.4 +/-7.5	*	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
9	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
9	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
10.2 +/-0.58	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
10.6 +/-1.72	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
10.6 +/-1.71	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
10.7 +/-1.84	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
10.8 +/-1.72	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
0.9 +/-2.1	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
0.9 +/-1.7	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.4 +/-2.9	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
4.1 +/-3.43	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
4.1 +/-3.43	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
4.5 +/-3.54	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
4.5 +/-3.54	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
15	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
15	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
6.2 +/-2.14	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
1.6 +/-11.3	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
1.6 +/-11.3	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
1.6 +/-11.3	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
1.6 +/-11.3	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3.5 +/-92.7	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
<50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
9.2 +/-106	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUB ADT	3.53+/-1.35		Long 1993
5.6 +/-113	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
967 +/-325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
967 +/-325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
967 +/-325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
800	*	Laboratory	SSBA	288-h	LC50	Nereis virens (sandworm)		2		McLeese et al. 1982

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A summary of the available data on the biological effects associated with sediment-sorbed CHLORPYRIFOS (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

pyrifos +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	United States	EqPA		Interim Marine Sediment Quality Criteria (FCV)	Benthic community		1		EPA 1988

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31. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDD (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

,p'-DDD ›nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
03 +/-0.027	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
07 +/-0.049	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
09 +/-0.033	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
13 +/-0.052	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
14 +/-0.027	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
25	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
25	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
25	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
25	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
25	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
25	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
25	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
13	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Beller et al. 1986
38 +/-0.018	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
38 +/-0.099	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
38 +/-0.099	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
95 +/-0.100	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
23	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
35	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
35	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
35	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
35	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
35	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
35	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.03	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
35	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
35	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
35	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
35	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992

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A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDD (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

DDD +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
/-0.132	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
/-0.13	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
/-0.13	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
/-0.132	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
/-0.237	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
-0.145	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
/-0.145	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
/-0.15	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
/-0.15	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
/-0.15	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
/-0.15	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
/-0.16	SG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
/-0.187	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
-0.219	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
-0.504	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
/-0.156	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
/-0.502	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
-0.609	*	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
/-0.7	NG	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
/-0.283	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
/-0.332	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
-0.332	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
/-0.332	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
/-0.332	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
/-1.6	NG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
		TEL								

31. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDD (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

p'-DDD nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5 +/-0.739	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
3 +/-0.3	NC	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
3 +/-1.2	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
3 +/-2.1	NG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
6 +/-0.885	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.75	Bricker et al. 1993
5 +/-1.9	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
5 +/-0.64	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
6 +/-0.777	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
1 +/-1.68	*	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
1 +/-1.41	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
1 +/-1.41	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
6 +/-0.853	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
5	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
2	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
5 +/-0.489	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
3 +/-0.115	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
3 +/-2.32	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
4 +/-0.095	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86 6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
9 +/-0.355	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
3 +/-0.37	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
3 +/-0.359	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
3 +/-0.395	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
5 +/-0.07	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
3 +/-1.19	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
3 +/-0.364	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
3 +/-0.452	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
3 +/-0.36	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
5 +/-2.35	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
5 +/-3.21	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
3 +/-2.64	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
7 +/-2.65	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
3 +/-2.93	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
5 +/-1.67	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
3 +/-2.01	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
) +/-2.72	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
5 +/-3.65	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
5 +/-3.72	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
3 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
3 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep

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A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDD (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

DDD +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
/-1.79	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
/-2.2	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
/-0.482	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
/-2.31	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
/-4.77	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
/-4.1	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
/-5.21	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
/-4.25	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
/-7.83	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
/-3.43	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
/-5.35	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
/-5.5	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
/-5.89	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
/-6.41	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
/-7.29	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
/-6.02	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
/-5.14	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
		PEL								
/-11.3	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
/-6.54	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
/-6.35	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
/-7.4	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-6.15	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
/-8.39	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
/-8.5	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-21	SG	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
/-23.2	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
	-	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
-/-231	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
-/-266	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993

31. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDD (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

p'-DDD nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
9 +/-284	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
0	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
0	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
7 +/-289	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
7 +/-289	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
7 +/-289	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
0	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
0	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
2 +/-8121	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
2 +/-8121	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993

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A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

DE /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
/-0.007	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
/-0.032	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
/-0.158	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
/-0.237	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
/-0.279	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
/-0.198	*	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
/-0.156	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992

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32. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

'-DDE c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
4	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
4	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
2 +/-0.128	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
3 +/-0.173	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
1 +/-0.41	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
5 +/-0.178	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
3 +/-0.102	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
3 +/-0.507	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
2 +/-0.144	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
2 +/-0.144	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
2 +/-0.144	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
2 +/-0.144	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.23% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
5 +/-0.247	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
5 +/-0.607	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
5	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986
5 +/-0.70	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
7 +/-0.28	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
7 +/-0.28	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
7 +/-0.28	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
3 +/-0.71	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
7 +/-0.976	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
7 +/-1.0	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
2 +/-1.27	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
1 +/-0.116	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
1 +/-0.116	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
1 +/-0.116	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b

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A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

DE ·SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	•	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Beller et al. 1986
-0.5	NG	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
-0.9	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
-0.9	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
-1.11	•	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
-1.0	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
-1.0	NG	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
-3.4	NG	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
		TEL								
-3.9	•	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
	•	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	•	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster, mussel	LAR			Long & Morgan 1990
-0.115	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
-0.095	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
-3.97	•	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
-0.993	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
-0.37	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
-0.359	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
-0.395	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
-0.364	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
-0.452	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
-0.894	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
-0.36	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
	•	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
	•	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
-0.361	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
	•	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
-0.712	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
-0.928	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
-0.947	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
-0.88	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
-0.969	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
-0.841	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993

32. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

›'-DDE ›c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
‹4 +/-1.95	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
4 +/-5.2	*	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
8 +/-0.925	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
5 +/-0.754	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
6 +/-0.95	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
8 +/-0.482	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
9 +/-2.97	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
5 +/-1.64	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
2 +/-3.46	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
2 +/-3.19	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
2 +/-3.19	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
1 +/-4.14	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
9 +/-4.08	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
9 +/-5.1	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
5	NC	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
7 +/-8.94	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
2 +/-3.77	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
3 +/-4.73	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
7 +/-4.94	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
2 +/-5.6	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
3 +/-5.48	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
5 +/-5.59	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (10.4+/-6.3% mortality)	Nephtys caecoides (polychaete)		1.63+/-0.657		Word et al. 1988
5 +/-5.59	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (0.2+/-0.6% mortality)	Macoma nasuta (clam)		1.63+/-0.657		Word et al. 1988
3 +/-5.82	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
5 +/-6.25	NE	Oakland Harbor, CA	COA	10-d	Not significantly toxic (23.3+/-6.14% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.738		Word et al. 1988
4 +/-4.74	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
3 +/-6.01	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
5 +/-7.49	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
3 +/-6.49	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
4 +/-5.87	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
9 +/-5.81	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
4 +/-6.19	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
9	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
9 +/-7.26	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
0 +/-7.14	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
1 +/-8.41	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
1 +/-6.9	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
3 +/-8.8	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993

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A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

DE -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
-61.7	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (7.2+/-1.89% mortality)	Eohaustorius estuarius (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
-61.7	NE	Oahu, Hawaii	COA	10-d	Not significantly toxic (10.1+/-4.01% mortality)	Corophium acherusicum (amphipod)	ADT	1.93+/-1.94	10.3+/-12.4	Lamberson et al. 1993
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
	NE	Palos Verdes, CA	COA		High density (4.4 N/0.1 sq.m.)	Echinoderm		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (88 N/0.1 sq.m.)	Foraminifera (sponge)		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (132 N/0.1 sq.m.)	Ophiuroidea (brittle star)		0.9		Swartz et al. 1985a
	NE	Palos Verdes, CA	COA		High density (93.4 N/0.1 sq.m.)	Echinoderm		1.3+/-0.77		Swartz et al. 1986
	NE	Palos Verdes, CA	COA		High abundance (208 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
		PEL								
-252	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
-252	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
-252	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
-713	NE	Palos Verdes, CA	COA		High species richness (80.8+/-13.7 S/0.1 sq.m.)	Macro benthos		2.10+/-1.15		Swartz et al. 1985a
-713	NE	Palos Verdes, CA	COA		High density (54.5+/-9.91 N/0.1 sq.m.)	Amphipod		2.1+/-1.15		Swartz et al. 1985a
-713	NE	Palos Verdes, CA	COA		High density (34.3+/-5.67 N/0.1 sq.m.)	Phoxocephalid		2.1+/-1.15.		Swartz et al. 1985a
-713	NE	Palos Verdes, CA	COA		High density (111+/-32 N/0.1 sq.m.)	Crustacea		2.1+/-1.15		Swartz et al. 1985a
-969	NE	Palos Verdes, CA	COA		High abundance (54.6+/-5.09 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
-969	NE	Palos Verdes, CA	COA		High abundance (30.7+/-0.99 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
-1360	NE	Palos Verdes, CA	COA		High density (20.9+/-0.23 N/0.1 sq.m.)	Amphipod		1.7+/-0.61		Swartz et al. 1986
-1360	NE	Palos Verdes, CA	COA		High density (11.2+/-1.64 N/0.1 sq.m.)	Phoxocephalid		1.7+/-0.61		Swartz et al. 1986
	NE	Palos Verdes, CA	COA		High density (2177 N/0.1 sq.m.)	Polychaeta		3.2		Swartz et al. 1985a
-3550	NE	Palos Verdes, CA	COA		High density (594+/-688 N/0.1 sq.m.)	Mollusca		2.53+/-1.27		Swartz et al. 1985a
-3550	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (8+/-5.7% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.53+/-1.27		Swartz et al. 1985a
	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
-3080	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (9.5+/-5.45% mortality)	Rhepoxynius abronius (amphipod)	ADT	2.42+/-0.88		Swartz et al. 1986
-3023	*	Palos Verdes, CA	COA		Low density (365+/-178 N/0.1 sq.m.)	Polychaeta		3.15+/-1.32		Swartz et al. 1985a
-2687	*	Palos Verdes, CA	COA		Low density (0.03+/-0.08 N/0.1 sq.m.)	Echinoderm		3.53+/-0.742		Swartz et al. 1985a
-2687	*	Palos Verdes, CA	COA		Low density (0.233+/-0.367 N/0.1 sq.m.)	Foraminifera (sponge)		3.53+/-0.742		Swartz et al. 1985a
-2687	*	Palos Verdes, CA	COA		Low density (0.3+/-0.8 N/0.1 sq.m.)	Ophiuroidea (brittle star)		3.53+/-0.742		Swartz et al. 1985a
-2524	NE	Palos Verdes, CA	COA		High species richness (70.9+/-16.9 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
-2747	*	Palos Verdes, CA	COA		Low density (0.2+/-0.14 N/0.1 sq.m.)	Echinoderm		2.64+/-0.77		Swartz et al. 1986
-1065	*	Palos Verdes, CA	COA		Low density (21.5+/-11.6 N/0.1 sq.m.)	Mollusca		4+/-0.265		Swartz et al. 1985a
-1065	*	Palos Verdes, CA	COA	10-d	Significantly toxic (21+/-6.3% mortality)	Rhepoxynius abronius (amphipod)	ADT	4+/-0.265		Swartz et al. 1985a
-4860	NC	Palos Verdes, CA	COA		Low abundance (415+/-94.4 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
-3687	NE	Palos Verdes, CA	COA	10-d	Not significantly toxic (11.9+/-5.36% mortality)	Rhepoxynius abronius (amphipod)	VAR			Ferraro et al. 1991
-547	NE	Palos Verdes, CA	COA		High abundance (944+/-101 N/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991
-1596	*	Palos Verdes, CA	COA		Low species richness (26.0+/-11.5 S/0.1 sq.m.)	Macro benthos		3.95+/-0.238		Swartz et al. 1985a
-1596	*	Palos Verdes, CA	COA		Low density (1.0+/-1.2 N/0.1 sq.m.)	Amphipod		3.95+/-0.238		Swartz et al. 1985a
-1596	*	Palos Verdes, CA	COA		Low density (0 N/0.1 sq.m.)	Phoxocephalid		3.95+/-0.238		Swartz et al. 1985a

: 32. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

.p'-DDE onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
:26 +/-1596	•	Palos Verdes, CA	COA		Low density (8.7+/-6.01 N/0.1 sq.m.)	Crustacea		3.95+/-0.238		Swartz et al. 1985a
:16 +/-3247	•	Palos Verdes, CA	COA		Low abundance (2.4+/-5.65 N/0.1 sq.m.)	Echinoderms	VAR			Ferraro et al. 1991
190 +/-1342	•	Palos Verdes, CA	COA		Low density (5.3+/-3.7 N/0.1 sq.m.)	Amphipod		3.13+/-0.15		Swartz et al. 1986
190 +/-1342	•	Palos Verdes, CA	COA		Low density (0.13+/-0.23 N/0.1 sq.m.)	Phoxocephalid		3.13+/-0.15		Swartz et al. 1986
93 +/-2752	•	Palos Verdes, CA	COA		Low abundance (13.8+/-11.4 N/0.1 sq.m.)	Amphipods	VAR			Ferraro et al. 1991
93 +/-2752	•	Palos Verdes, CA	COA		Low abundance (5.87+/-7.06 N/0.1 sq.m.)	Phoxocephalids	VAR			Ferraro et al. 1991
300	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
00	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
20	•	Palos Verdes, CA	COA		Low species richness (19.2 S/0.1 sq.m.)	Benthic species	VAR			Ferraro et al. 1991

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A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDT (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

DT /-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
-0.021	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
-0.078	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
-0.021	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
-0.057	SG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
-0.055	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
	*	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
-0.021	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
-0.021	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
-0.04	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
-0.04	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
-0.06	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
-0.069	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
	*	Puget Sound, WA	AETA	10-d	1986 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT	1		Bellar et al. 1986
	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
/-0.433	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
/-0.433	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
/-0.433	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
/-0.334	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
/-0.409	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
/-0.2	NC	San Francisco Bay, CA	COA	48-h	Highly toxic (92.4+/-4.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-0.841	*	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
/-0.841	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
	*	Puget Sound, WA	AETA		1986 Puget Sound AET	Benthic species		1		Bellar et al. 1986

. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDT (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

DDT +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
+/-3.7	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-0.115	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
+/-0.095	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
+/-9.58	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
+/-0.37	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
+/-0.359	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
+/-0.395	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
+/-0.364	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
+/-0.452	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
+/-0.36	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
+/-2.1	NG	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-2.68	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
+/-2.16	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-2.16	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-2.16	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-2.16	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-2.37	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
+/-2.37	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-2.37	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-2.37	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-2.37	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992

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3. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDT (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

-DDT :+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-0.919	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
+/-0.428	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
+/-0.579	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
+/-0.764	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-0.764	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-0.788	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
+/-0.438	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
+/-0.858	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
+/-0.537	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
+/-0.354	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al 1992
+/-0.354	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.354	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.354	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.663	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
+/-1.07	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
+/-1	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
+/-0.870	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
+/-0.443	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
+/-0.69	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al 1993
+/-1.01	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
		TEL								
+/-3.16	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-1.19	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
+/-1.35	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
+/-0.802	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
+/-2.8	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-1.34	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
+/-1.23	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
+/-1.6	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
+/-0.932	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al 1993
+/-1.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
	*	United States	EqPA		Chronic Marine Sediment Safe Level Criteria					Pavlou 1987
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992

·33. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDT (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

p'-DDT nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
77 +/-2.37	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
77 +/-2.37	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
14 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
14 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
14 +/-2.65	SG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
.2 +/-5.5	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
25 +/-11.6	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
.3 +/-11.4	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
.3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
.3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
18 +/-3.06	*	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
53 +/-1.36	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
58 +/-0.482	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
.7 +/-11.1	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
19 +/-14.8	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14 7+/-24	Bricker et al. 1993
.7	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
7		*PEL*								
8 +/-14.9	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
1 +/-15.3	SG	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
2 +/-16	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
6	-	Puget Sound, WA	AETA	48-h	1988 Puget Sound AET	Crassostrea gigas (oyster)	LAR			PTI 1988
3	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
3	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
6 +/-17.9	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
9 +/-17.9	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
8 +/-18.4	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
5 +/-18.3	*	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
1 +/-14.8	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
7 +/-15.3	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
6	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
6	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster, mussel	LAR			Long & Morgan 1990
6	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
6	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
8 +/-19.3	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
2 +/-24.7	*	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
4 +/-26.4	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
4	*	Puget Sound, WA	AETA		1988 Puget Sound AET	Benthic community				PTI 1988
0	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984

A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDT (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

DDT +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-630	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
	-	Puget Sound, WA	AETA	10-d	1988 Puget Sound AET	Rhepoxynius abronius (amphipod)	ADT			PTI 1988
/-731	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
/-782	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
/-1325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
/-1325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
/-1325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

t 34. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL DDT (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

Total DDT Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.4	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
0.7	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
0.8	NE	San Francisco Bay, CA	COA	48-h	Least toxic (17.3% mortality)	Mussel	LAR	1.25		Chapman et al. 1987a
0.9 +/-0.42	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (57.1+/-13.6% mortality)	Mussel	LAR	1.14+/-0.33		Chapman et al. 1987a
1.04 +/-0.35	NE	San Francisco Bay, CA	COA	4-wk	Least toxic (116+/-4.3 young produced)	Tigriopus californicus (copepod)	ADT	1.23+/-0.09		Chapman et al. 1987a
1.08 +/-0.618	NE	San Francisco Bay, CA	COA	48-h	Least toxic (18+/-8.01% abnormal)	Mussel	LAR	1.2+/-0.38		Chapman et al. 1987a
1.27 +/-1.08	NE	San Francisco Bay, CA	COA	10-d	Least toxic (13.6+/-7.76% mortality)	Amphipod	ADT	1.4+/-0.79		Chapman et al. 1987a
.36 +/-0.77	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (25.1+/-6.61% abnormal)	Mussel	LAR	1.26+/-0.17		Chapman et al. 1987a
.39 +/-1.06	NE	San Francisco Bay, CA	COA	10-d	Least Toxic (4.63+/-2.91% avoidance)	Amphipod	ADT	1.44+/-0.74		Chapman et al. 1987a
1.5	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
1.5 +/-0.408	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
.58	*	United States	EqPA		Marine Chronic Sediment Criteria	Aquatic biota		1		JRB Associates 1984
1.6	*	United States	EqPA		EPA Chronic Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
2	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
.18 +/-1.45	SG	San Francisco Bay, CA	COA	10-d	Moderately toxic (28.3+/-7.51% mortality)	Amphipod	ADT	2.01+/-0.98		Chapman et al. 1987a
.92 +/-0.68	*	San Francisco Bay, CA	COA	48-h	Highly toxic (92.3+/-5.5% mortality)	Mussel	LAR	2.87+/-1.32		Chapman et al. 1987a
.92 +/-0.68	*	San Francisco Bay, CA	COA	4-wk	Moderately toxic (94.9+/-10.1 young produced)	Tigriopus californicus (copepod)	ADT	2.87+/-1.07		Chapman et al. 1987a
.93	*	San Francisco Bay, CA	COA	10-d	Most toxic (95% mortality)	Amphipod	ADT	4.03		Chapman et al. 1987a
.93	*	San Francisco Bay, CA	COA	10-d	Highly toxic (37% avoidance)	Amphipod	ADT	4.03		Chapman et al. 1987a
.27	*	San Francisco Bay, CA	COA	48-h	Highly toxic (66.8% abnormal)	Mussel	LAR	3.59		Chapman et al. 1987a
42 +/-2.87	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
99		*TEL*								
1.6 +/-3.39	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
94 +/-3.56	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
5	NC	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
5	NC	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
5	NC	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
5	NE	Puget Sound, WA	SBA		EPA/ACOE Puget Sound Interim Criteria	Aquatic biota				USACOE 1988
5	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
5	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
5	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
17 +/-0.93	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
17 +/-0.913	SG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
18 +/-0.945	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
18 +/-0.945	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992

A summary of the available data on the biological effects associated with sediment-sorbed TOTAL DDT (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

DDT -/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
/-0.945	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
/-1.02	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
/-1.07	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
/-1.39	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
/-2.04	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
/-11.9	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
/-7.89	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
/-16.4	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
/-18	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
/-17.2	*	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
/-18.8	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	1.92+/-0.085		Word et al. 1987
/-25.9	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
/-21.4	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
/-23.1	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
/-43.5	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	0.58+/-0.121		Word et al. 1987
/-60	NE	Southern California	COA		High abundance (191+/-70.1 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
		PEL								
	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	0.6+/-0.031		Word et al. 1987
	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	0.12+/-0.006		Word et al. 1987
/-71.7	NC	Southern California	COA	10-d	Significantly toxicity (51.7% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
	*	Puget Sound, WA	AETA		PSDDA Maximum Level Criteria	Aquatic biota				USACOE 1988
/-130	SG	Southern California	COA		Moderate abundance (56.2+/-23 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
/-150	NE	Southern California	COA		High abundance (148+/-58 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
	*	Laboratory	SSBA	10-d	LC50	Rhepoxynius abronius (amphipod)	ADT	0.25+-0.01		Word et al. 1987
	*	United States	EqPA		EPA Acute Marine EP Threshold	Aquatic biota		1		Lyman et al. 1987
/-490	NC	Southern California	COA		Moderate abundance (75.6+/-12.7 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
/-620	NC	Southern California	COA		Moderate species richness (72+/-3.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
/-710	*	Southern California	COA		Moderate abundance (72.6+/-6.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
/-1125	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
	*	United States	SLCA		National Screening Level Concentration-Marine	Benthic species		1		Neff et al. 1987
/-1302	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
/-1391	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
/-2424	NE	Southern California	COA	10-d	Not significantly toxic (23.2% mortality)	Grandidierella japonica (amphipod)	JUV			Anderson et al. 1988
/-5440	NC	Southern California	COA		Low abundance (57.6+/-13.6 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979
/-7190	NE	Southern California	COA		High species richness (96.3+/-22.3 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979

le 34. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL DDT (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Total DDT Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
3000	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
3000	*	Southern California	AETA		Southern California AET Values	Benthic species				Becker et al. 1990
9300	-	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
9300	-	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
3420 +/-37670	*	Southern California	COA		Low abundance (35.3+/-15.8 N/0.1 sq.m.)	Arthropods				Word & Mearns 1979
4190 +/-40200	*	Southern California	COA		Low species richness (51.2+/-8.6 S/0.1 sq.m.)	Benthic species				Word & Mearns 1979
5500	*	Laboratory	SSBA	288-h	LC0	Nereis virens (sandworm)		2		McLeese et al. 1982
3260 +/-43080	*	Southern California	COA		Low abundance (6.1+/-7.2 N/0.1 sq.m.)	Echinoderm				Word & Mearns 1979
5300 +/-59540	NE	Southern California	COA		High abundance (88.9+/-35.4 N/0.1 sq.m.)	Benthic species				Word & Mearns 1979

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A summary of the available data on the biological effects associated with sediment-sorbed DIELDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

drin +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
/-0.015	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
/-0.007	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
/-0.035	NG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
/-0.025	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
/-0.023	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
/-0.023	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
/-0.02	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
/-0.020	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
/-0.016	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.83	EMAP Louisiana Province 1991
/-0.007	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
/-0.013	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
	SG	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
/-0.032	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
/-0.068	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
/-0.068	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
/-0.085	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
/-0.064	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
/-0.188	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
/-0.225	*	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
/-0.202	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
/-0.202	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
/-0.202	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992

ble 35. A summary of the available data on the biological effects associated with sediment-sorbed DIELDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Dieldrin Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.449	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
.449	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
449	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
449	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
449	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (12% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
449	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
449	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
449	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
449	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
449	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
449	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
0.5	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
533 +/-0.179	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
558 +/-0.22	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
608 +/-0.388	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
608 +/-0.388	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
608 +/-0.39	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
608 +/-0.39	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
613 +/-0.318	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
.63 +/-0.226	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.63 +/-0.226	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.63 +/-0.226	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.63 +/-0.226	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
633 +/-0.262	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
539 +/-0.425	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
539 +/-0.425	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
.64 +/-0.43	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
.64 +/-0.43	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
.64 +/-0.43	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
.64 +/-0.43	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992

. A summary of the available data on the biological effects associated with sediment-sorbed DIELDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

drin .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-0.43	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
+/-0.381	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
+/-0.48	SG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
		TEL								
+/-0.997	*	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
+/-0.976	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
+/-0.656	SG	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
+/-0.655	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
+/-0.73	SG	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
+/-0.373	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
+/-0.816	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
+/-0.416	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
+/-0.421	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
+/-0.522	NG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality).	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
+/-0.442	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
+/-0.888	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
+/-0.817	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
+/-0.476	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
+/-0.604	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
+/-0.54	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
+/-1.03	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
+/-0.939	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
+/-0.644	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
+/-1.05	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
+/-0.798	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
+/-0.862	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
+/-0.862	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
+/-0.862	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
+/-0.899	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
+/-1.06	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
+/-1.64	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-1.64	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-1.71	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
+/-1.94	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
+/-0.115	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
+/-0.095	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
+/-3.15	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
+/-3.17	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
+/-0.37	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep

e 35. A summary of the available data on the biological effects associated with sediment-sorbed DIELDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Dieldrin onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.33 +/-0.359	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
.34 +/-0.395	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
.38 +/-2.7	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
.38 +/-0.364	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
38 +/-0.452	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
38 +/-0.36	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.5	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
1.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
57 +/-3.57	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
58 +/-2.69	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
66 +/-2.84	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
93 +/-2.28	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
94 +/-2.54	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
34 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
34 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
.3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
13 +/-3.17	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
18 +/-2.39	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
18 +/-2.5	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
9 +/-2.58	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
8 +/-0.482	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
2 +/-3.15	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
1 +/-3.07	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
8 +/-2.57	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
1 +/-2.89	*	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
3		*PEL*								
4 +/-2.3	NC	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
6 +/-2.21	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
5	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
2 +/-1.2	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
2 +/-1.2	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
2	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
2	*	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
2 +/-0.6	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
2 +/-0.5	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
6	*	San Francisco Bay, CA	AETA	10-d	San Francisco Bay AET	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
6	*	San Francisco Bay, CA	AETA	48-h	San Francisco Bay AET	Oyster; mussel	LAR			Long & Morgan 1990
6	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990

. A summary of the available data on the biological effects associated with sediment-sorbed DIELDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

drin +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
-/-7.0	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
-/-7.5	SG	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
-/-8.1	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
-/-9.0	*	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	*	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	.	Southern California	AETA	10-d	Southern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
	*	United States	EqPA		Interim Marine Sediment Quality Criteria (FCV)	Benthic community		1		EPA 1988
	*	New York State	EqPA		New York State Sediment Criteria Value			1		Newell 1989
-/-70.8	*	United States	EqPA		Sediment Quality Criteria					Hansen et al. 1991b
-/-50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
/-50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
/-50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (1.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
	*	Laboratory	SSBA	288-h	LC0	Nereis virens (sandworm)		2		McLeese et al. 1982

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ble 36. A summary of the available data on the biological effects associated with sediment-sorbed ENDOSULFAN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

Endosulfan Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.04	*	New York State	EqPA		New York State Sediment Criteria Value			1		Newell 1989
50	*	South Carolina Tidal Creek, SC	COA	7-d	Significant reduction in colonization (50% reduction)	Streblospio benedicti (polychaete)	LAR			Chandler & Scott 1991
100	NE	South Carolina Tidal Creek, SC	COA	7-d	Not significantly toxic	Nannopus palustris (copepod)	JUV			Chandler & Scott 1991
200	NE	South Carolina Tidal Creek, SC	COA	7-d	Not significantly toxic	Pseudobradya pulchella (copepod)	JUV			Chandler & Scott 1991
200	*	South Carolina Tidal Creek, SC	COA	7-d	Significantly toxic	Nannopus palustris (copepod)	JUV			Chandler & Scott 1991
340	*	Laboratory	SSBA	288-h	LC50	Nereis virens (sandworm)		2		McLeese et al. 1982

. A summary of the available data on the biological effects associated with sediment-sorbed ENDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

drin .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
+/-0.05	*	San Francisco Bay, CA	SQAV	SQTA	Significantly Toxic Triad Minimum Bioeffects	Benthic species				Chapman et al. 1987b
	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.974	1.41+/-1.93	EMAP Louisiana Province 1991
	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
	NG	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
	NG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
	NG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
	NG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
	NG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
	NG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993

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ble 37. A summary of the available data on the biological effects associated with sediment-sorbed ENDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Endrin Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.57	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
0.57	NG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
0.57	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
0.57	NG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
0.57	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
0.57	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
0.57	NG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
0.57	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
0.57	NG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
0.57	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
0.57	NG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
0.573 +/-0.021	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
0.575 +/-0.027	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
0.577 +/-0.032	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
0.59 +/-0.056	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
0.62	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
0.62	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
0.62	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
0.62	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
0.62	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
0.62	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
0.62	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
0.62	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
0.62	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
0.62	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
0.62	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
0.62	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
0.62	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992

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A summary of the available data on the biological effects associated with sediment-sorbed ENDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

drin +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2:67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
+/-0.433	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
+/-0.438	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
+/-0.567	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
+/-0.612	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
+/-0.688	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
+/-0.706	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
+/-1.34	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
+/-0.354	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
+/-1.73	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
	*	United States	EqPA		Marine Chronic Sediment Criteria	Aquatic biota		1		JRB Associates 1984
+/-0.645	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.645	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.645	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.645	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
	*	United States	EqPA		Interim Marine Sediment Quality Criteria (FCV)	Benthic community		1		EPA 1988
	*	New York State	EqPA		New York State Sediment Criteria Value			1		Newell 1989
+/-0.115	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
+/-0.095	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
+/-0.37	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
+/-0.359	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
+/-0.395	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
+/-0.364	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
+/-0.452	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep

ble 37. A summary of the available data on the biological effects associated with sediment-sorbed ENDRIN (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Endrin Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
2.38 +/-0.36	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
2.98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
2.98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
3.04 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
3.04 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
3.16 +/-1.44	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
3.3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3.3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
3.58 +/-0.482	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
4.77 +/-3.77	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
6.6 +/-5.11	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
7.3 +/-3.15	*	United States	EqPA		Sediment Quality Criteria					Hansen et al. 1991a
49.4 +/-115	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
<50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
67.6 +/-132	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
74.7 +/-141	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
28000	*	Laboratory	SSBA	288-h	Significantly toxic (40% mortality)	Nereis virens (sandworm)		2		McLeese et al. 1982

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8. A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

tachlor c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
4	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		I		Pavlou et al. 1987
5	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		I		Pavlou et al. 1987
5 +/-0.049	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
7 +/-0.04	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
1	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
2	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
1	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
	SG	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
	SG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
+/-0.156	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
+/-0.156	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
+/-0.082	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
+/-0.074	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-0.074	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
+/-0.111	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
+/-0.081	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
+/-0.026	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
+/-0.064	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
+/-0.159	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993

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le 38. A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Heptachlor Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.3	•	New York State	EqPA		New York State Sediment Criteria Value			1		Newell 1989
0.303 +/-0.320	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
0.306 +/-0.227	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
0.315 +/-0.144	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
0.32 +/-0.168	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
0.323 +/-0.247	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
0.323 +/-0.138	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
0.323 +/-0.21	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
0.329 +/-0.083	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
0.335 +/-0.156	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
0.336 +/-0.239	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
0.337 +/-0.098	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
0.343 +/-0.126	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
0.344 +/-0.256	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
0.371 +/-0.159	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
0.379 +/-0.348	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
0.396 +/-0.522	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
0.397 +/-0.136	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
0.4 +/-0.26	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
0.4 +/-0.26	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
0.4 +/-0.26	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
0.402 +/-0.356	•	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
0.41	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.41	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.41	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.41	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
0.41	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
0.41	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
0.41	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
0.41	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
0.41	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
0.41	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
0.41	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
0.41	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
0.41	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
0.41	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
0.41	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
0.41	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
0.41	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
0.41	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
0.41	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
0.41	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992

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18. A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ptachlor c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001 mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
+/-0.752	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
+/-0.42	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
+/-0.726	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
+/-0.839	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
+/-0.202	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
	NE	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
+/-0.236	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990
+/-0.927	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
+/-0 62	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
+/-0.345	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
+/-0.345	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
+/-0.27	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
+/-0.336	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
+/-0.39	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
+/-0.334	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0 334	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0.33	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0 33	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0.278	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
+/-0.33	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
+/-0 36	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0 36	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0.36	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0.36	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0.36	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
+/-0.445	SG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
+/-0.307	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.307	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.307	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.307	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	SG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
+/-1.23	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep

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le 38. A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Ieptachlor :onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
I	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
I.08 +/-1.39	SG	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
I.12 +/-1.38	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
I.15 +/-1.48	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
I.16 +/-0.048	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
I.16 +/-0.072	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
1.2 +/-0.193	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
1.2 +/-0.206	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.2 +/-0.191	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
.23 +/-0.19	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
.23 +/-0.236	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
.24 +/-0.184	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
.29 +/-1.57	*	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
.47 +/-2.08	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
.59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
.59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
.75 +/-1.78	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
.86 +/-0.268	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
.04 +/-1.97	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
2.5	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
.63 +/-2.3	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
.28 +/-3.6	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
.73 +/-1.85	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
.73 +/-1.85	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
.73 +/-1.85	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
5	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
5	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
5.6 +/-1.65	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
2.2 +/-63.7	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
0.9 +/-74.1	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
3.4 +/-79.7	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
:50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
ℹ66 +/-534	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
ℹ66 +/-534	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
ℹ66 +/-534	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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). A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR EPOXIDE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

chlor Epoxide onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.05 +/-0.042	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
06 +/-0.035	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
65 +/-0.021	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
65 +/-0.021	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
.08	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
.08	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
.08	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.23% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
08	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
08	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
08	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
08	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
08	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
08	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
08	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
08	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
08	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
08	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
08	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
08	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
08	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
08	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
08	SG	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
08	SG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
23	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
23	NG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
23	NG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
23	NG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
23	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
23	NG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
23	NG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
23	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993

‹le 39. A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR EPOXIDE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

›ptachlor Epoxide Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.23	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
0.23	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
0.23	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
0.23	NG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
0.23	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
0.23	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
0.23	NG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
0.24 +/-0.072	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
0.242 +/-0.086	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
0.261 +/-0.128	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
0.269 +/-0.152	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
0.28 +/-0.157	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
0.285	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca-(amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
0.285	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
0.285	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992

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A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR EPOXIDE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

hlor Epoxide nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
:5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
:5	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
:5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5 +/-0.165	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
3	*	New York State	EqPA		New York State Sediment Criteria Value			1		Newell 1989
3 +/-0.208	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
5 +/-0.354	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
6 +/-0.339	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
6 +/-0.339	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
7 +/-0.298	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
8 +/-0.351	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
5 +/-0.87	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
5 +/-0.565	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
6 +/-1	*	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
7 +/-0.261	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7 +/-0.261	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7 +/-0.261	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7 +/-0.261	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
1 +/-0.53	NE	Oakland Harbor, CA	COA	10-d	Significantly toxic (35.3+/-2.5% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.56+/-0.07		Word et al. 1988
:4 +/-0.988	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
1	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
)7 +/-0.751	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
6 +/-0.048	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
:9 +/-0.215	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
4	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep

ble 39. A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR EPOXIDE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Heptachlor Epoxide Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1.86 +/-0.268	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
2.12 +/-1.75	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
2.21 +/-1.85	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
2.23 +/-1.84	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
2.33 +/-1.97	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
2.55 +/-2.06	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
3.78 +/-2.45	*	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
4.69 +/-7.37	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
6.31 +/-8.16	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
6.84 +/-8.64	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
<50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984

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l0. A summary of the available data on the biological effects associated with sediment-sorbed LINDANE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

ndane c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
3 +/-0.026	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
4 +/-0.028	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
5 +/-0.052	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
5 +/-0.064	SG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
3 +/-0.015	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
3 +/-0.015	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3 +/-0.015	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
7 +/-0.009	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
1	*	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
1	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
1	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
1	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
1	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
1	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
1	NE	San Francisco Bay, CA	COA	48-h	Least toxic (23.3+/-7.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
1	NE	San Francisco Bay, CA	COA	48-h	Not significantly toxic (31.9+/-15.5% abnormal)	Bivalve	LAR			Long & Morgan 1990
1	NE	San Francisco Bay, CA	COA	10-d	Not significantly toxic (18.4+/-6.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
1	NE	San Francisco Bay, CA	COA	10-d	Least toxic (18+/-6.6% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
1	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
1	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
1	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
1	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
1	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
1	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
1	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
1	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
1	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
1	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
1	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
1	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
1	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
1	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
1	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
1	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
1	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
1	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
1 +/-0.116	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993

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ıle 40. A summary of the available data on the biological effects associated with sediment-sorbed LINDANE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Lindane Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.175 +/-0.16	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
0.185 +/-0.198	NC	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
0.195 +/-0.194	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
0.195 +/-0.194	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
0.197 +/-0.29	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
0.203 +/-0.207	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
0.21 +/-0.244	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
0.212 +/-0.237	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
0.217 +/-0.285	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
0.224 +/-0.329	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
0.225 +/-0.247	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
0.225 +/-0.247	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
0.225 +/-0.196	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
0.225 +/-0.332	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
0.229 +/-0.304	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
0.242 +/-0.377	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
0.243 +/-0.329	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
0.25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
0.25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
0.25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
0.252 +/-0.921	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
0.253 +/-0.3	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993
0.26 +/-0.274	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
0.26 +/-0.274	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
0.274 +/-0.389	SG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
0.287 +/-0.29	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
0.298 +/-0.432	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
0.3 +/-0.7	*	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
0.308	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
0.308	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
0.308	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
0.308	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.308	NC	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.308	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
0.308	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
0.308	NC	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
0.308	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
0.308	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
0.308	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
0.308	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
0.308	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
0.308	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992

. A summary of the available data on the biological effects associated with sediment-sorbed LINDANE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

lane +/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
+/-0.113	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.113	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.113	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-0.113	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
		TEL								
+/-0.65	*	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
+/-0.356	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
+/-0.425	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
+/-0.439	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
+/-0.208	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0.208	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0.21	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0.21	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
+/-0.7	*	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
+/-0.23	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0.23	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0.23	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0.23	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
+/-0.23	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
+/-0.449	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993
+/-0.29	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NC	Puget Sound, WA	COA	2-d	Significantly toxic (3.8% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.5		Pastorok & Becker 1990
+/-0.185	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (13.8+/-4.09% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.47+/-0.306		Pastorok & Becker 1990
+/-0.379	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
+/-0.22	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (6.67+/-8.07% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.51+/-0.330		Pastorok & Becker 1990

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able 40. A summary of the available data on the biological effects associated with sediment-sorbed LINDANE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Lindane Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.563 +/-0.36	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
0.567 +/-0.549	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
0.567 +/-0.549	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
0.567 +/-0.549	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
0.6 +/-0.8	*	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
0.6 +/-0.324	NE	Puget Sound, WA	COA	20-d	Not significantly toxic (5+/-3.86% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.46+/-0.26		Pastorok & Becker 1990
0.61 +/-0.375	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
0.617 +/-0.375	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
0.617 +/-0.375	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
0.633 +/-0.262	NE	Puget Sound, WA	COA	15-min	Not significantly toxic (EC50; 0.283+/-0.168% extract)	Microtox (Photobacterium phosphoreum)		1.39+/-0.37		Pastorok & Becker 1990
0.654 +/-0.387	NE	Puget Sound, WA	COA	10-d	Not significantly toxic (4.43+/-2.1% mortality)	Panope generosa (geoduck)	JUV	1.51+/-0.261		Pastorok & Becker 1990
0.7	*	Northern California	AETA	10-d	Northern California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
0.7	*	California	AETA	10-d	California AET Values	Rhepoxynius abronius (amphipod)	ADT			Becker et al. 1990
0.771 +/-0.555	SG	Puget Sound, WA	COA	15-min	Significantly toxic (EC50; 0.065+/-0.043% extract)	Microtox (Photobacterium phosphoreum)		1.58+/-0.255		Pastorok & Becker 1990
0.808 +/-0.555	NE	Puget Sound, WA	COA	2-d	Not significantly toxic (2.09+/-1.73% abnormal chromosome)	Dendraster excentricus (echinoderm)	EMB	1.56+/-0.329		Pastorok & Becker 1990
0.817	*	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
0.817	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
0.867 +/-0.618	SG	Puget Sound, WA	COA	2-d	Significantly toxic (60.4+/-46.5% abnormal development)	Dendraster excentricus (echinoderm)	EMB	1.57+/-0.287		Pastorok & Becker 1990
0.99		*PEL*								
1	NC	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
1	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
1	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
1.08 +/-0.665	*	Puget Sound, WA	COA	10-d	Significantly toxic (80.8+/-30.6% mortality)	Rhepoxynius abronius (amphipod)	ADT	1.65+/-0.266		Pastorok & Becker 1990
1.16 +/-0.072	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
1.16 +/-0.048	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
1.2 +/-0.193	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
1.2 +/-0.206	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.2 +/-0.191	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
1.23 +/-0.19	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
1.23 +/-0.236	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
1.24 +/-0.184	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.3	*	California	AETA	48-h	California AET Values	Mytilus edulis (bivalve)	LAR			Becker et al. 1990
1.3	*	California	AETA		California AET Values	Benthic species				Becker et al. 1990
>1.3	-	Northern California	AETA		Northern California AET Values	Benthic species				Becker et al. 1990
1.32 +/-0.791	*	Puget Sound, WA	COA	20-d	Significantly toxic (37.3+/-22% mortality)	Neanthes arenaceodentata (polychaete)	EMB	1.87+/-0.208		Pastorok & Becker 1990
1.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1.59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
1.59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
1.7 +/-1.09	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993

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0. A summary of the available data on the biological effects associated with sediment-sorbed LINDANE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

dane .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-1.13	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
+/-0.268	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
	*	Puget Sound, WA	COA	10-d	Significantly toxic (56% mortality)	Panope generosa (geoduck)	JUV	2.1		Pastorok & Becker 1990
	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
+/-1.91	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
	*	United States	EqPA		Chronic Marine Sediment Safe Level Criteria					Pavlou 1987
	NE	Puget Sound, WA	AETA		PSDDA Screening level concentration	Aquatic biota				USACOE 1988
+/-47.6	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
+/-55.1	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
+/-58.5	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
+/-86	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
+/-86	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
+/-86	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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ble 41. A summary of the available data on the biological effects associated with sediment-sorbed MIREX (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

Mirex Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
005	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
005	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
005	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
085	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
085	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
085	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
085	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
85	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
85	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
85	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973.	EMAP Louisiana Province 1991
85	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
85	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
85	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
85	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
85	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
85	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
85	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
85	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
85	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
85	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
85	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
85	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
85	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
85	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
85	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
85	NG	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
85	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
85	NG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
45	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-6.07% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.71+/-0.9	15.3+/-23.2	Bricker et al. 1993
45	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (91.5+/-7.28% normal development)	Mulinia lateralis (bivalve)	LAR	2.6+/-0.899	36.8+/-34.9	Bricker et al. 1993
45	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (21.5+/-6.36% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.35+/-1.05	10.5+/-13.4	Bricker et al. 1993
45	NG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (25.9+/-5.01% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.21+/-0.444	2.41+/-2.32	Bricker et al. 1993
45	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (6.48+/-10.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
45	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99+/-0.862% normal development)	Mulinia lateralis (bivalve)	LAR	1.46+/-0.733	4.2+/-6.27	Bricker et al. 1993
45	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (17.2+/-7.99% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.14+/-0.352	6.09+/-5.38	Bricker et al. 1993
45	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (12.3+/-14.5% mortality)	Mulinia lateralis (bivalve)	LAR	1.53+/-0.743	15.7+/-23.2	Bricker et al. 1993
45	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (88.5+/-8.39% normal development)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.05	38.1+/-38.9	Bricker et al. 1993
45	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (19.3+/-5.86% mortality)	Ampelisca abidta (amphipod)	SUBADT	1.82+/-0.225	6.3+/-6.2	Bricker et al. 1993
45	NG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (39.5+/-18.2% mortality)	Ampelisca abidta (amphipod)	SUBADT	2.06+/-0.523	20.1+/-13.9	Bricker et al. 1993
45	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (15.2+/-9.21% mortality)	Mulinia lateralis (bivalve)	LAR	2.17+/-0.663	18.4+/-19.9	Bricker et al. 1993
45	NG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.5+/-11.4% mortality)	Mulinia lateralis (bivalve)	LAR	2.33+/-0.364	26.8+/-9.42	Bricker et al. 1993
45	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.3+/-2.22% normal development)	Mulinia lateralis (bivalve)	LAR	2.18+/-0.531	19.1+/-12.5	Bricker et al. 1993

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l. A summary of the available data on the biological effects associated with sediment-sorbed MIREX (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

ex +/-SD	HIt	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NG	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (96+/-1.66% normal development)	Mulinia lateralis (bivalve)	LAR	2.52+/-0.997	35+/-42.9	Bricker et al. 1993
	NE	Long Island Sound, NY, CT	COA	10-d	Not significantly toxic (23+/-4.24% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.46+/-1.22	40+/-55.1	Bricker et al. 1993
	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (75.1+/-10.6% mortality)	Mulinia lateralis (bivalve)	LAR	3.32+/-0.317	42.3+/-19.2	Bricker et al. 1993
	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.061+/-0.038 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.8+/-0.477	8.52+/-10.7	Bricker et al. 1993
	NG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.014+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.51+/-0.45	29.6+/-15.7	Bricker et al. 1993
	NC	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.016+/-0.007 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.26+/-0.936	43.4+/-35.6	Bricker et al. 1993
	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.125+/-0.084 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.25+/-0.468	1.98+/-2.25	Bricker et al. 1993
	NG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.008+/-0.001 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.19+/-1.27	12+/-11.3	Bricker et al. 1993
/-0.581	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (99.3+/-0.827% normal development)	Mulinia lateralis (bivalve)	LAR	1.43+/-0.738	14.7+/-24	Bricker et al. 1993
/-0.83	SG	San Francisco Bay, CA	COA	10-d	Significantly toxic (42.9+/-19.2% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
/-0.653	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.074+/-0.043 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.27+/-0.626	6.21+/-5.41	Bricker et al. 1993
/-0.8	SG	San Francisco Bay, CA	COA	48-h	Significantly toxic (55.7+/-22.7% abnormal)	Bivalve	LAR			Long & Morgan 1990
/-0.671	SG	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (30.5+/-16.4% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.62+/-0.777	17.7+/-26.3	Bricker et al. 1993
/-0.735	NC	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (68.1+/-13.3% mortality)	Mulinia lateralis (bivalve)	LAR	2.68+/-0.955	31.8+/-24.4	Bricker et al. 1993
/-0.9	SG	San Francisco Bay, CA	COA	48-h	Moderately toxic (59.4+/-11.3% abnormal)	Bivalve	LAR			Long & Morgan 1990
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992

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ble 41. A summary of the available data on the biological effects associated with sediment-sorbed MIREX (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

Mirex Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.789+/-0.866	2.04+/-1.75	Hall et al. 1992
0.5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
0.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
0.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
0.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
0.5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
0.5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
0.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
0.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
0.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
0.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
0.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
0.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
0.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
0.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
0.5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
0.5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
0.5	NG	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
0.5	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
.0.5	NG	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
0.5	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
0.5	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
0.5	NG	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
0.5	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
506 +/-0.801	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.096+/-0.101 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.37+/-0.759	6.93+/-6.83	Bricker et al. 1993
0.7 +/-1.1	SG	San Francisco Bay, CA	COA	10-d	Highly toxic (67+/-11.8% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
832 +/-3.54	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (98.1+/-2.78% normal development)	Mulinia lateralis (bivalve)	LAR	2.12+/-1.04	22.9+/-23.7	Bricker et al. 1993
895 +/-3.87	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (17+/-16.1% mortality)	Mulinia lateralis (bivalve)	LAR	1.99+/-1	21.6+/-24.5	Bricker et al. 1993
969 +/-3.93	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (34.9+/-15.7% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.23+/-1.04	25.4+/-25.5	Bricker et al. 1993
1.01 +/-4.52	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.013+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		2.79+/-0.744	37.6+/-25.3	Bricker et al. 1993
1.14 +/-1.34	NE	Long Island Sound, NY, CT	COA		Not significantly toxic (EC50; 0.167+/-0.198 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.59+/-1.09	4.67+/-6.99	Bricker et al. 1993
1.19 +/-1.64	*	Long Island Sound, NY, CT	COA	48-h	Significantly toxic (51.3+/-6.95% mortality)	Mulinia lateralis (bivalve)	LAR	1.8+/-1.71	29.6+/-46.3	Bricker et al. 1993
1.73 +/-5.83	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (96.6+/-3.79% normal development)	Mulinia lateralis (bivalve)	LAR	2.87+/-0.94	35.1+/-25.9	Bricker et al. 1993
1.89 +/-6.12	*	Long Island Sound, NY, CT	COA	10-d	Significantly toxic (38+/-13% mortality)	Ampelisca abdita (amphipod)	SUBADT	2.92+/-0.937	34.6+/-23.9	Bricker et al. 1993
1.92 +/-6.68	SG	Long Island Sound, NY, CT	COA		Significantly toxic (EC50; 0.011+/-0.006 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.28+/-0.363	45.3+/-21.4	Bricker et al. 1993
2.47 +/-7.11	NE	Long Island Sound, NY, CT	COA	48-h	Not significantly toxic (29.8+/-13.9% mortality)	Mulinia lateralis (bivalve)	LAR	2.65+/-1.07	32.1+/-28.4	Bricker et al. 1993

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. A summary of the available data on the biological effects associated with sediment-sorbed TOXAPHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems.

phene .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	*	United States	EqPA		99% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
	*	United States	EqPA		95% Chronic Marine Criteria	Aquatic organisms		1		Pavlou et al. 1987
+/-0.264	NE	Narragansett Bay, RI	COA	10-d	Not significantly toxic (5.28+/-3.04% mortality)	Ampelisca abdita (amphipod)	ADT			Munns et al. 1991
	NE	San Francisco Bay, CA	COA	10-d	Moderately toxic (33.8+/-4.7% mortality)	Rhepoxynius abronius (amphipod)	ADT			Long & Morgan 1990
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
	*	New York State	EqPA		New York State Sediment Criteria Value			1		Newell 1989
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
	*	United States	EqPA		Chronic Marine EqP Threshold	Aquatic biota		1		Bolton et al. 1985
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (0.33+/-0.516% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (2.33+/-1.03% mortality)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (55.0+/-22.6% mortality)	Hyalella azteca (amphipod)	JUV	0.338+/-0.133	2.9+/-3.11	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (15.3+/-11.0% mortality)	Hyalella azteca (amphipod)	JUV	0.648+/-0.641	1.74+/-1.39	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29.8+/-11.1% mortality)	Streblospio benedicti (polychaete worm)		0.316+/-0.12	2.13+/-2.46	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1% mortality)	Streblospio benedicti (polychaete worm)		1.38	3.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (55.0+/-19.5% mortality)	Streblospio benedicti (polychaete worm)		0.349+/-0.11	1.07+/-0.66	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (16.5+/-9.19% mortality)	Streblospio benedicti (polychaete worm)		0.783+/-0.845	4.83+/-2.23	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.367+/-0.085 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.0005 mg/day growth)	Streblospio benedicti (polychaete worm)		0.493+/-0.448	2.32+/-2.25	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.003 mg/day growth)	Lepidactylus dytiscus (amphipod)		1.38	3.25	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.003+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.316+/-0.120	2.13+/-2.46	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (29% mortality)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (7.2+/-1.92% mortality)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (89.7% reburial)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.6+/-0.55% reburial)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Lepidactylus dytiscus (amphipod)		0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Lepidactylus dytiscus (amphipod)		0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	6.41	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.56+/-0.47	1.5+/-1.13	Hall et al. 1992
	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (-0.004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.001+/-0.001 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.555+/-0.471	2.68+/-2.3	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (1.83+/-1.6% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (3.5+/-1.87% mortality)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992

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e 42. A summary of the available data on the biological effects associated with sediment-sorbed TOXAPHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

'oxaphene 'onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (45.5+/-12% mortality)	Lepidactylus dytiscus (amphipod)		0.383+/-0.279	3.61+/-2.79	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (9.25+/-5.32% mortality)	Lepidactylus dytiscus (amphipod)		0.638+/-0.768	1.65+/-1.62	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (63.0+/-24.3% mortality)	Hyalella azteca (amphipod)	JUV	0.317+/-0.228	2.57+/-2.67	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (22.3+/-7.37% mortality)	Hyalella azteca (amphipod)	JUV	0.788+/-0.866	2.04+/-1.75	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (22% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (8.8+/-7.12% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (28% mortality)	Streblospio benedicti (polychaete worm)		0.185	0.5	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (14+/-9.22% mortality)	Streblospio benedicti (polychaete worm)		0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	10-d	Significantly toxic (82.9% reburial)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	10-d	Not significantly toxic (99.1+/-0.865% reburial)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>20% emergence)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<20% emergence)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Toxic (>10% emergence)	Hyalella azteca (amphipod)	JUV	0.185	5.58	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (<10% emergence)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	1.65+/-1.40	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (-0.057+/-0.04 mg/day growth)	Palaemonetes pugio (grass shrimp)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not toxic (0.002+/-0.001mg/day growth)	Streblospio benedicti (polychaete worm)		0.553+/-0.622	2.31+/-2.04	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.016 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.185	5.58	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.008+/-0.002 mg/day growth)	Lepidactylus dytiscus (amphipod)		0.626+/-0.666	1.65+/-1.4	Hall et al. 1992
5	NG	Chesapeake Bay, VA, MD	COA	20-d	Significantly toxic (0.003 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.185	0.5	Hall et al. 1992
5	NE	Chesapeake Bay, VA, MD	COA	20-d	Not significantly toxic (0.005+/-0.0004 mg/day growth)	Hyalella azteca (amphipod)	JUV	0.626+/-0.666	2.67+/-2.05	Hall et al. 1992
5	NG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
5	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
5	NG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
5	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
5	NG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
5	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
5	NG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
5	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
5	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
5	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991

2. A summary of the available data on the biological effects associated with sediment-sorbed TOXAPHENE (ppb) used to support the derivation of sediment quality guidelines for marine and estuarine ecosystems (continued).

aphene c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
	NG	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
	NG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
	NG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
+/-1.61	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
+/-4.78	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
+/-4.9	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
+/-5.24	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
+/-4.83	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
+/-6	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
+/-4.76	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
+/-11.3	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-11.3	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-11.3	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-11.3	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-2.5	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
+/-23.7	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep

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Approach to the Assessment of Sediment Quality in Florida Coastal Waters

Volume 4 - Supporting Documentation: Regional Biological Effects Database for Sediments

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January, 1994

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GLOSSARY OF ACRONYMS

SUBSTANCE

Conc.+/-SD	=	Concentration Plus or Minus Standard Deviation

ANALYSIS TYPE

COA	=	Co-occurrence Analysis
AETA	=	Apparent Effects Threshold Approach
EqPA	=	Equilibrium Partitioning Approach
SQO	=	Sediment Quality Objective
SQG	=	Sediment Quality Guideline
SBA	=	Sediment Background Approach
SSBA	=	Spike Sediment Bioassay Approach
SLCA	=	Screening Level Concentration Approach

TEST DURATION

d	=	Day
h	=	Hour
wk	=	Week
m	=	Month
FT	=	Flow-Through Test
ST	=	Static Test

END-POINT MEASURED

ACOE	=	Army Corps of Engineers
AET	=	Apparent Effects Threshold
C.L.	=	Confidence Limit
EC50	=	Effective Concentration to 50% of the Tested Organisms
EPA	=	Environmental Protection Agency
EqP	=	Equilibrium Partitioning
FCV	=	Final Chronic Value
LC50	=	Lethal Concentration to 50% of the Tested Organisms
LPL	=	Lower Prediction Limit
MFO	=	Mixed-Function Oxidase
N	=	Number of Organisms
NSLC	=	National Screening Level Concentration
PSDDA	=	Puget Sound Dredge Disposal Analysis
S	=	Species
SDUs	=	Species Diversity Units
sq.m.	=	Square Meter
SRUs	=	Species Richness Units
TLm	=	Median Tolerance Limit
TU/g	=	Toxic Units / Gram

GLOSSARY OF ACRONYMS (continued)

SPECIES

sp.	=	Species
spp.	=	Species (plural)

LIFE STAGE

ADT	=	Adult
ADT/JUV	=	Adult and/or Juvenile
HAT	=	Hatchling
GAM	=	Gamete
I	=	Instar
JUV	=	Juvenile
LAR	=	Larval
NEO	=	Neonate
NYM	=	Nymph
SUBADT	=	Sub-Adult

HIT

NC	=	No Concordance
NE	=	No Effect
NG	=	No Gradient
SG	=	Small Gradient
*	=	Hit
-	=	Indeterminate

TOC

TOC	=	Total Organic Carbon

AVS

AVS	=	Acid Volatile Sulphide

\ summary of the available data on the biological effects associated with sediment-sorbed ARSENIC (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

ic -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
1.02	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
1.02	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
1.02	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
?	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
).15	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
).32	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
).32	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
).32	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
	NE	*Georgetown Harbor, SC*	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
	NC	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
	NC	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
	NC	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
.208	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
.208	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
.208	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
.36	NC	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
.464	NE	Houston Ship Channel, TX	COA	*10-d*	*Not significantly toxic (5.4+/-3.6% mortality)*	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
.6	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
.784	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
.48	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
514	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
32	NC	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
248	SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
56	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	*Arbacia punctulata (sea urchin)*		0.03	19 ug/g	Windom In Prep
942	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
15	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
94	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
33	NC	*Savannah River Entrance Channel, GA*	COA	*10-d*	*Significantly toxic (28.3+/-6.11% mortality)*	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
26	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
92	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
63	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
87	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
215	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
502	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
11	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992

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\ summary of the available data on the biological effects associated with sediment-sorbed ARSENIC (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

ic -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
2	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
0.373	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
0.373	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.37	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
1.89	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
1.75	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
1.99	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
).769	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
3.26	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
1.5	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
1.73	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
3.46	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
3.39	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
2	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
2.04	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
2.04	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
2.62	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
.93	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
.04	SG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
.36	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
.52	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
.03	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
.03	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
.21	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
.283	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
.83	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
.141	NE	Mississippi River. MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
.71	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
.66	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
.86	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
.86	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
.86	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
.45	SG	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
.354	SG	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
.25	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
.03	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
.97	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
84	SG	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
88	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
16	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
61	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
61	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
61	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980

A summary of the available data on the biological effects associated with sediment-sorbed ARSENIC (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

ic -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1.67	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
1.67	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2.94	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
		TEL								
3.34	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
6.28	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
6.28	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
2.45	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
6.36	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
6.37	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
3.77	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
3.64	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
3.64	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
3.64	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
11.8	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
3.20	*	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
3.06	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3.02	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
.76	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
.44	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.44	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.44	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.44	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.54	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
.34	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
.34	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
.34	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
		PEL								
16	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
16	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
16	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c

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, summary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

um -SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
-0.022	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
-0.01	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
-0.015	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
-0.014	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
-0.014	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
-0.021	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
-0.018	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
-0.014	NC	Mississippi Sound, MS -	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
-0.048	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
-0.045	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
0.046	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
0.046	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.033	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.018	NE	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.42+/-0.13		Chapman et al. 1991
0.052	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
0.047	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
0.048	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
0.02	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
0.02	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
0.02	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
0.055	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
0.06	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
0.041	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
0.041	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
0.107	NE	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	0.443+/-0.127		Chapman et al. 1991
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
0.03	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
0.03	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
0.03	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
0.1	NE	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	0.425+/-0.128		Chapman et al. 1991
0.099	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
0.041	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
	NC	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
0.043	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992

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summary of the available data on the biological effects associated with sediment-sorbed *CADMIUM* (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

ım SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.095	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
0.105	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
0.053	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
0.091	*NE*	*Mobile Bay, AL*	*COA*		*Not significantly toxic (1.07+/-1.85% mortality)*	*Mysidopsis bahia (mysid shrimp)*		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
0.076	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
	NC	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox (Photobacterium phosphoreum)		0.4		Chapman et al. 1991
.03	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
.03	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
.03	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
.099	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
.057	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
.137	NC	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.45+/-0.058		Chapman et al. 1991
.131	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
.133	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
.082	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	*Benthic invertebrates*		0.985+/-0.247	22+/-11.2	Carr 1992
.099	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
.059	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
.13	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
.072	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
.142	SG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
.141	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
.203	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
.17	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.17	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.17	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.17	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	*Macoma nasuta (clam)*		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.155	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
.092	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
.057	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
.142	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
.049	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
.170	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
.347	*NE*	*Brunswick Harbor Entrance, GA*	*COA*	*48-h*	*Not significantly toxic (86.6+/-4.25% normal development)*	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
.029	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991

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summary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

ım SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.397	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
0.397	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
0.37	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
0.37	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
0.37	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
0.512	*	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
0.448	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
0.349	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
0.469	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
1.673	NE	Gulf of Mexico	COA		Not toxic (3.21+/-0.239 diversity index)	Benthic species		0.464+/-0.143		Chapman et al. 1991
0.436	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
0.705	NE	Gulf of Mexico	COA		Least toxic (6.32+/-3.68 TU/g)	Microtox (Photobacterium phosphoreum)		0.47+/-0.149		Chapman et al. 1991
0.405	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3+/-1.51% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			Vittor & Associates 1988
0.405	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (7.7+/-3.02% mortality)	Nereis virens (sandworm)	ADT			Vittor & Associates 1988
0.375	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
1.049	NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
0.217	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
0.177	NC	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
1.834	NE	Gulf of Mexico	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.471+/-0.18		Chapman et al. 1991
1.165	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
1.269	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
	NG	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
.095	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
.03	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
.863	*	Gulf of Mexico	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.5+/-0.155		Chapman et al. 1991
.502	NE	Miami River/Seybold Canal, FL	COA	10-d	Significantly toxic (24.7+/-15% mortality)	Pennaeus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
.41	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
		TEL								
.03	*	Gulf of Mexico	COA	48-h	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	LAR	0.5+/-0.18		Chapman et al. 1991
.13	*	Gulf of Mexico	COA	48-h	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	LAR	0.567+/-0.153		Chapman et al. 1991
.36	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
.36	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
.36	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
.86	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
.85	NE	Miami River, FL	COA	10-d	Not toxic (18.6+/-7.27% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			ERCO 1985
.85	NE	Miami River, FL	COA	10-d	Not toxic (1.2+/-0.837% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			ERCO 1985
.85	NE	Miami River, FL	COA	10-d	Not toxic (3.6+/-1.67% mortality)	Nereis virens (sandworm)	ADT			ERCO 1985

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e 2. A summary of the available data on the biological effects associated with sediment-sorbed CADMIUM (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

'admium onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.64 +/-1.79	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
.86 +/-2.03	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
.86 +/-2.03	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
.86 +/-2.03	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c
93 +/-1.58	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
07 +/-0.929	*NE*	*Galveston Harbor, TX*	*COA*	*10-d*	*Not toxic (2.4+/-1.52% mortality)*	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
07 +/-0.929	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
07 +/-0.929	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
09 +/-2.19	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
.2		*PEL*								
5.3 +/-41.5	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
5.3 +/-41.5	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
5.3 +/-41.5	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b

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3. *A summary of the available data on the biological effects associated with sediment-sorbed* **CHROMIUM (ppm)** *used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.*

romium nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
32 +/-1.34	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
32 +/-1.34	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
32 +/-1.34	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
46	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	*Benthic species*		0.12		Van Dolah et al. 1984
4	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
.2 +/-2.43	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
.5 +/-2.12	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
.6	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	*Windom In Prep*
6	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
6 +/-2.94	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
.4	SG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	*Benthic species*				Winn et al. 1989
54 +/-2.47	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
57 +/-5.03	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
.8	SG	*Charleston Harbor, SC*	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
.5 +/-3.54	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province *1991*
32 +/-2.45	SG	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
37 +/-2.30	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
37 +/-2.30	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
37 +/-2.30	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
13 +/-2.49	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
13 +/-2.49	NE	Sabine-Neches Waterway, TX	*COA*	*10-d*	*Not toxic* (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
13 +/-2.49	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
12 +/-3.27	SG	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
5 +/-9.19	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
8 +/-4.61	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		*0.181+/-0.162*	*182+/-208 ug/g*	Windom In Prep
2 +/-14	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
3 +/-11.5	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
5 +/-6.11	SG	Savannah River Entrance Channel, GA	*COA*	*10-d*	*Significantly toxic (28.3+/-6.11% mortality)*	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
5 +/-12.3	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
4 +/-14 1	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
2 +/-11.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
7 +/-12.5	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		*Crocker et al. 1991*
4 +/-8.41	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
8 +/-11.9	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
1 +/-8.17	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	*Arbacia punctulata (sea urchin)*	GAM		0.131+/-0.169	Long 1993
4 +/-12.2	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
6 +/-13	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
9 +/-0.173	*NE*	*Galveston Harbor, TX*	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
9 +/-0.173	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
9 +/-0.173	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
8 +/-4.93	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
8 +/-4.93	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
8 +/-4.93	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b

3. A summary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

ıromium nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
ı 7 +/-4.45	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
20 +/-5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	*Palaemonetes pugio (grass shrimp)*	ADT			Espey, Huston & Associates 1983b
20 +/-5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
20 +/-5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
20 +/-1.97	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
.5 +/-14.3	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
.5 +/-3.51	*NE*	*Galveston Bay, TX*	COA		*High species richness (24.5+/-3.7 S/0.00203 sq.m.)*	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5 +/-3.51	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
.6 +/-8.67	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
:2 +/-13.5	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
4 +/-10.3	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
5 +/-3.54	NG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
.7 +/-22.3	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. *1991*
7 +/-15.6	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
6 +/-29.9	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
8 +/-22.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
8 +/-22.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
8 +/-22.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	*ADT*			EG&G Bionomics 1980
5 +/-14.4	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
4 +/-5.08	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
4 +/-5.08	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
4 +/-5.08	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
7 +/-12	NC	*Galveston Bay, TX*	COA		*Low abundance (0.3+/-0.651 N/0.00203 sq.m.)*	*Amphipoda*		0.859+/-0,487	7.67+/-8.12	Carr 1992
1 +/-25.4	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
1 +/-25.4	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
1 +/-25.4	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
1 +/-15.7	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
2 +/-16	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
2 +/-16	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
3 +/-11.3	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
5 +/-16.1	SG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
1 +/-16.5	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
1 +/-12.9	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
1 +/-33.2	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
7 +/-17.1	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
3 +/-17.7	NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
5 +/-10.5	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
5 +/-35.9	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
5 +/-11.5	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	*EMB*	*1.06+/-0.449*	*14.5+/-9.2*	*Carr 1992*
7 +/-18.5	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
3 +/-13.4	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
5 +/-26.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
5 +/-26.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep

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:3. A summary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

aromium onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
9.1 +/-13.1	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
9.9 +/-27.1	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
0.1 +/-23.5	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
0.2 +/-27.3	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
2.5 +/-37	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
43 +/-26.9	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
3.1 +/-22.8	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3.1 +/-22.8	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3.1 +/-22.8	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3.1 +/-22.8	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
1.3 +/-21.9	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
1.2 +/-26.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
1.2 +/-26.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
1.2 +/-26.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
51	NE	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox (Photobacterium phosphoreum)		0.4		Chapman et al. 1991
.2 +/-42.9	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
.2 +/-18.3	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
.6 +/-3.05	NE	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.42+/-0.13		Chapman et al. 1991
7 +/-2.56	NE	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	0.443+/-0.127		Chapman et al. 1991
.9 +/-2.42	NE	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	0.425+/-0.128		Chapman et al. 1991
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.8 +/-2.36	NE	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.45+/-0.058		Chapman et al. 1991
.8 +/-14.2	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
8 +/-14.2	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3 +/-21	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
56 +/-18.2	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
56 +/-3.41	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
.5 +/-15.2	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
.9 +/-44.9	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
.9 +/-9.2	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
56 +/-36.4	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
.5 +/-13.4	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
.8 +/-36.4	NE	Gulf of Mexico	COA		Not toxic (3.21+/-0.239 diversity index)	Benthic species		0.464+/-0.143		Chapman et al. 1991
.5 +/-37.9	NE	Gulf of Mexico	COA		Least toxic (6.32+/-3.68 TU/g)	Microtox (Photobacterium phosphoreum)		0.47+/-0.149		Chapman et al. 1991
.5 +/-20.5	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
.4 +/-44.3	NE	Gulf of Mexico	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.471+/-0.18		Chapman et al. 1991
.4 +/-45.8	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
30 +/-5.66	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
3 +/-46.4	SG	Gulf of Mexico	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.5+/-0.155		Chapman et al. 1991
37	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
7 +/-35.8	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993

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e 3. A summary of the available data on the biological effects associated with sediment-sorbed CHROMIUM (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

hromium onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
96 +/-52.3	SG	Gulf of Mexico	COA	48-h	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	LAR	0.5+/-0.18		Chapman et al. 1991
110 +/-53.5	*	Gulf of Mexico	COA	48-h	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	LAR	0.567+/-0.153		Chapman et al. 1991
116 +/-23.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
.16 +/-23.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
16 +/-23.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crassostrea virginica (oyster)	ADT			Parrish 1987c
60		*PEL*								

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4. A summary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

opper nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.5	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
.9 +/-3.39	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
13 +/-6.70	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
.9 +/-0.283	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
.5	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
.5	NG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
.5	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
.5	NG	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
.5 +/-0.61	NC	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
.5 +/-0.071	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
7 +/-0.082	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
5 +/-0.071	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
9	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
3 +/-0.733	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
3 +/-0.733	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
3 +/-0.733	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
1 +/-1.12	*	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
2	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
2 +/-0.141	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
5	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
3 +/-0.793	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
5 +/-2.77	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
3 +/-2.27	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
) +/-2.42	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
) +/-1.14	SG	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
; +/-2.36	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
: +/-1.85	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
3 +/-1.43	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
' +/-2.35	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
; +/-1.91	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
; +/-1.91	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
; +/-1.91	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
: +/-2.28	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
; +/-1.51	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
; +/-1.63	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
; +/-3.01	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
. +/-4.25	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
+/-2.32	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
+/-2.32	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
+/-2.32	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
+/-0.669	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
+/-4.03	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
+/-6.3	NC	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993

le 4. A summary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Copper :onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
6.06 +/-1.42	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
6.06 +/-1.42	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duoranum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
6.06 +/-1.42	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
5.17 +/1.59	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5.17 +/1.59	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5.65 +/-2.16	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
5.73 +/-9.83	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
5.73 +/-3.76	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
7.51 +/-3.46	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
7.59 +/-5.48	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
7.91 +/-5.83	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
7.91 +/-5.83	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
:24 +/-6.16	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
.24 +/-6.16	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
.49 +/-9.56	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
49 +/-9.56	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
49 +/-9.56	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
8.5 +/-6.36	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
8.5 +/-6.36	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
8.5 +/-6.36	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
53 +/-3.49	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
55 +/-7.19	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
62 +/-3.82	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
68 +/-6.41	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
08 +/-3.19	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
09 +/-4.16	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
29 +/-4.08	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
55 +/-0.778	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
13 +/-6.66	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
.4 +/-10.5	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
.4 +/-6.77	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
.4 +/-6.77	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
6 +/-10.2	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
7 +/-6.87	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
.7 +/-7.07	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
8 +/-6.19	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8 +/-6.19	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8 +/-6.19	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8 +/-6.19	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
1 +/-7.12	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
5 +/-4.35	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992

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:4. A summary of the available data on the biological effects associated with sediment-sorbed COPPER (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Copper onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1.5 +/-7.61	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
1.9 +/-7.53	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
2.3 +/-3.85	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2.3 +/-3.85	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2.7 +/-21.9	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
2.7 +/-2.04	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
3.4 +/-1.50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
3.4 +/-1.50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
3.4 +/-1.50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
3.8 +/-8.05	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
3.8 +/-4.93	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
14 +/-5.85	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
1.1 +/-4.78	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
1.3 +/-2.52	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
13 +/-2.52	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
13 +/-2.52	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
1.5 +/-25.5	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
'6 +/-12.2	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
:5 +/-2.12	SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
7		*TEL*								
:8 +/-16.5	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
:8 +/-16.5	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
.8 +/-16.5	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
.7 +/-9.69	NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
.9 +/-22.4	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
.9 +/-16.7	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
30 +/-5.30	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
13 +/-9.63	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
13 +/-9.63	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
13 +/-9.63	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c
.8 +/-54.2	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
.9 +/-102	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
.9 +/-102	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
.9 +/-102	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b
'2 +/-64.2	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
.9 +/-86.2	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
13 +/-58.9	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
8		*PEL*								
.3 +/-108	NE	Miami River, FL	COA	10-d	Not toxic (18.6+/-7.27% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			ERCO 1985
.3 +/-108	NE	Miami River, FL	COA	10-d	Not toxic (1.2+/-0.837% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			ERCO 1985
.3 +/-108	NE	Miami River, FL	COA	10-d	Not toxic (3.6+/-1.67% mortality)	Nereis virens (sandworm)	ADT			ERCO 1985

le 5. A summary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

Lead onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
:0.5	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
0.7	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.9 +/-0.283	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
.38 +/-0.727	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
1.5	NC	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
1.5	NC	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
1.5	NC	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
.55 +/-1.81	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
.55 +/-1.81	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
.55 +/-1.81	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
.59 +/-0.36	NC	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
81 +/-0.68	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
85 +/-0.778	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
38 +/-1.03	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
2.5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
2.5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
2.5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
05 +/-2.76	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
1.7	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
17 +/-5.66	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
17 +/-0.737	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
17 +/-0.737	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
17 +/-0.737	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
5 +/-4.24	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
97 +/-4.26	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
57 +/-1.53	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
8	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
2 +/-3.28	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
6 +/-2.65	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
1 +/-2.83	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
6 +/-2.81	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
3 +/-1.04	SG	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
5 +/-7.28	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
7 +/-2.82	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
2 +/-2.72	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
2 +/-13.1	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
2 +/-13.1	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
2 +/-13.1	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b
9 +/-7.03	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
3 +/-5.51	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
5 +/-0.545	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
3 +/-5.82	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
5 +/-4.49	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep

A summary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

:ad .+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-5.52	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
+/-12.2	*	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
+/-1.06	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
+/-7.96	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
+/-8.63	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
+/-2.72	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
+/-3.92	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
+/-9.65	NC	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
+/-3.66	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
+/-7.33	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
+/-7.33	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
+/-6.65	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
+/-6.65	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
+/-6.65	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
+/-8.55	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
+/-22.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
+/-22.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
+/-22.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
+/-12.7	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
+/-26.7	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
+/-7.07	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-7.07	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-7.07	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-7.07	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-4.36	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
+/-4.36	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
+/-4.36	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
+/-10.3	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
+/-0.849	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
+/-7.11	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
+/-26.8	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
+/-26.8	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
+/-26.3	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
+/-6.56	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
+/-23.5	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
+/-23.5	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
+/-23.5	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
+/-9.59	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-9.59	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-29.8	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
+/-10.9	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
+/-10.9	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
+/-7.59	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
+/-9.72	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992

5. A summary of the available data on the biological effects associated with sediment-sorbed LEAD (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Lead Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
3 +/-3.59	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3 +/-3.59	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
i +/-10.5	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
2 +/-28.8	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
9 +/-28.4	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
9	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
1 +/-4.45	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
2 +/-9.2	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
3 +/-2.66	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
3 +/-2.66	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
3 +/-2.66	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
2	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3 +/-31.8	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
5 +/-13.1	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
1 +/-8.46	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
1 +/-9.16	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
4 +/-2.26	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
5 +/-51.5	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
2 +/-63.6	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
1 +/-10.7	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
1 +/-22.9	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
1 +/-22.9	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
1 +/-22.9	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
1 +/-13.2	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
9 +/-14.6	NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
9 +/-9.55	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
		TEL								
2 +/-2.83	SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
1 +/-60.5	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
5 +/-102	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
1 +/-88.6	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
3 +/-83.7	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3+/-1.51% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			Vittor & Associates 1988
3 +/-83.7	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (7.7+/-3.02% mortality)	Nereis virens (sandworm)	ADT			Vittor & Associates 1988
3 +/-104	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
		PEL								
5 +/-140	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
1 +/-102	*	Miami River/Seybold Canal, FL	COA	10-d	Significantly toxic (24.7+/-15% mortality)	Pennaeus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
7 +/-122	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
9 +/-102	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
9 +/-102	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
9 +/-102	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c
1 +/-637	NE	Miami River, FL	COA	10-d	Not toxic (18.6+/-7.27% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			ERCO 1985
1 +/-637	NE	Miami River, FL	COA	10-d	Not toxic (1.2+/-0.837% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			ERCO 1985
1 +/-637	NE	Miami River, FL	COA	10-d	Not toxic (3.6+/-1.67% mortality)	Nereis virens (sandworm)	ADT			ERCO 1985

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:6. A summary of the available data on the biological effects associated with sediment-sorbed MERCURY (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

Mercury onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
035	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
035	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
005 +/-0.003	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
007 +/-0.008	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
008 +/-0.008	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
008 +/-0.008	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
008 +/-0.009	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
009 +/-0.009	•	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.01 +/-0.004	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
011 +/-0.014	•	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
012 +/-0.004	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
015 +/-0.011	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
015 +/-0 011	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
016 +/-0 013	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
019 +/-0.014	•	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
3.02	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
025	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
025	NG	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
025	NG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
.025	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
.025	NG	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
.025	NG	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
.039 +/-0.01	NE	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.42+/-0.13		Chapman et al. 1991
.043	•	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
.044 +/-0.019	NE	Gulf of Mexico	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.471+/-0.18		Chapman et al. 1991
.045 +/-0.031	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.045 +/-0.031	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.045 +/-0.031	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.045 +/-0.031	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.048 +/-0.029	NE	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	0.425+/-0.128		Chapman et al. 1991
0.05	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
0.05	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
0.05	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
0.05	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
0.05	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
0.05	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
0.05	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
0.05	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
0.05	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
0.05	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
0.05	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
0.05	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
0.05	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992

6. A summary of the available data on the biological effects associated with sediment-sorbed MERCURY (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

lercury nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
05	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
05	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
05	NG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
05	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
05	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
05	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
05	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
05	NG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
05	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
05 +/-0.06	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
05 +/-0.06	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
05 +/-0.06	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
51 +/-0.027	NE	Gulf of Mexico	COA		Least toxic (6.32+/-3.68 TU/g)	Microtox (Photobacterium phosphoreum)		0.47+/-0.149		Chapman et al. 1991
52 +/-0.029	NE	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	0.443+/-0.127		Chapman et al. 1991
57 +/-0.026	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
59 +/-0.038	NE	Gulf of Mexico	COA		Not toxic (3.21+/-0.239 diversity index)	Benthic species		0.464+/-0.143		Chapman et al. 1991
06 +/-0.05	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
63 +/-0.046	SG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
64 +/-0.047	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
64 +/-0.047	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
66 +/-0.054	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
67 +/-0.051	SG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
67 +/-0.051	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
71 +/-0.054	SG	Gulf of Mexico	COA	48-h	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	LAR	0.5+/-0.18		Chapman et al. 1991
76 +/-0.046	SG	Gulf of Mexico	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.5+/-0.155		Chapman et al. 1991
83 +/-0.069	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
87 +/-0.051	SG	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.45+/-0.058		Chapman et al. 1991
89 +/-0.049	SG	Gulf of Mexico	COA	48-h	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	LAR	0.567+/-0.153		Chapman et al. 1991
93 +/-0.045	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
)1 +/-0.083	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
03 +/-0.092	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
03 +/-0.092	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
03 +/-0.092	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
17 +/-0.088	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
!3		*TEL*								
45	*	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox (Photobacterium phosphoreum)		0.4		Chapman et al. 1991
13 +/-0.197	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
)3 +/-0.283	*	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
35 +/-0.251	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
42 +/-0.179	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3+/-1.51% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			Vittor & Associates 1988
42 +/-0.179	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (7.7+/-3.02% mortality)	Nereis virens (sandworm)	ADT			Vittor & Associates 1988
45 +/-0.352	NE	Miami River, FL	COA	10-d	Not toxic (18.6+/-7.27% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			ERCO 1985
45 +/-0.352	NE	Miami River, FL	COA	10-d	Not toxic (1.2+/-0.837% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			ERCO 1985

6. A summary of the available data on the biological effects associated with sediment-sorbed MERCURY (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

lercury nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
45 +/-0.352	NE	Miami River, FL	COA	10-d	Not toxic (3.6+/-1.67% mortality)	Nereis virens (sandworm)	ADT			ERCO 1985
49 +/-0.044	SG	Miami River/Seybold Canal, FL	COA	10-d	Significantly toxic (24.7+/-15% mortality)	Pennaeus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
)5 +/-0.14	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
)5 +/-0.14	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
)5 +/-0.14	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
61 +/-0.61	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
65 +/-0.15	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
65 +/-0.15	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
65 +/-0.15	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
)6		*PEL*								
03 +/-0.08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
03 +/-0.08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
03 +/-0.08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
82 +/-0.21	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
82 +/-0.21	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
82 +/-0.21	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
03 +/-0.14	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
03 +/-0.14	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
03 +/-0.14	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b
5.5 +/-25.5	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
8 +/-49	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
4 +/-58.9	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
1 +/-80.6	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
38 +/-120	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
82 +/-72.1	NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
86 +/-175	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
05 +/-136	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
34 +/-126	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993

7. A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

Nickel Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1 +/-0.11	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crassostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
1 +/-0.11	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
1 +/-0.11	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
7	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
7	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
3 +/-0.491	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
3 +/-0.491	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
3 +/-0.491	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
5 +/-0.25	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
5 +/-0.354	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
1	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
1	NG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
1	NG	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
5 +/-0.61	SG	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
5 +/-1.12	SG	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
7	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
7	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
3	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
1 +/-2.54	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
3 +/-2.07	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
5 +/-4.88	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
2	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
3 +/-2.5	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
3 +/-4.55	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
5 +/-6.03	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
9 +/-4.87	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
9	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
1 +/-4.5	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
5 +/-5.43	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
4 +/-4.51	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
5 +/-6.24	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
5 +/-4.07	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
5 +/-4.07	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
5 +/-4.07	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
1 +/-4.41	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
2 +/-6.75	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
5 +/-6.15	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
3 +/-4.11	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
3 +/-4.11	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
3 +/-4.11	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
3 +/-5.4	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
3 +/-4.09	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1 +/-7.2	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991

7. A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

‹ickel ›c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5 +/-3.89	NC	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
7 +/-4.03	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
7 +/-4.03	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
7 +/-4.03	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
9 +/-2.28	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
9 +/-2.28	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
9 +/-2.28	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
3 +/-6.86	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
3 +/-5.75	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1:13	9172+/-13363 ug/g	Windom In Prep
5 +/-5.85	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
7 +/-0.862	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
1 +/-2.83	SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
1 +/-0.85	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
1 +/-7.51	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
3 +/-5.32	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
4 +/-5.43	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
4 +/-5.43	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
7 +/-6.78	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7 +/-6.78	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7 +/-6.78	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7 +/-6.78	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7 +/-6.53	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
2 +/-8.9	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
4 +/-8.91	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
5 +/-4.5	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
5 +/-5.24	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3 +/-10.3	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
9 +/-3.97	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
3 +/-4.89	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
3 +/-11.8	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
2 +/-5.23	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
4	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
2 +/-5.48	NC	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
2 +/-5.48	NC	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
2 +/-5.38	NC	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
4 +/-5.35	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
5 +/-1.9	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
6 +/-1.56	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
9 +/-5.5	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
9 +/-5.07	SG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
3 +/-5.8	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992

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: 7. A summary of the available data on the biological effects associated with sediment-sorbed NICKEL (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Nickel onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
; 7 +/-5.31	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
9		*TEL*								
16 +/-0.3	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
16 +/-0.3	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
16 +/-0.3	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984
.1 +/-1.71	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
.1 +/-1.71	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
.1 +/-3.39	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991.
.5 +/-3.46	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
.6 +/-1.65	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
.8 +/-4.21	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
17 +/-9.15	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
.2 +/-8.34	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
.8 +/-3.35	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
.9 +/-0.849	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
.2 +/-3.94	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
.4 +/-6.48	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
8 +/-1.65	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
.8 +/-1.65	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
8 +/-1.65	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duoranim (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b
:1 +/-6.86	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
1 +/-12.6	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
5 +/-13.9	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
5 +/-13.9	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
7 +/-13.8	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
3 +/-6.51	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
3 +/-6.51	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
3 +/-6.51	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
8 +/-14.5	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
.8 +/-14.5	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
8 +/-14.5	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
2 +/-16.5	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
3 +/-1.27	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
6 +/-22.5	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
4 +/-19.9	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
8		*PEL*								
:8 +/-9.73	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
18 +/-9.73	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
18 +/-9.73	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c

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l. A summary of the available data on the biological effects associated with sediment-sorbed SILVER (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

ilver ıc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
3	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
5 +/-0.006	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
5 +/-0.007	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
5 +/-0.007	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
5 +/-0.007	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
4	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
5 +/-0.014	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
5 +/-0.026	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
5 +/-0.038	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-0.038	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-0.038	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-0.038	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
2 +/-0.026	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
4 +/-0.09	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
6 +/-0.063	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
8 +/-0.078	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
8 +/-0.067	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1 +/-0.065	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
9 +/-0.066	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
8 +/-0.022	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
8 +/-0.067	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
3 +/-0.056	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
8 +/-0.021	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
8 +/-0.017	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
1 +/-0.055	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1 +/-0.055	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1 +/-0.063	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
9	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
8 +/-0.024	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
8 +/-0.024	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
8 +/-0.087	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
9 +/-0.07	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
3 +/-0.062	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
5 +/-0.049	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
7 +/-0.042	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
4 +/-0.042	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
5 +/-0.021	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
7 +/-0.087	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
7 +/-0.071	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
2 +/-0.28	*	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
5 +/-0.106	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991

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8. A summary of the available data on the biological effects associated with sediment-sorbed SILVER (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Silver onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
18 +/-0.099	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
08 +/-0.305	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			4.33+/-1.96	Long 1993
17 +/-0.146	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
22 +/-0.246	*	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
36 +/-0.327	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
24 +/-0.198	SG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
13 +/-0.312	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
57 +/-0.431	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
1.5	NE	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
1.5	NG	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
1.5	NG	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
1.5	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
1.5	NG	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
1.5	NG	Charleston Harboj, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
1.5	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3+/-1.51% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			Vittor & Associates 1988
1.5	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (7.7+/-3.02% mortality)	Nereis virens (sandworm)	ADT			Vittor & Associates 1988
1.5	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
.5	NG	Miami River/Seybold Canal, FL	COA	10-d	Significantly toxic (24.7+/-15% mortality)	Pennaeus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
55 +/-0.498	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
.6 +/-0.087	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
56 +/-0.396	SG	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
56 +/-0.433	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
3		*TEL*								
2 +/-0.393	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993
.9 +/-0.391	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
2 +/-0.404	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
5 +/-0.389	SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
6 +/-0.411	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
7		*PEL*								

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9. A summary of the available data on the biological effects associated with sediment-sorbed TRIBUTYLTIN (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

butyltin nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
4 +/-0.0004	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4 +/-0.0004	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4 +/-0.0004	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4 +/-0.0004	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3 +/-0.198	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
4 +/-0.179	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
9	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
5	NG	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
5	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
5	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
5	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
5	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
5	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
5	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
5	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
5	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
5	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
5	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
5	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
7 +/-0.203	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
3 +/-0.286	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
3 +/-0.286	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
3 +/-0.286	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
5	NC	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
5	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
5	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
5	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
3 +/-2.5	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
4 +/-2.65	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
4 +/-2.65	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
7 +/-2.83	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
5 +/-3.06	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
5 +/-4.33	*	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
5	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
5	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
5	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
5	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
3 +/-9.07	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
9 +/-7.52	SG	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
1 +/-8.69	SG	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
4 +/-10.7	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
7 +/-9.21	SG	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
5 +/-16.3	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991

le 9. A summary of the available data on the biological effects associated with sediment-sorbed TRIBUTYLTIN (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

ributyltin onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
l.5 +/-16.3	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2.1 +/-9.2	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
2.2 +/-14.3	NC	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
13 +/-7.07	SG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
3.5 +/-11.6	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
3.5 +/-11.6	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
15 +/-8.88	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
16 +/-7.21	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
5.6 +/-11.3	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
l.2	*	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep

10. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

Zinc c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
+/-1.91	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
+/-2.69	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
+/-2.69	NC	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
+/-2.69	NC	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
+/-2.53	NC	Charleston Harbor, SC	COA		High species richness (14.9+/-2.04; SRUs)	Benthic species				Winn et al. 1989
+/-1.41	NC	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
	NC	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
	NC	Charleston Harbor, SC	COA		Low diversity (1.16; SDUs)	Benthic species				Winn et al. 1989
+/-2.57	NE	Charleston Harbor, SC	COA		High diversity (4.15+/-0.59; SDUs)	Benthic species				Winn et al. 1989
	NE	Charleston Harbor, SC	COA		Low species richness (5.16; SRUs)	Benthic species				Winn et al. 1989
+/-3.11	NE	Charleston Harbor, SC	COA		Moderate species richness (9.05+/-1.33; SRUs)	Benthic species				Winn et al. 1989
+/-4.95	NE	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
	NE	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
+/-4.32	NE	Charleston Harbor, SC	COA		Moderate diversity (2.3+/-0.2; SDUs)	Benthic species				Winn et al. 1989
+/-4.25	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
+/-9.76	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
+/-7.91	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
+/-8.42	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
+/-8.37	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
+/-3.36	NE	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
+/-8.39	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
+/-8.3	NE	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
+/-14.3	NE	Tampa Bay, FL	COA	1-h	Least toxic (83+/-4.26% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.131+/-0.169	Long 1993
+/-26.2	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
+/-6.24	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
+/-15.5	NE	Houston Ship Channel, TX	COA		Not significantly toxic (15+/-13.2% mortality)	Sheepshead minnow	ADT	0.05+/-0.0242		Crocker et al. 1991
+/-7.56	NE	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
+/-10.5	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
+/-8.08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
+/-8.08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
+/-8.08	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
+/-1.68	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
+/-1.68	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
+/-1.68	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
+/-32.5	NE	Tampa Bay, FL	COA	1-h	Moderately toxic (44.5+/-17.8% fertilization)	Arbacia punctulata (sea urchin)	GAM		0.622+/-1.12	Long 1993
+/-24.3	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
+/-17.3	NE	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
+/-23.1	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-23.1	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-23.5	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep

10. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Zinc nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
3 +/-23.9	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
5 +/-4.74	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
5 +/-28.6	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
2 +/-40.3	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
2 +/-40.3	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
2 +/-40.3	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
1 +/-15.5	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1 +/-15.5	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
3 +/-11.6	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
2 +/-27.5	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
5 +/-18.5	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
7 +/-38.2	NE	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
9	NE	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
5 +/-23.1	NE	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
3	NE	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
1 +/-35.1	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
1 +/-5.51	NE	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
1 +/-21.5	NE	Tampa Bay, FL	COA	48-h	Significantly toxic (48.1+/-1.91% mortality)	Mulinaria lateralis (coot clam)	LAR		2.82+/-2.65	Long 1993
3 +/-31.7	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
7 +/-30.9	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
9 +/-52.3	SG	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
5 +/-27.9	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
1 +/-99.4	SG	Tampa Bay, FL	COA	10-d	Not significantly toxic (9.5+/-6.15% mortality)	Ampelisca abdita (amphipod)	SUBADT		1.56+/-2.73	Long 1993
: +/-120	SG	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.133+/-0.103 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			1.23+/-1.96	Long 1993
5 +/-32.2	SG	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-32.2	SG	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-32.2	SG	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-32.2	SG	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3 +/-18.9	SG	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3 +/-18.9	SG	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2 +/-53.8	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (4.7+/-4.29% mortality)	Amphipod	ADT	0.144+/-0.123		Crocker et al. 1991
1 +/-38.9	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
5 +/-4.24	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
5 +/-26.8	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
9 +/-6.05	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Gneco 1984
9 +/-6.05	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Gneco 1984
9 +/-6.05	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Gneco 1984
4 +/-42.5	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
7 +/-42.9	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
3 +/-43.7	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
3 +/-43.7	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
7 +/-16.8	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
7 +/-16.8	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b

10. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Zinc c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-16.8	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
+/-45.3	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
+/-70.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (5.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	5.2+/-2.6		Parrish 1988b
+/-70.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (8+/-6% mortality)	Arenicola cristata (lugworm)	ADT	5.2+/-2.6		Parrish 1988b
+/-70.1	NE	Bayou Casotte, MS	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	5.2+/-2.6		Parrish 1988b
1 +/-45.8	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
1 +/-14.1	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
2 +/-48.1	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
3 +/-15.8	NE	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.42+/-0.13		Chapman et al. 1991
5 +/-22.2	NE	Galveston Bay, TX	COA	10-d	*Not significantly toxic (1.35+/-1.45% mortality)*	*Ampelisca abdita (amphipod)*		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
3 +/-26.6	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
5 +/-47.1	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
3 +/-51.3	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
+/-88.5	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
5 +/-26.3	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (1+/-1.41% mortality)	Crossostrea virginica (oyster)	ADT	7.31+/-3.86		Parrish 1990
5 +/-26.3	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (4+/-2.83% mortality)	Penaeus duorarum (pink shrimp)	ADT	7.31+/-3.86		Parrish 1990
5 +/-26.3	NE	Pascagoula Naval Station, MS	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Nereis virens (polychaete)	ADT	7.31+/-3.86		Parrish 1990
5 +/-57	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
2 +/-73.8	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (8+/-2% mortality)	Crossostrea virginica (oyster)	ADT	6.73+/-2.04		Parrish 1987b
2 +/-73.8	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (22+/-5.29% mortality)	Arenicola cristata (lugworm)	ADT	6.73+/-2.04		Parrish 1987b
2 +/-73.8	NE	Gulfport Mississippi Channel, MS	COA	10-d	Not significantly toxic (3.3+/-3.06% mortality)	Penaeus duorarum (pink shrimp)	ADT	6.73+/-2.04		Parrish 1987b
4 +/-72.1	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
5 +/-71.4	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (0% mortality)	Crossostrea virginica (oyster)	ADT	2.5+/-2.83		Parrish 1988a
5 +/-71.4	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (5+/-1.41% mortality)	Penaeus duorarum (pink shrimp)	ADT	2.5+/-2.83		Parrish 1988a
5 +/-71.4	NE	Pensacola Naval Air Station, FL	COA	10-d	Not significantly toxic (8% mortality)	Arenicola cristata (lugworm)	ADT	2.5+/-2.83		Parrish 1988a
		TEL								
5 +/-18.4	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
7 +/-53.7	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
8 +/-87	NE	Houston Ship Channel, TX	COA	7-d	Not significantly toxic (7.5+/-5% mortality)	Sheepshead minnow	ADT	0.137+/-0.056		Crocker et al. 1991
4 +/-234	NE	Houston Ship Channel, TX	COA	10-d	Not significantly toxic (5.4+/-3.6% mortality)	Amphipod	ADT	0.129+/-0.054		Crocker et al. 1991
9 +/-273	*	Tampa Bay, FL	COA	1-h	Most toxic (1.96+/-3.19% fertilization)	Arbacia punctulata (sea urchin)	GAM		3.95+/-5.94	Long 1993
0 +/-78.5	SG	Houston Ship Channel, TX	COA	10-d	Significantly toxic (22.7+/-0.778% mortality)	Amphipod	ADT	0.248+/-0.132		Crocker et al. 1991
3 +/-64.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (5.6+/-2.2% mortality)	Arenicola cristata (lugworm)	ADT			Parrish 1987c
3 +/-64.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (6.5+/-5.14% mortality)	Penaeus duorarum (pink shrimp)	ADT			Parrish 1987c
3 +/-64.5	NE	Pascagoula Mississippi Channel, MS	COA	10-d	Not significantly toxic (0.7+/-0.82% mortality)	Crossostrea virginica (oyster)	ADT			Parrish 1987c
9 +/-373	NE	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	0.443+/-0.127		Chapman et al. 1991
1 +/-351	NE	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	0.425+/-0.128		Chapman et al. 1991
		PEL								
8 +/-335	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.021+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)			6.13+/-8.06	Long 1993
7 +/-504	NE	Tampa Bay, FL	COA	48-h	Not significantly toxic (38.5+/-2.9% mortality)	Mulinaria lateralis (coot clam)	LAR		2.64+/-3.04	Long 1993
4 +/-472	NC	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.45+/-0.058		Chapman et al. 1991
3	NC	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox (Photobacterium phosphoreum)		0.4		Chapman et al. 1991
5 +/-372	*	Tampa Bay, FL	COA	10-d	Significantly toxic (32.1+/-16.9% mortality)	Ampelisca abdita (amphipod)	SUBADT		7.63+/-9.44	Long 1993

le 10. A summary of the available data on the biological effects associated with sediment-sorbed ZINC (ppm) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Zinc onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
·39 +/-1600	NE	Gulf of Mexico	COA		Not toxic (3.21+/-0.239 diversity index)	Benthic species		0.464+/-0.143		Chapman et al. 1991
·86 +/-1678	NE	Gulf of Mexico	COA		Least toxic (6.32+/-3.68 TU/g)	Microtox (Photobacterium phosphoreum)		0.47+/-0.149		Chapman et al. 1991
39 +/-1966	NE	Gulf of Mexico	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.471+/-0.18		Chapman et al. 1991
·55 +/-1940	*	Gulf of Mexico	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.5+/-0.155		Chapman et al. 1991
99 +/-2219	*	Gulf of Mexico	COA	48-h	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	LAR	0.5+/-0.18		Chapman et al. 1991
99 +/-2287	*	Gulf of Mexico	COA	48-h	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	LAR	0.567+/-0.153		Chapman et al. 1991

e 11. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

cenaphthene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.04	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
048 +/-0 01	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
.055 +/-0 007	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
.062 +/-0.026	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
.065 +/-0.025	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
072 +/-0.033	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
083 +/-0.032	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
.115 +/-0.092	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
235 +/-0.086	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
0.44 +/-0.339	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
0.7 +/-0.448	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
.777 +/-0.806	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
0 83 +/-0.313	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
869 +/-0.696	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
1 35 +/-1.72	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
1 48 +/-1.9	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
1.7 +/-1 55	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
1.75 +/-1.86	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.75 +/-1.86	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1 87 +/-0.983	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
1.92 +/-2 55	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
1.99 +/-2.03	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
1.99 +/-2.03	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2 +/-1.17	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
2.26 +/-2.18	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
2 45 +/-4 94	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0 642+/-0.356	13.4+/-8.65	Carr 1992
2 61 +/-3.09	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
3 34 +/-3.96	NC	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
3 59 +/-4.04	NC	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
3 83 +/-4.71	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
3 99 +/-9.68	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
4.03 +/-10 8	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
4 14 +/-5.72	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
4.41 +/-9.73	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
4 41 +/-9.73	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
4 41 +/-9.55	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
4.68 +/-10.5	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0 848+/-0.427	9.21+/-8.61	Carr 1992
4 97 +/-10.4	*	Galveston Bay, TX	COA		Low abundance (4 21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
5.55 +/-11 6	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0 879+/-0.47	9.63+/-9.65	Carr 1992
6.2 +/-5.59	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0 459	16.3+/-9.58	Ward et al. 1992
6.2 +/-5.59	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
6 2 +/-5.59	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
6 2 +/-5 59	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992

ble 11. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Acenaphthene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
6.71		*TEL*								
6.89 +/-7.93	*	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
7.52 +/-10.5	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
9.83 +/-13.8	*	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
26 +/-35.9	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
80	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
80	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
80	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
80 +/-10	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
88.9		*PEL*								
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
194 +/-184	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
236 +/-202	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
250 +/-210	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

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e 12. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHYLENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

enaphthylene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.04	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.048 +/-0.01	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.055 +/-0.007	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.062 +/-0.026	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.065 +/-0.025	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.072 +/-0.033	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.083 +/-0.032	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.115 +/-0.092	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.235 +/-0.086	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
0.44 +/-0.339	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
0.7 +/-0.448	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
0.777 +/-0.806	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
0.83 +/-0.313	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
0.869 +/-0.696	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
1.35 +/-1.72	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
1.48 +/-1.9	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
1.7 +/-1.55	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
1.75 +/-1.86	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.75 +/-1.86	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.87 +/-0.983	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
1.92 +/-2.55	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
1.99 +/-2.03	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
1.99 +/-2.03	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2 +/-1.17	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
2.26 +/-2.18	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
2.45 +/-4.94	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
2.61 +/-3.09	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
3.34 +/-3.96	NC	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
3.59 +/-4.04	NC	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
3.83 +/-4.71	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
3.99 +/-9.68	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
4.03 +/-10.8	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
4.14 +/-5.72	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
4.41 +/-9.73	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
4.41 +/-9.73	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
4.41 +/-9.55	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
4.68 +/-10.5	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
4.97 +/-10.4	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
5.55 +/-11.6	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
5.87		***TEL***								
6.2 +/-5.59	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
6.2 +/-5.59	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
6.2 +/-5.59	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992

ıle 12. A summary of the available data on the biological effects associated with sediment-sorbed ACENAPHTHYLENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

cenaphthylene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
6.2 +/-5.59	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
6.89 +/-7.93	*	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
7.52 +/-10.5	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
9.83 +/-13.8	*	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
26 +/-35.9	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
80	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
80	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
80	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
80 +/-10	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
128		*PEL*								
194 +/-184	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
236 +/-202	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
250 +/-210	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

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ble 13. A summary of the available data on the biological effects associated with sediment-sorbed ANTHRACENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

Anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.065 +/-0.013	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.065 +/-0.007	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.065 +/-0.021	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.095 +/-0.073	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.115 +/-0.065	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.16 +/-0.68	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.163 +/-0.096	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.35 +/-0.453	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.57 +/-0.113	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
0.77 +/-0.365	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
1.12 +/-0.77	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.12 +/-0.765	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.31 +/-0.752	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
1.31 +/-0.752	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
1.54 +/-0.919	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
1.73 +/-0.974	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
1.76 +/-1.75	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
1.94 +/-1.5	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
2.04 +/-2.30	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
2.69 +/-4.34	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
3.04 +/-3.3	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
3.2 +/-3.53	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
3.67 +/-2.41	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
3.83 +/-6.58	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
3.83 +/-2.64	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
3.86 +/-5.1	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
4.17 +/-5.75	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
4.33 +/-3.7	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
4.45 +/-4.73	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
4.57 +/-7.11	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
5.94 +/-15	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
6.82 +/-15.5	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
6.99 +/-15.7	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
6.99 +/-15.7	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
7.76 +/-16.9	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
9.14 +/-18.8	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
11 +/-14.9	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
12.5 +/-22.7	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
13.6 +/-9.71	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
13.6 +/-9.71	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
13.6 +/-9.71	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
13.6 +/-9.71	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
14.9 +/-31.8	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992

e 13. A summary of the available data on the biological effects associated with sediment-sorbed ANTHRACENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

nthracene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
6.9 +/-30.9	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
8.2 +/-17.8	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
20 +/-31.4	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
21 +/-39.3	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
5.9		*TEL*								
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
7.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
8.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
36 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
0.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
1.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
90	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
90	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
90	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
90	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
36 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
0.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
2.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
2.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
00	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
00	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
09 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
45		*PEL*								
81 +/-321	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
53 +/-355	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
90 +/-370	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

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14. A summary of the available data on the biological effects associated with sediment-sorbed FLUORENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

luorene nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
95 +/-0.049	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
21 +/-0.044	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
25 +/-0.049	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
53 +/-0.116	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
54 +/-0.084	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
33 +/-0.143	SG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
35 +/-0.184	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
03 +/-0.232	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
6 +/-0.24	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
73 +/-0.849	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
74 +/-0.44	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
74 +/-0.437	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
31 +/-0.622	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
02 +/-0.551	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
24 +/-1.06	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
3 +/-1.9	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
41 +/-1.05	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
46 +/-1.06	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
98 +/-1.18	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
98 +/-1.18	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
51 +/-2.96	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
52 +/-1.57	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
52 +/-1.43	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
1 +/-5.11	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
23 +/-10.2	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
03 +/-9.93	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
6 +/-4.92	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
73 +/-10.2	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
75 +/-11	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
32 +/-10.3	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
32 +/-10.3	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
34 +/-3.44	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
37 +/-6.42	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
94 +/-3.3	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
04 +/-3.9	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
05 +/-4.29	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
24 +/-11.1	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
59 +/-3.11	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
59 +/-3.11	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
59 +/-3.11	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
59 +/-3.11	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
01 +/-6.53	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
11 +/-12.4	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992

le 14. A summary of the available data on the biological effects associated with sediment-sorbed FLUORENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Fluorene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5.58 +/-4.02	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
5.94 +/-15.4	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
1.9 +/-21.4	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
1.2		*TEL*								
28 +/-37.4	*	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
57.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
58.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
90	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
90	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
90	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
90	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
44		*PEL*								
235 +/-206	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
290 +/-219	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
320 +/-220	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

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: 15. A summary of the available data on the biological effects associated with sediment-sorbed 2-METHYLNAPHTHALENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

lethylnaphthalene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.75 +/-0.28	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.872 +/-0.354	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.902 +/-0.796	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
1.05 +/-0.978	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
1.05 +/-0.339	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
1.5 +/-0.658	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
1.62 +/-1.02	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
1.75 +/-0.546	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
1.82 +/-0.577	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
1.84 +/-0.955	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
2.05 +/-1.23	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
2.65 +/-0.93	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
2.65 +/-0.93	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
4.31 +/-2.65	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4.31 +/-2.65	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4.31 +/-2.65	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4.31 +/-2.65	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
4.39 +/-4.85	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
5.1 +/-6.76	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
7.05 +/-6.77	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
7.18 +/-8.69	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
7.23 +/-6	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
8.57 +/-10.7	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
9.9 +/-4.85	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
11.3 +/-6.81	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
20.2		*TEL*								
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-10.5	NC	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
72.1 +/-11.1	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
72.2 +/-11.5	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
73.8 +/-11.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
73.8 +/-11.3	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
74.2 +/-13.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
85	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
201		*PEL*								

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e 16. A summary of the available data on the biological effects associated with sediment-sorbed NAPHTHALENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

iphthalene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.64 +/-0.24	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
905 +/-0.544	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
1.14 +/-0.775	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
1.26 +/-0.304	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
1.32 +/-0.17	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
1.37 +/-1.14	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
1.44 +/-0.43	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.44 +/-0.433	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
1.46 +/-0.747	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
1.49 +/-0.961	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
.51 +/-0.265	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
.58 +/-0.342	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
.63 +/-0.792	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
.95 +/-0.774	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
.96 +/-0.66	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
.01 +/-1.08	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
2.1 +/-0.426	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
.17 +/-1.81	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
.29 +/-0.718	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
.33 +/-1.84	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
.33 +/-0.442	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
.36 +/-1.19	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
.36 +/-2.06	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
.51 +/-1.16	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
.51 +/-1.16	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
68 +/-1.81	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
.71 +/-1.84	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
.71 +/-1.84	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
.71 +/-2.01	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
.75 +/-1.99	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
.96 +/-2.14	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
.98 +/-1.62	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
05 +/-1.32	SG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
81 +/-3.61	*	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
.09 +/-4.71	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
54 +/-5.15	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
42 +/-6.26	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
44 +/-4.71	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
72 +/-3.29	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
72 +/-3.29	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
72 +/-3.29	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
72 +/-3.29	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
19 +/-4.64	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991

16. A summary of the available data on the biological effects associated with sediment-sorbed NAPHTHALENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

phthalene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
?.13 +/-5.78	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
?.41 +/-5.37	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
10.1 +/-7.2	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
10.4 +/-6.8	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
4.6		*TEL*								
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
57.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
58.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
70	*NG*	*Tampa Bay, FL*	*COA*	*1-h*	*Moderately toxic (15.3+/-10.6% fertilization)*	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
70	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
70	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		*0.267+/-0.25*	*102+/-71.1 ug/g*	*Windom In Prep*
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13368 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
113 +/-92	SG	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
129 +/-105	SG	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
140 +/-110	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
391		*PEL*								

17. A summary of the available data on the biological effects associated with sediment-sorbed PHENANTHRENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

enanthrene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
535 +/-0.417	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
705 +/-0.343	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
392 +/-0.22	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
923 +/-0.3	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
.94 +/-0.085	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
.01 +/-0.116	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
.07 +/-0.127	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
3.6 +/-4.53	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
3.7 +/-1.36	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
.78 +/-0.912	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
.32 +/-1.67	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
.32 +/-1.67	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
6.2 +/-5.01	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
.77 +/-3.81	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
.25 +/-5.26	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
.77 +/-6.1	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
.04 +/-5.79	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
.62 +/-10.1	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
2.5 +/-17.5	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
3.1 +/-9.34	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3.1 +/-9.34	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3.1 +/-12.6	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
4.3 +/-18.7	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
4.7 +/-18.8	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
4.9 +/-10	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
7.3 +/-12.7	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7.3 +/-12.7	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7.3 +/-12.7	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7.3 +/-12.7	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8.6 +/-20.5	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
9.5 +/-46.2	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
0.5 +/-17.9	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
21 +/-20	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
1.7 +/-47.2	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
22 +/-23	SG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
2.2 +/-48	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
2.2 +/-48	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
4.4 +/-51.6	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
27 +/-34.4	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
8.1 +/-19.4	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
8.2 +/-57.6	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
7.7 +/-70.8	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
8.1 +/-99.2	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992

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17. A summary of the available data on the biological effects associated with sediment-sorbed PHENANTHRENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

:nanthrene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.6 +/-53.9	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
2.3 +/-97.3	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
2.1 +/-97.8	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
7.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
7.8 +/-122	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
8.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
0.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
0.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
1.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
i.7		*TEL*								
90	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
0.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
0.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
2.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
2.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100 +/-28	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
150 +/-120	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
180 +/-95	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
44		*PEL*								
350 +/-1430	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
140 +/-1530	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
570 +/-1600	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

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e 18. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL LOW MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

al LMW PAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.46 +/-4.75	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
65 +/-1.11	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
6.8 +/-6 08	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
23 +/-1	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
77 +/-1.52	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
91 +/-2 9	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
.29 +/-2 86	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
96 +/-3 09	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
63 +/-4.31	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
63 +/-9.11	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
).3 +/-5.29	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
) 3 +/-5.29	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5.2 +/-8.2	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
5 6 +/-12.3	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
19 +/-11.9	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
1.6 +/-29.5	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
22 +/-10.7	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
2.4 +/-10 5	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
).4 +/-53.8	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
5.5 +/-57.6	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
5.3 +/-16 6	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
5.3 +/-16.6	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
1.9 +/-78.7	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
1.8 +/-82.1	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
.7 +/-83.5	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
.7 +/-83.5	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
50 +/-89.7	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
.4 +/-67 8	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
.8 +/-38.1	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.8 +/-38.1	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.8 +/-38.1	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.8 +/-38.1	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
'8 +/-58.9	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
2 +/-99 3	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
8 +/-64.5	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
.1 +/-70 8	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
59 +/-43	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
73 +/-48 6	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
3 +/-118	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
75 +/-71 4	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
.7 +/-146	*	Galveston Bay, TX	COA		Moderate abundance (58 3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
'7 +/-102	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
8 +/-142	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992

18. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL LOW MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine *ecosystems (continued).*

I LMW PAHs :onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
3 +/-66.3	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
12 +/-180	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
7 +/-161	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
17 +/-173	SG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
2		*TEL*								
0	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
0	*NE*	*Tampa Bay, FL*	*COA*	*1-h*	*Least toxic (79.4+/-9.9% fertilization)*	*Arbacia punctulata (sea urchin)*	GAM	1.45+/-0.587		Long 1993
0 +/-28	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
0	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
0 +/-23.1	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
17 +/-23.1	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
0 +/-130	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
4 +/-70.7	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
8 +/-79.3	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
0 +/-75.6	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1 +/-84.1	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
8 +/-97.2	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
9 +/-77.2	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 µg/g	Windom In Prep
0 +/-95	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
4 +/-194	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
4 +/-194	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	*Mysidopsis bahia (mysid)*		*1.19+/-1.04*	*7864+/-11973 ug/g*	*Windom In Prep*
3 +/-205	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
3 +/-205	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
0	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
0	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
2 +/-118	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
2		*PEL*								
50 +/-2360	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
50 +/-2540	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
0 +/-2650	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

le 19. A summary of the available data on the biological effects associated with sediment-sorbed BENZ(a)ANTHRACENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

nz(a)anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.02	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.095 +/-0.021	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.103 +/-0.015	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.11	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.218 +/-0.137	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0 265 +/-0.132	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.32 +/-0.297	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0 376 +/-0.166	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.387 +/-0.23	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.905 +/-0.601	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
1.96 +/-1.09	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
2.95 +/-2.18	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
2.95 +/-2.18	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
3.24 +/-1.33	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
3.44 +/-3.16	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3.44 +/-3 16	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3.79 +/-2	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
4.08 +/-5 24	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
4.08 +/-5.59	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepods		0.844+/-0.524	4.73+/-3.1	Carr 1992
4.1 +/-5.76	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
4.48 +/-4.68	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
4.78 +/-3.88	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
8.42 +/-18 6	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
8.62 +/-11.2	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
8.93 +/-10.5	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
9.19 +/-12.4	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
9.38 +/-2.51	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
9.83 +/-9.42	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
9.99 +/-3.23	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
10.2 +/-20	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
10 6 +/-9.12	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
11.8 +/-14.6	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
12.1 +/-6.03	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
13.4 +/-17.1	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
15 +/-10.1	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
19 4 +/-63 3	SG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
20.8 +/-64.2	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
21.4 +/-65.3	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
21.4 +/-65.3	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
24 2 +/-70 4	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8 61	Carr 1992
29.3 +/-78.6	*	Galveston Bay, TX	COA		Low abundance (2 05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9 65	Carr 1992
30 1 +/-25	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5 8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
30.1 +/-25	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1 82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992

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19. A summary of the available data on the biological effects associated with sediment-sorbed BENZ(a)ANTHRACENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

z(a)anthracene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
30.1 +/-25	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
30.1 +/-25	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
45.3 +/-96.7	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
60.2 +/-53.8	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
60.5 +/-137	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
66.2 +/-135	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
74.8		***TEL***								
77.3 +/-135	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
85.9 +/-170	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
130	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
130	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
180 +/-100	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
203 +/-127	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
693		***PEL***								
923 +/-1160	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
1250 +/-1220	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
1340 +/-1290	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

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le 20. A summary of the available data on the biological effects associated with sediment-sorbed BENZO(a)PYRENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

enzo(a)pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.02	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
0.14 +/-0.057	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.17 +/-0.063	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.2 +/-0.071	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.215 +/-0.212	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.263 +/-0.183	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.315 +/-0.375	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.466 +/-0.247	*	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.537 +/-0.317	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.77 +/-0.622	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
1.71 +/-1.12	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
2.98 +/-2.69	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
2.98 +/-2.69	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
3.43 +/-4.54	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
3.88 +/-1.39	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
3.9 +/-3.48	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3.9 +/-3.48	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
4.09 +/-5.26	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	.748+/-0.476	4.16+/-3.45	Carr 1992
4.37 +/-2.33	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
4.56 +/-5.4	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
5.08 +/-4.49	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
5.56 +/-7.83	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.72+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
6.25 +/-10.4	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
7.61 +/-11.3	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
11 +/-0.931	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
11 +/-1.32	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
11 +/-15.2	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
11.4 +/-12.6	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
12.1 +/-10.9	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
12.2 +/-13.8	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
12.6 +/-36.4	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
12.8 +/-16.8	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
13.7 +/-37	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
14 +/-37.7	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
14 +/-37.7	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
14.8 +/-17.8	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
15 +/-21.7	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
15 +/-7.47	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
15.3 +/-40.7	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
15.8 +/-8.67	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
18.9 +/-45.1	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
27.1 +/-55.8	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
28.1 +/-25.8	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992

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: 20. A summary of the available data on the biological effects associated with sediment-sorbed *BENZO(a)PYRENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems* (continued).

ızo(a)pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
28.1 +/-25.8	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
28.1 +/-25.8	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
28.1 +/-25.8	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
32 +/-29.4	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
36.5 +/-79.5	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
39.9 +/-78	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
44 +/-78.4	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
50.1 +/-99	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	*Mysidopsis bahia (mysid)*		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
88.8		*TEL*								
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
170	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
170	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
217 +/-81	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
220 +/-110	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
763		*PEL*								
865 +/-929	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
1140 +/-955	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
1210 +/-1020	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

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21. A summary of the available data on the biological effects associated with sediment-sorbed CHRYSENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

hrysene nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
15	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
2 +/-0.071	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
8 +/-0.076	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
5 +/-0.106	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
9 +/-0.156	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
5 +/-0.357	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
17 +/-0.283	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
8 +/-0.265	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
9 +/-0.366	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
1 +/-0.057	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
2 +/-1.08	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
3 +/-1.37	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
8 +/-3.28	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
8 +/-3.28	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
8 +/-4.64	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
1 +/-3.85	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
2 +/-2.45	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
9 +/-6.36	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
4 +/-6.24	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
5 +/-7.35	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
9 +/-6.32	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
9 +/-6.32	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
6 +/-0.007	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
9 +/-1.09	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
3 +/-15.2	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
6 +/-30.7	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
9 +/-20.1	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
4 +/-14.7	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
3 +/-15.2	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
8 +/-20.1	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
8 +/-13.3	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
6 +/-17.3	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
7 +/-41.5	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
7 +/-10.4	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
3 +/-10.9	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
5 +/-57.6	SG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
2 +/-58.4	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
5 +/-59.4	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
5 +/-59.4	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
3 +/-63.9	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
6 +/-71.1	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
7 +/-25.6	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7 +/-25.6	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992

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1. A summary of the available data on the biological effects associated with sediment-sorbed CHRYSENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

ysene :+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
+/-25.6	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-25.6	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
+/-116	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
+/-113	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
+/-93.5	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
+/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
+/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
+/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
+/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
+/-11 2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
+/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
+/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
+/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
+/-143	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
+/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
+/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
+/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
	SG	*Brunswick Harbor Entrance, GA*	*COA*	*96-h*	*Toxic (22.3% mortality)*	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
+/-120	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
		TEL								
+/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
+/-12	*	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
+/-95	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
+/-231	*	*Tampa Bay, FL*	*COA*	*1-h*	*Moderately toxic (15.3+/-10.6% fertilization)*	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
+/-250	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
		PEL								
+/-1350	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
+/-1350	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
+/-1470	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

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·22. A summary of the available data on the biological effects associated with sediment-sorbed DIBENZO(a,h)ANTHRACENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

enzo(a,h)-thracene nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
03	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
03 +/-0 014	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
05 +/-0.026	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
07 +/-0.014	*	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
11 +/-0 067	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0 824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
15 +/-0.106	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
17 +/-0.107	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
23 +/-0.192	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
54 +/-0.14	*	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
32 +/-0.325	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
57 +/-0.29	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
88 +/-0 85	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
88 +/-0.85	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
)9 +/-0.73	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
)9 +/-0.726	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
93 +/-1.27	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
02 +/-0.798	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
06 +/-1.28	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
25 +/-0.706	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
29 +/-1.26	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
49 +/-1 05	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
77 +/-2.52	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
33 +/-2.5	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
36 +/-2.58	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
93 +/-0 09	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
97 +/-2.35	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
99 +/-0.007	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
44 +/-3.02	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
57 +/-5.86	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
51 +/-3.49	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
31 +/-2.49	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
39 +/-1 05	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
95 +/-6.08	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
99 +/-6.19	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
99 +/-6.19	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
99 +/-4.05	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
)5 +/-3.31	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
.3 +/-6.65	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
36 +/-1.71	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
37 +/-7 34	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
93 +/-3 45	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
93 +/-3 45	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992

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23. A summary of the available data on the biological effects associated with sediment-sorbed FLUORANTHENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

oranthene nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
7.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
8.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
0.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
0.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
1.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
7.6 +/-61	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7.6 +/-61	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7.6 +/-61	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7.6 +/-61	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
90 +/-200	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
107 +/-113	NC	Galveston Bay, TX	COA		*Low abundance (53+/-33.9 N/0.00203 sq.m.)*	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
110	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
113		*TEL*								
124 +/-285	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
137 +/-279	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
155 +/-279	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
179 +/-351	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
198 +/-134	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
400 +/-480	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
407 +/-402	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
494		*PEL*								
2730 +/-3440	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
3740 +/-3570	*	Tampa Bay, FL	*COA*	*10-d*	*Significantly toxic (35.2+/-17.5% mortality)*	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
3980 +/-3810	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

le 24. A summary of the available data on the biological effects associated with sediment-sorbed PYRENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

Pyrene Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
).29	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
545 +/-0.342	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
555 +/-0.049	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
).64 +/-0.309	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
713 +/-0.184	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
832 +/-0.353	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
833 +/-0.492	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
).87	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
915 +/-0.94	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
5.76 +/-2.63	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
3.89 +/-9.19	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
9.2 +/-7.79	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
?.98 +/-2.53	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
.0.5 +/-3.09	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
:1.2 +/-15.4	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
.2.8 +/-5.25	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
:2.8 +/-5.25	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5.2 +/-12.1	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
.5.2 +/-12.1	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
.8.9 +/-9.99	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
9.4 +/-9.57	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
.9.4 +/-15.7	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
!0.3 +/-6.94	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
!0.4 +/-15.8	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
!2.1 +/-11.8	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
:3.3 +/-26.4	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	.748+/-0.476	4.16+/-3.45	Carr 1992
!6.5 +/-25.7	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
!8.2 +/-31.7	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
!9.2 +/-21.8	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
36.7 +/-36.2	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
12.3 +/-64.2	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
16.3 +/-53	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
16.9 +/-61.5	SG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
17.7 +/-105	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
50.8 +/-44	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
53.2 +/-108	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
54.4 +/-110	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
54.4 +/-110	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
59.3 +/-118	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
57.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
58.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep

24. A summary of the available data on the biological effects associated with sediment-sorbed PYRENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

?yrene nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
9 +/-131	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
'0 +/-9 57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
6 +/-10 4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
6 +/-11 2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
7 +/-12 9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
7 +/-9 31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
9 +/-10 3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
2 +/-88 8	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
7 +/-63 6	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
' +/-63 6	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
' +/-63 6	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7 +/-63 6	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3 +/-74 6	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
6 +/-24 3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
6 +/-24 3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
2 +/-160	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
9 +/-25 6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
9 +/-25 6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
0	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
0	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
9 +/-14 7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
3 +/-232	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
1 +/-228	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
8 +/-221	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
3		*TEL*								
6 +/-287	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
5 +/-49	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
4 +/-241	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
7 +/-434	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
10 +/-570	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
8		*PEL*								
30 +/-3330	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
30 +/-3410	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdina (amphipod)	SUBADT	3.53+/-1.35		Long 1993
60 +/-3640	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

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le 25. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL HIGH MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

al HMW PAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.92	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
2.58 +/-0.042	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
2.8 +/-0.422	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
3.02 +/-0.587	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
5.86 +/-5.87	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
11	NC	Gulf of Mexico	COA		Most toxic (100 TU/g)	Microtox (Photobacterium phosphoreum)		0.4		Chapman et al. 1991
11.5 +/-5.65	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
14.8 +/-7.21	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
19.3 +/-12.7	NC	Gulf of Mexico	COA	10-d	Significantly toxic (41.75+/-38.9% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.45+/-0.058		Chapman et al. 1991
24.9 +/-15.4	*	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
26 +/-13	NE	Gulf of Mexico	COA	10-d	Not toxic (0.36+/-0.261% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.42+/-0.13		Chapman et al. 1991
26.8 +/-16	NE	Gulf of Mexico	COA	48-h	Not significantly toxic (7.76+/-1.89% abnormality)	Crassostrea gigas (oyster)	LAR	0.425+/-0.128		Chapman et al. 1991
27.3 +/-20.9	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
27.8 +/-2.55	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
28.1 +/-16.8	NE	Gulf of Mexico	COA	48-h	Not toxic (4.54+/-5.37% mortality)	Crassostrea gigas (oyster)	LAR	0.443+/-0.127		Chapman et al. 1991
33.5 +/-14.5	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
49.6 +/-34.4	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
49.6 +/-34.4	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
60.8 +/-26.8	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
68.7 +/-32.1	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
70.6 +/-76.6	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
74.5 +/-61.6	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
74.5 +/-61.6	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
75.9 +/-82.2	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	.748+/-0.476	4.16+/-3.45	Carr 1992
77 +/-108	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
80.6 +/-72.9	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
86.9 +/-59.8	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
121 +/-188	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
145 +/-200	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
161 +/-26.9	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
165 +/-36.9	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
183 +/-144	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
189 +/-196	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
198 +/-557	NE	Gulf of Mexico	COA		Not toxic (3.21+/-0.239 diversity index)	Benthic species		0.464+/-0.143		Chapman et al. 1991
212 +/-186	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
214 +/-544	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
216 +/-298	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
217 +/-584	NE	Gulf of Mexico	COA		Least toxic (6.32+/-3.68 TU/g)	Microtox (Photobacterium phosphoreum)		0.47+/-0.149		Chapman et al. 1991
217 +/-272	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
227 +/-154	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
233 +/-553	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
236 +/-68.2	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
238 +/-563	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
238 +/-563	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992

5. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL HIGH MOLECULAR WEIGHT PAHs (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

MW PAHs c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
38 +/-247	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
63 +/-606	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
66 +/-110	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
01 +/-696	NE	Gulf of Mexico	COA	10-d	Not significantly toxic (9+/-3.96% mortality)	Rhepoxynius abronius (amphipod)	ADT	0.471+/-0.18		Chapman et al. 1991
12 +/-673	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
42 +/-753	SG	Gulf of Mexico	COA	10-d	Highly toxic (2.5+/-1.05% emergence/d)	Rhepoxynius abronius (amphipod)	ADT	0.5+/-0.155		Chapman et al. 1991
60 +/-285	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
60 +/-285	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
60 +/-285	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
60 +/-285	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
64 +/-821	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
97 +/-922	*	Gulf of Mexico	COA	48-h	Highly toxic (59.4+/-15.5% mortality)	Crassostrea gigas (oyster)	LAR	0.5+/-0.18		Chapman et al. 1991
40	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
54 +/-1172	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
65	*NE*	*Savannah River Entrance Channel, GA*	*COA*	*48-h*	*Not significantly toxic (0% mortality)*	*Arbacia punctulata (sea urchin)*		0.03	19 ug/g	Windom In Prep
08 +/-26	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
15 +/-26	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
32 +/-82.4	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
37 +/-91.3	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
39 +/-97.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
41 +/-1134	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
43 +/-84.2	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
48 +/-112	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
49 +/-89.6	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
54 +/-427	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
55		***TEL***								
56 +/-1059	*	Gulf of Mexico	COA	48-h	Significantly toxic (32.6+/-14.2% abnormality)	Crassostrea gigas (oyster)	LAR	0.567+/-0.153		Chapman et al. 1991
727 +/-1144	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
763 +/-1455	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
315 +/-219	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
315 +/-219	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
336 +/-231	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
336 +/-231	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
900	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
900	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
981 +/-133	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
050 +/-49	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
330 +/-615	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
310 +/-2240	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
330 +/-2020	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
576		***PEL***								
100 +/-15400	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
970 +/-16830	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
000 +/-15700	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993

26. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL PAHs (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

tal PAHs onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
2.7	NC	Mobile Bay, AL	COA		Significantly toxic (10% mortality)	Mysidopsis bahia (mysid shrimp)		0.009	0.004	EMAP Louisiana Province 1991
59 +/-4.07	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
38 +/-7.28	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
14 +/-17.4	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
44 +/-7.64	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
92 +/-3.79	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
1.7 +/-38.6	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
2.1 +/-30	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
9.9 +/-39.6	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
9.9 +/-39.6	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
2.3 +/-19.4	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
3.6 +/-24.5	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
19 +/-35.6	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
34 +/-39.7	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
2 +/-87.6	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
.4 +/-111	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
51 +/-239	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
30 +/-256	*	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
39 +/-249	NC	Mobile Bay, AL	COA	10-d	Significantly toxic (46+/-49.3% mortality)	Ampelisca abdita (amphipod)		0.22+/-0.298	3.84+/-5.43	EMAP Louisiana Province 1991
93 +/-136	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
10 +/-65	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
10 +/-65	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
10 +/-65	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
10 +/-86.3	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
21 +/-115	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
53 +/-619	NC	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
78 +/-630	*	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
33 +/-641	*	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
33 +/-641	*	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
94 +/-374	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
3 +/-690	*	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
71 +/-766	*	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
93 +/-107	NE	Mobile Bay, AL	COA		Not significantly toxic (1.07+/-1.85% mortality)	Mysidopsis bahia (mysid shrimp)		0.968+/-0.815	8.23+/-3.4	EMAP Louisiana Province 1991
34 +/-279	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
34 +/-279	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
07 +/-148	NE	Mobile Bay, AL	COA	10-d	Not significantly toxic (0.5+/-0.778% mortality)	Ampelisca abdita (amphipod)		1.24+/-0.948	8.51+/-4.76	EMAP Louisiana Province 1991
.7 +/-321	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.7 +/-321	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.7 +/-321	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.7 +/-321	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
54 +/-393	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
37 +/-510	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
38 +/-932	*	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992

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26. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL PAHs (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

al PAHs nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1 +/-255	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
9 +/-464	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
0 +/-1317	*	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
4 +/-372	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
7 +/-1276	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
8 +/-1179	NC	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
3 +/-601	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
5 +/-1295	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
6 +/-1635	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
3 +/-696	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
9 +/-1051	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
0	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
5	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
8 +/-49.1	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
2 +/-49.1	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
5 +/-153	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
4 +/-170	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
0 +/-181	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
3 +/-160	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
5 +/-209	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
3 +/-166	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
9 +/-413	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
9 +/-413	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
9 +/-436	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
9 +/-436	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
/		*TEL*								
0	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
0	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
3 +/-251	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
0 +/-49	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
0 +/-616	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
0 +/-2360	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
0 +/-2110	SG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
1 +/-21968	NE	Mississippi Sound, MS	COA	96-h	Not significantly toxic (7.3+/-8.7% mortality)	Mysidopsis almyra (mysid)		2.51+/-3.16		Lytle & Lytle 1985
4 +/-25733	NE	Mississippi Sound, MS	COA	96-h	Not significantly toxic (15.2+/-6.74% mortality)	Gammarus mucronatus (amphipod)	ADT	2.90+/-3.42		Lytle & Lytle 1985
0 +/-17700	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
/		*PEL*								
0 +/-5515	NE	Bayou Casotte, MS	COA	96-h	Not significantly toxic	Mysidipsis almyra (mysid shrimp)		2.77		Lytle & Lytle 1983
0 +/-18200	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
0 +/-19410	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
9 +/-68844	*	Mississippi Sound, MS	COA	96-h	Significantly toxic (81.4+/-19.6% mortality)	Gammarus mucronatus (amphipod)	ADT	4.54+/-3.52		Lytle & Lytle 1985
5 +/-59921	*	Mississippi Sound, MS	COA	96-h	Significantly toxic (76.7+/-21.3% mortality)	Mysidopsis almyra (mysid)		4.85+/-3.83		Lytle & Lytle 1985
0	*	Mississippi Sound, MS	AETA		Mississippi AET	Gammarus mucronatus (amphipod)				Lytle & Lytle 1985

le 26. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL PAHs (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

otal PAHs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
000	*	Mississippi Sound, MS	AETA		Mississippi AET	Mysidopsis almyra (mysid)		3.91+/-1.29		Lytle & Lytle 1985
200 +/-696924	NE	Bayou Casotte, MS	COA	96-h	Not significantly toxic	Gammarus mucronatus (amphipod)		2.1		Lytle & Lytle 1983
000	*	Bayou Casotte, MS	COA	96-h	Significantly toxic	Gammarus mucronatus (amphipod)		2.61		Lytle & Lytle 1983
000 +/-223446	*	Bayou Casotte, MS	COA	96-h	Significantly toxic	Mysidipsis almyra (mysid shrimp)		2.72		Lytle & Lytle 1983

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27. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL POLYCHLORINATED BIPHENYLS (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

tal PCBs onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.5	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
.5	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
.5	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
5	NC	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
25 +/-2.31	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
57 +/-2.89	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
.5 +/-2.89	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
.5 +/-2.89	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
.5 +/-3.54	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
36 +/-8.3	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
0 +/-7.75	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
.4 +/-0.1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
.4 +/-0.1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
4 +/-0.1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
.8 +/-11.8	NC	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
.5 +/-10.7	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
.8 +/-12.7	SG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
12 +/-12.1	*	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
.2 +/-12.2	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
.3 +/-12.4	SG	*Galveston Bay, TX*	COA		*Low species richness (10+/-3.73 S/0.00203 sq.m.)*	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
.3 +/-12.4	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
.5 +/-8.66	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
.5 +/-13.1	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
.9 +/-0.125	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
14 +/-0.219	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
14 +/-0.149	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
.2 +/-13.9	NC	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
.3 +/-0 095	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
.3 +/-0.115	SG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
.6 +/-0.76	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
.8 +/-0.277	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
15 +/-7.07	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
.2 +/-0.219	SG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
.3 +/-2.02	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
.7 +/-1.45	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
.7 +/-1.45	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
.8 +/-15.2	SG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992

le 27. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL POLYCHLORINATED BIPHENYLS (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Total PCBs Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
16 4 +/-3 79	NE	Mississippi Sound, MS	COA		Not significantly toxic (0 789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
17.2 +/-4.39	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
18 8 +/-2.16	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
19.3 +/-7.37	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
19 8 +/-7 99	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
20	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (2.3+/-1.51% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			Vittor & Associates 1988
20	NE	Miami River/Seybold Canal, FL	COA	10-d	Not significantly toxic (6.7+/-2.31% mortality)	Penmaeus aztecus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
21.4 +/-5.76	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
1.5		*TEL*								
21.7 +/-19.1	*	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
26.5 +/-14 9	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
26.9 +/-19.9	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
28 3 +/-24.1	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
28.4 +/-20.6	SG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
47.6 +/-43.9	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
103 +/-59.1	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
131 +/-124	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
189		*PEL*								
200	*	Miami River/Seybold Canal, FL	COA	10-d	Significantly toxic (24.7+/-15% mortality)	Pennaeus aztecus (brown shrimp)	ADT			Vittor & Associates 1988
218 +/-161	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
490 +/-413	NE	Miami River, FL	COA	10-d	Not toxic (18.6+/-7.27% mortality)	Pennaeus aztecus aztecus (brown shrimp)	ADT			ERCO 1985
490 +/-413	NE	Miami River, FL	COA	10-d	Not toxic (1.2+/-0.837% mortality)	Mercenaria mercenaria (atlantic quahog)	ADT			ERCO 1985
490 +/-413	NE	Miami River, FL	COA	10-d	Not toxic (3.6+/-1.67% mortality)	Nereis virens (sandworm)	ADT			ERCO 1985
911 +/-8 06	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
167 +/-2434	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
596 +/-2777	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
773 +/-2948	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
600 +/-29256	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
600 +/-29256	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
600 +/-29256	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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18. A summary of the available data on the biological effects associated with sediment-sorbed ALDRIN (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

ldrin c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
4 +/-0.031	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
5 +/-0.03	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
5 +/-0.03	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
7 +/-0.028	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
8	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
8	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
8	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
8	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
8	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
3	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
8	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
8	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
8	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
8	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
8	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
8	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
8	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
8	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
8	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
8	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
8	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
1	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
1	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
1	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
1	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
57 +/-0.236	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
57 +/-0.236	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
57 +/-0.236	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
57 +/-0.236	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
1	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
1	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
16 +/-0.048	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
16 +/-0.072	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
.2 +/-0.283	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
.2 +/-0.193	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep

le 28. A summary of the available data on the biological effects associated with sediment-sorbed ALDRIN (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Aldrin onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1.2 +/-0.206	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.2 +/-0.191	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
.23 +/-0.19	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
.23 +/-0.236	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
.24 +/-0.184	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
.54 +/-1.17	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
.59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
.59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
1.8 +/-1.43	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
.86 +/-0.268	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
.43 +/-5.84	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
3.5 +/-2.19	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
.79 +/-6.63	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
91 +/-7.13	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
50 +/-589	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
50 +/-589	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
50 +/-589	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

: 29. A summary of the available data on the biological effects associated with sediment-sorbed CHLORDANE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

lordane nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
!	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
I	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
I	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
2	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
5 +/-0.121	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
7 +/-0.046	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
I +/-0.045	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
5 +/-0.048	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
5 +/-0.03	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
5 +/-0.03	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
3	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
3	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
3	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
3	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
3	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
3	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
3	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
3	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
3	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
5 +/-0.163	SG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
5 +/-0.163	SG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
3 +/-0.214	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
.	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
.	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
.	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
.	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
' +/-0.289	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
' +/-0.289	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
' +/-0.289	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
+/-0.734	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
' +/-0.895	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
: +/-0.99	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
		TEL								
.	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
.	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
' +/-1.81	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
ı +/-3.5	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
		PEL								
.	NG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
.	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992

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e 29. A summary of the available data on the biological effects associated with sediment-sorbed CHLORDANE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

hlordane nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5	NG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
5	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
5	NG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
5	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
5	NG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
5	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
5	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
7 +/-4.12	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
9	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
9	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
2 +/-0.58	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
5 +/-1.72	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
5 +/-1.71	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
7 +/-1.84	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
3 +/-1.72	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
9 +/-2.1	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
9 +/-1.7	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1 +/-2.9	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
1 +/-3.43	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1 +/-3.43	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
5 +/-3.54	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
5 +/-3.54	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
5	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
5	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
2 +/-2.14	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
5 +/-11.3	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-11.3	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-11.3	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-11.3	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-92.7	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993

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19. A summary of the available data on the biological effects associated with sediment-sorbed CHLORDANE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

ordane c.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
+/-106	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
+/-113	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
+/-325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
+/-325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
+/-325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

e 30. A summary of the available data on the biological effects associated with sediment-sorbed CHLORPYRIFOS (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

hlorpyrifos Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
NO DATA REPORTED										

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t 31. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDD (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

p'-DDD nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
13 +/-0.027	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
17 +/-0.049	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
19 +/-0.033	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
13 +/-0.052	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
14 +/-0.027	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
15	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
15	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
15	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
15	SG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
15	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
15	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
38 +/-0.018	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
38 +/-0.099	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
38 +/-0.099	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
35 +/-0.100	*NE*	*Galveston Bay, TX*	*COA*		*Not significantly toxic (0% mortality)*	*Mysidopsis bahia (mysid shrimp)*		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
25	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
25	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
25	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
25	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
25	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
25	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
35 +/-0.504	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
55 +/-0.502	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
77 +/-0.609	*	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
52 +/-0.283	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
23 +/-0.332	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
23 +/-0.332	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
23 +/-0.332	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
23 +/-0.332	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
2		*TEL*								
45 +/-0.64	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
45 +/-1.9	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
51 +/-1.68	*	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
95	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
2	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
23 +/-0.115	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
24 +/-0.095	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
33 +/-0.37	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
33 +/-0.359	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
34 +/-0.395	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep

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›le 31. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDD (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

›,p'-DDD onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.38 +/-0.364	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
.38 +/-0.452	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
.38 +/-0.36	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
.98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
.98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
04 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
04 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
3.3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3.3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
3.5 +/-2.2	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
58 +/-0.482	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
18 +/-5.89	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
5.4 +/-6.41	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
31		*PEL*								
.50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
7.8 +/-231	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
34 +/-266	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
49 +/-284	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
17 +/-289	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
17 +/-289	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
17 +/-289	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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32. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

,p'-DDE onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
15 +/-0.007	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
57 +/-0.032	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
58	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
.1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
.1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
.1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
06 +/-0.158	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
22 +/-0.237	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
28 +/-0.279	NC	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
44 +/-0.198	*	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
57 +/-0.156	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
32 +/-0.128	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
03 +/-0.173	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
31 +/-0.41	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
36 +/-0.178	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
38 +/-0.102	SG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
08 +/-0.507	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
02 +/-0.144	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
02 +/-0.144	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
02 +/-0.144	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
02 +/-0.144	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
25	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
25 +/-0.247	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
45 +/-0.607	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
07 +/-0.28	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
07 +/-0.28	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
07 +/-0.28	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
92 +/-1.27	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
33 +/-0.116	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
33 +/-0.116	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
33 +/-0.116	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
01 +/-0.9	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
01 +/-0.9	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
04 +/-1.11	*	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
95	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
2	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
97		*TEL*								
23 +/-0.115	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
24 +/-0.095	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
33 +/-0.37	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep

32. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

p'-DDE nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
3 +/-0.359	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
4 +/-0.395	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
8 +/-0.364	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
8 +/-0.452	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
8 +/-0.36	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
8 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
8 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
4 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
4 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
8 +/-0.482	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
0	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
(		*PEL*								
3 +/-252	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
3 +/-252	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
3 +/-252	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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: 33. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDT (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

p'-DDT nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5 +/-0.078	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
3 +/-0.055	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
2	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
2	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
2	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
2	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
2	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
2	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
2	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
2	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
2	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
2	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
2	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
5 +/-0.021	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
5 +/-0.021	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
4 +/-0.04	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
4 +/-0.04	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
5 +/-0.06	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
5 +/-0.069	SG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
5 +/-0.433	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
5 +/-0.433	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
5 +/-0.433	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
5 +/-0.841	*	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
5 +/-0.841	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
5 +/-0.919	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
5 +/-0.354	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-0.354	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-0.354	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-0.354	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
7		*TEL*								
5	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
2	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
3 +/-0.115	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
4 +/-0.095	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep

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ɛ 33. A summary of the available data on the biological effects associated with sediment-sorbed p,p'-DDT (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

,p'-DDT ınc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
·3 +/-0.37	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
3 +/-0.359	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
4 +/-0.395	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
8 +/-0.364	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
8 +/-0.452	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
8 +/-0.36	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	'129.5+/-59.3 ug/g	Windom In Prep
4 +/-2.68	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
8 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
8 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
4 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
4 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
3 +/-0.482	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
		PEL								
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
' +/-15.3	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
1 +/-26.4	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
1	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
· +/-630	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
· +/-731	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
+/-782	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
+/-1325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
+/-1325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
+/-1325	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

34. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL DDT (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

›tal DDT ›nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
9		*TEL*								
6 +/-3.39	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
5	NC	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
5	NC	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
5	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
5	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
5	NC	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
5	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
7 +/-0.93	SG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
7 +/-0.913	SG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
8 +/-0.945	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
8 +/-0.945	SG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
8 +/-0.945	SG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
1 +/-1.02	SG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
3 +/-1.07	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
8 +/-1.39	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
3 +/-2.04	SG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
1 +/-7.89	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
5 +/-25.9	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
2 +/-43.5	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
7		*PEL*								
2 +/-1125	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
6 +/-1302	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
5 +/-1391	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

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le 35. A summary of the available data on the biological effects associated with sediment-sorbed DIELDRIN (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

Dieldrin Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.062 +/-0.025	NC	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.065 +/-0.023	NC	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.067 +/-0.023	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.07 +/-0.020	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.07 +/-0.02	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
0.073 +/-0.016	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
0.075 +/-0.007	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
0.076 +/-0.013	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
0.08	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.08	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.08	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.08	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.093 +/-0.032	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
0.095 +/-0.068	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
0.095 +/-0.068	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
0.1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
0.1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
0.1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
0.11 +/-0.085	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
0.125 +/-0.064	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
0.19 +/-0.188	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
0.21 +/-0.225	*	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
0.25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
0.25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
0.25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
0.367 +/-0.202	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
0.367 +/-0.202	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
0.367 +/-0.202	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
0.63 +/-0.226	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.63 +/-0.226	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.63 +/-0.226	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.63 +/-0.226	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.715		*TEL*								
0.755 +/-0.997	*	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
0.77 +/-0.976	*	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
1.58 +/-0.862	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
1.58 +/-0.862	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
1.58 +/-0.862	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
1.95	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
2	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
2.23 +/-0.115	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
2.24 +/-0.095	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
2.33 +/-0.37	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep

35. A summary of the available data on the biological effects associated with sediment-sorbed DIELDRIN (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Dieldrin Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.33 +/-0.359	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
.34 +/-0.395	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
.38 +/-0.364	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
.38 +/-0.452	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
.38 +/-0.36	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
.98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
.98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
04 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
04 +/-0 846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
3.3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3 3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
.58 +/-0.482	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
4.3		*PEL*								
<50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
500 +/-50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
500 +/-50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
500 +/-50	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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le 36. A summary of the available data on the biological effects associated with sediment-sorbed ENDOSULFAN (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

Endosulfan Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
50	*	South Carolina Tidal Creek, SC	COA	7-d	Significant reduction in colonization (50% reduction)	Streblospio benedicti (polychaete)	LAR			Chandler & Scott 1991
100	NE	South Carolina Tidal Creek, SC	COA	7-d	Not significantly toxic	Nannopus palustris (copepod)	JUV			Chandler & Scott 1991
200	NE	South Carolina Tidal Creek, SC	COA	7-d	Not significantly toxic	Pseudobradya pulchella (copepod)	JUV			Chandler & Scott 1991
200	*	South Carolina Tidal Creek, SC	COA	7-d	Significantly toxic	Nannopus palustris (copepod)	JUV			Chandler & Scott 1991

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·7. A summary of the available data on the biological effects associated with sediment-sorbed ENDRIN (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

ndrin ıc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
25	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
25	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
25	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
25	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
25	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
25	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
25	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
25	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
25	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
25	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
25	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
25	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
25	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
25	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
25	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
25	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
25	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
25	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
25	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
25	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
53	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
25 +/-0.354	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
.8 +/-0.645	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.8 +/-0.645	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.8 +/-0.645	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.8 +/-0.645	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0 459	16.3+/-9.58	Ward et al. 1992
95	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
2	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
23 +/-0.115	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
24 +/-0.095	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
33 +/-0.37	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
33 +/-0.359	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
34 +/-0.395	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
38 +/-0.364	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
38 +/-0.452	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
38 +/-0.36	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59 3 ug/g	Windom In Prep
98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
98 +/-0.787	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
04 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
04 +/-0.846	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
16 +/-1.44	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
3.3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
3.3	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep

: 37. A summary of the available data on the biological effects associated with sediment-sorbed ENDRIN (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Endrin onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
3.58 +/-0.482	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
4 77 +/-3 77	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
6.6 +/-5.11	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
49.4 +/-115	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
<50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
67.6 +/-132	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
74.7 +/-141	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993

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38. A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

ptachlor nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.1	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.1	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.1	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.1	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.1	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.1	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.1	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.1	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
0.1	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
0.1	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
0.1	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
0.1	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
0.1	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
0.1	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
0.1	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
0.1	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
0.1	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
0.1	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
0.1	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
0.1	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
0.1	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
.25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
.25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
.25	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
0.4 +/-0.26	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
0.4 +/-0.26	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
0.4 +/-0.26	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
855 +/-0.307	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
855 +/-0.307	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
855 +/-0.307	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
855 +/-0.307	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
1	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
1	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
1.15 +/-1.48	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
1.16 +/-0.048	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
1.16 +/-0.072	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
1.2 +/-0.193	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
1.2 +/-0.206	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.2 +/-0.191	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
1.23 +/-0.19	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
1.23 +/-0.236	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
1.24 +/-0.184	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep

e 38. A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Heptachlor Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1.59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
1.59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
1.86 +/-0.268	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
2.04 +/-1.97	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
3.28 +/-3.6	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
4.73 +/-1.85	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
4.73 +/-1.85	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
4.73 +/-1.85	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
5.6 +/-1.65	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
22.2 +/-63.7	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
30.9 +/-74.1	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
33.4 +/-79.7	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
<50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
2566 +/-534	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
2566 +/-534	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
2566 +/-534	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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39. A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR EPOXIDE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

achlor Epoxide :onc.+/-SD.	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
065 +/-0.021	NC	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
065 +/-0.021	NC	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
0.08	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
0.08	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
0.08	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
0.08	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
0.08	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
0.08	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
0.08	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
0.08	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
0.08	NC	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
0.08	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
0.08	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
0.08	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
0.08	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
0.08	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
0.08	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
0.08	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
0.08	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.35 +/-0.354	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
.515 +/-0.87	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
625 +/-0.565	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
0.66 +/-1	*	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
.727 +/-0.261	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.727 +/-0.261	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
727 +/-0.261	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.727 +/-0.261	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
844 +/-0.988	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
1	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
1.07 +/-0.751	*	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
1.16 +/-0.048	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
1.29 +/-0.215	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
1.4	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
1.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1.59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
1.59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
1.86 +/-0.268	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
2.12 +/-1.75	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
2.21 +/-1.85	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
2.23 +/-1.84	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep

le 39. A summary of the available data on the biological effects associated with sediment-sorbed HEPTACHLOR EPOXIDE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

ptachlor Epoxide Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
2.33 +/-1.97	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
2.55 +/-2.06	*	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
3.78 +/-2.45	*	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
4.69 +/-7.37	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
6.31 +/-8.16	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
6.84 +/-8.64	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
<50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984

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40. A summary of the available data on the biological effects associated with sediment-sorbed LINDANE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

ndane ıc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
)1	NC	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
55 +/-0.052	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
)3 +/-0.015	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
)3 +/-0.015	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
)3 +/-0.015	NC	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
)7 +/-0.009	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
.1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
.1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
1	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
.1	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
1	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
.1	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
1	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
.1	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
1	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
.1	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
1	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
.1	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
1	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
.1	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
.1	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
.1	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
1	SG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
!5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
!5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
!5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
.4 +/-0.113	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.4 +/-0.113	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
.4 +/-0.113	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2 83+/-0.459	16.3+/-9.58	Ward et al. 1992
.4 +/-0.113	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
2		***TEL***								
57 +/-0.549	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
57 +/-0.549	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
57 +/-0.549	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
51 +/-0.375	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
17 +/-0 375	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
17 +/-0 375	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
9		***PEL***								
1	NC	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0 908		Long 1993
1	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0 028	9 ug/g	Windom In Prep
1	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0 03	19 ug/g	Windom In Prep
16 +/-0 048	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86 6+/-4.25% normal development)	Arbacia punculata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep

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e 40. A summary of the available data on the biological effects associated with sediment-sorbed LINDANE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

Lindane onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
1.16 +/-0.072	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
1.2 +/-0.193	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
1.2 +/-0 206	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
1.2 +/-0.191	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
1.23 +/-0 19	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
1.23 +/-0.236	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
1 24 +/-0 184	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0 344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
1.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1.55 +/-0.415	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1 59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
1.59 +/-0.444	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
1 7 +/-1.09	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
1.7	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
1.79 +/-1.13	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
1.86 +/-0 268	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3 61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
2.5	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
2.85 +/-1.91	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
20.1 +/-47.6	*	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
26.9 +/-55.1	*	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
30.6 +/-58.5	*	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
<50	NE	Georgetown Harbor, SC	COA		Not toxic (species richness or abundance)	Benthic species		0.12		Van Dolah et al. 1984
900 +/-86	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
900 +/-86	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
900 +/-86	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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: 41. A summary of the available data on the biological effects associated with sediment-sorbed MIREX (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

Mirex onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
.005	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (9+/-1.73% mortality)	Nereis virens (polychaetes)	ADT			EG&G Bionomics 1980
.005	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (13+/-3.61% mortality)	Penaeus duorarum (pink shrimp)	ADT			EG&G Bionomics 1980
.005	NE	Pensacola Harbor & Bay, FL	COA	10-d	Not significantly toxic (11.3+/-3.21% mortality)	Crassostrea virginica (oyster)	ADT			EG&G Bionomics 1980
.085	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
.085	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
.085	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
.085	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
.085	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
.085	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
.085	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
.085	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
.085	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
.085	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
.085	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
.085	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
.085	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
.085	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
.085	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
.085	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
.085	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
.085	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
.085	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
.085	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
.085	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
0.5	NG	Tampa Bay, FL	COA	10-d	Significantly toxic (35.2+/-17.5% mortality)	Ampelisca abdita (amphipod)	SUBADT	3.53+/-1.35		Long 1993
0.5	NE	Tampa Bay, FL	COA	10-d	Not significantly toxic (14.6+/-7.67% mortality)	Ampelisca abdita (amphipod)	SUBADT	1.63+/-0.596		Long 1993
0.5	NG	Tampa Bay, FL	COA	1-h	Most toxic (0.091+/-0.187% fertilization)	Arbacia punctulata (sea urchin)	GAM	2.96+/-1.49		Long 1993
0.5	NG	Tampa Bay, FL	COA	1-h	Moderately toxic (15.3+/-10.6% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.94+/-0.908		Long 1993
0.5	NE	Tampa Bay, FL	COA	1-h	Least toxic (79.4+/-9.9% fertilization)	Arbacia punctulata (sea urchin)	GAM	1.45+/-0.587		Long 1993
0.5	NG	Tampa Bay, FL	COA		Significantly toxic (EC50; 0.017+/-0.012 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		3.47+/-1.49		Long 1993
0.5	NE	Tampa Bay, FL	COA		Not significantly toxic (EC50; 0.066+/-0.033 mg dry wt/ml)	Microtox (Photobacterium phosphoreum)		1.89+/-0.902		Long 1993

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le 42. A summary of the available data on the biological effects associated with sediment-sorbed TOXAPHENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

oxaphene onc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
)1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (7.2+/-2.77% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985a
)1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (10.6+/-5.18% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985a
)1	NE	Matagorda Ship Channel, TX	COA	10-d	Not toxic (0.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985a
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (2+/-1% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1985b
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (9.6+/-4.22% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1985b
5	NE	Freeport Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1985b
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (4.8+/-2.28% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983a
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (15.8+/-4.21% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983a
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.2+/-0.447% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983a
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (6+/-2.35% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Espey, Huston & Associates 1983b
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (2.6+/-2.97% mortality)	Nereis virens (sandworm)	ADT			Espey, Huston & Associates 1983b
5	NE	Sabine-Neches Waterway, TX	COA	10-d	Not toxic (1.8+/-1.79% mortality)	Mercenaria mercenaria (hard clams)	ADT			Espey, Huston & Associates 1983b
5	NG	Galveston Bay, TX	COA	1-h	Toxic (20.4+/-18.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	1.26+/-0.47	14.6+/-10.1	Carr 1992
5	NE	Galveston Bay, TX	COA	1-h	Not toxic (92.5+/-6.9% fertilization)	Arbacia punctulata (sea urchin)	EMB	0.77+/-0.448	6.37+/-6.58	Carr 1992
5	NG	Galveston Bay, TX	COA	48-h	Toxic (4.65+/-16.1% normal development)	Arbacia punctulata (sea urchin)	EMB	1.06+/-0.449	14.5+/-9.2	Carr 1992
5	NE	Galveston Bay, TX	COA	48-h	Not toxic (98.1+/-1.79% normal development)	Arbacia punctulata (sea urchin)	EMB	0.748+/-0.476	4.16+/-3.45	Carr 1992
5	NG	Galveston Bay, TX	COA		Low species richness (10+/-3.73 S/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
5	NE	Galveston Bay, TX	COA		High species richness (24.5+/-3.7 S/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (89+/-60.7 N/0.00203 sq.m.)	Benthic species		0.795+/-0.425	8.56+/-8.14	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (359+/-92.8 N/0.00203 sq.m.)	Benthic species		1.36+/-0.66	1.2+/-0.39	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (41.7+/-21.8 N/0.00203 sq.m.)	Polychaeta		0.848+/-0.427	9.21+/-8.61	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (156+/-22.9 N/0.00203 sq.m.)	Polychaeta		0.916+/-0.661	2.94+/-2.3	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (4.21+/-5.66 N/0.00203 sq.m.)	Oligochaeta		0.895+/-0.453	7.85+/-8.8	Carr 1992
5	NG	Galveston Bay, TX	COA		Moderate abundance (58.3+/-16.2 N/0.00203 sq.m.)	Oligochaeta		0.632+/-0.274	7.93+/-5.6	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (155+/-49.5 N/0.00203 sq.m.)	Oligochaeta		1.2+/-1.27	4.27+/-3.85	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (1.86+/-2.59 N/0.00203 sq.m.)	Mollusca		0.784+/-0.421	8.29+/-8.13	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (27.3+/-10 N/0.00203 sq.m.)	Mollusca		1.64+/-0.4	1.39+/-0.17	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (0.3+/-0.651 N/0.00203 sq.m.)	Amphipoda		0.859+/-0.487	7.67+/-8.12	Carr 1992
5	NE	Galveston Bay, TX	COA		High Abundance (6+/-1.41 N/0.00203 sq.m.)	Amphipoda		0.955+/-0.629	7.21+/-8.2	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (2.05+/-1.58 N/0.00203 sq.m.)	Copepoda		0.879+/-0.47	9.63+/-9.65	Carr 1992
5	NE	Galveston Bay, TX	COA		High abundance (16.2+/-6.19 N/0.00203 sq.m.)	Copepoda		0.844+/-0.524	4.73+/-3.1	Carr 1992
5	NE	Apalachee Bay, FL	COA		Not significantly toxic (0.75+/-1.5% mortality)	Mysidopsis bahia (mysid shrimp)		0.540+/-0.385	0.405+/-0.417	EMAP Louisiana Province 1991
5	NG	Apalachee Bay, FL	COA	10-d	Significantly toxic (15.6% mortality)	Ampelisca abdita (amphipod)		0.438+/-0.442	0.421+/-0.593	EMAP Louisiana Province 1991
5	NE	Apalachee Bay, FL	COA	10-d	Not significantly toxic (3.3+/-3.25% mortality)	Ampelisca abdita (amphipod)		0.643+/-0.455	0.390+/-0.410	EMAP Louisiana Province 1991
5	NE	Chandeleur Sound, LA	COA		Not significantly toxic (1.03+/-2.05% mortality)	Mysidopsis bahia (mysid shrimp)		0.824+/-0.915	1.69+/-0.920	EMAP Louisiana Province 1991
5	NG	Chandeleur Sound, LA	COA		Significantly toxic (7.6+/-1.32% mortality)	Mysidopsis bahia (mysid shrimp)		0.624+/-0.197	2.07+/-1.19	EMAP Louisiana Province 1991
5	NE	Chandeleur Sound, LA	COA	10-d	Not significantly toxic (2.87+/-4.05% mortality)	Ampelisca abdita (amphipod)		0.517+/-0.166	2.02+/-1.38	EMAP Louisiana Province 1991
5	NG	Chandeleur Sound, LA	COA	10-d	Significantly toxic (11.5+/-4.86% mortality)	Ampelisca abdita (amphipod)		0.811+/-0.711	1.87+/-0.973	EMAP Louisiana Province 1991
5	NE	Galveston Bay, TX	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		0.934+/-0.657	0.457+/-0.530	EMAP Louisiana Province 1991
5	NG	Galveston Bay, TX	COA		Significantly toxic (13.4+/-9.11% mortality)	Mysidopsis bahia (mysid shrimp)		0.778+/-0.482	1.21+/-0.778	EMAP Louisiana Province 1991
5	NE	Galveston Bay, TX	COA	10-d	Not significantly toxic (1.35+/-1.45% mortality)	Ampelisca abdita (amphipod)		0.961+/-0.537	1.17+/-0.640	EMAP Louisiana Province 1991
5	NG	Galveston Bay, TX	COA	10-d	Significantly toxic (15.8+/-3.89% mortality)	Ampelisca abdita (amphipod)		0.647+/-0.606	0.160+/-0.184	EMAP Louisiana Province 1991
5	NE	Matagorda Bay, TX	COA		Not significantly toxic (1.58+/-1.82% mortality)	Mysidopsis bahia (mysid shrimp)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991

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: 42. A summary of the available data on the biological effects associated with sediment-sorbed TOXAPHENE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems (continued).

xaphene nc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
5	NE	Matagorda Bay, TX	COA	10-d	Not significantly toxic (2.33+/-4.65% mortality)	Ampelisca abdita (amphipod)		0.944+/-0.540	1.93+/-1.58	EMAP Louisiana Province 1991
5	NE	Mississippi River, MS, LA	COA		Not significantly toxic (0% mortality)	Mysidopsis bahia (mysid shrimp)		1.3+/-0.83	1.14+/-1	EMAP Louisiana Province 1991
5	NG	Mississippi River, MS, LA	COA		Significantly toxic (32.9+/-36.4% mortality)	Mysidopsis bahia (mysid shrimp)		1.07+/-0.924	1.41+/-1.93	EMAP Louisiana Province 1991
5	NE	Mississippi River, MS, LA	COA	10-d	Not significantly toxic (7.8+/-1.63% mortality)	Ampelisca abdita (amphipod)		1.15+/-1.04	2.31+/-0.651	EMAP Louisiana Province 1991
5	NG	Mississippi River, MS, LA	COA	10-d	Significantly toxic (15.9+/-6.65% mortality)	Ampelisca abdita (amphipod)		1.22+/-0.717	0.235+/-0.276	EMAP Louisiana Province 1991
5	NE	Mississippi Sound, MS	COA		Not significantly toxic (0.789+/-1.59% mortality)	Mysidopsis bahia (mysid shrimp)		0.827+/-0.757	1.46+/-1.58	EMAP Louisiana Province 1991
5	NG	Mississippi Sound, MS	COA		Significantly toxic (12.2+/-4.42% mortality)	Mysidopsis bahia (mysid shrimp)		0.939+/-0.335	2.63+/-2.3	EMAP Louisiana Province 1991
5	NE	Mississippi Sound, MS	COA	10-d	Not significantly toxic (1.4+/-1.73% mortality)	Ampelisca abdita (amphipod)		0.998+/-0.602	2.01+/-1.82	EMAP Louisiana Province 1991
5	NG	Mississippi Sound, MS	COA	10-d	Significantly toxic (11.6+/-3.39% mortality)	Ampelisca abdita (amphipod)		0.111+/-0.045	0.03	EMAP Louisiana Province 1991
5	NE	Galveston Bay, TX	COA		Low species (11.2+/-1.94 S/0.00203 sq.m.)	Benthic species		0.642+/-0.356	13.4+/-8.65	Carr 1992
5	NG	Galveston Bay, TX	COA		Low abundance (53+/-33.9 N/0.00203 sq.m.)	Benthic invertebrates		0.985+/-0.247	22+/-11.2	Carr 1992
5	NE.	Galveston Bay, TX	COA		High abundance (154+/-30.2 N/0.00203 sq.m.)	Benthic invertebrates		0.47+/-0.27	9.07+/-2.94	Carr 1992
5	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
5	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
3 +/-1.61	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
) +/-4.78	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
1 +/-4.9	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
2 +/-5.24	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
7 +/-4.83	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
7 +/-6	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
3 +/-4.76	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
5 +/-11.3	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-11.3	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-11.3	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
5 +/-11.3	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
3 +/-2.5	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
1 +/-23.7	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
1 +/-23.7	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
)	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
)	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
9 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
3 +/-8787	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.4+/-1.52% mortality)	Palaemonetes pugio (grass shrimp)	ADT			Grieco 1984
3 +/-8787	NE	Galveston Harbor, TX	COA	10-d	Not toxic (0% mortality)	Mercenaria mercenaria (hard clams)	ADT			Grieco 1984
3 +/-8787	NE	Galveston Harbor, TX	COA	10-d	Not toxic (2.8+/-2.17% mortality)	Nereis virens (sandworm)	ADT			Grieco 1984

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le 43. A summary of the available data on the biological effects associated with sediment-sorbed PENTACHLOROPHENOL (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

'entachlorophenol Conc.+/-SD	Hit-	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
178 +/-161	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
178 +/-161	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
178 +/-161	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
178 +/-161	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
305	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
305	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
345 +/-14.1	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
350 +/-13.2	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
360 +/-52	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
361 +/-54.1	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
362 +/-57.8	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
367 +/-67.1	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
368 +/-53.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
369 +/-50.3	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
462 +/-127	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
462 +/-127	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
474 +/-137	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
474 +/-137	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
500	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
500	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
556 +/-86.2	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep

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e 44. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL 2,3,7,8-T4CDD (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

tal 2,3,7,8-T4CDD Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.00017 +/-0.00002	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (88.2+/-4.24% normal development)	Arbacia punctulata (sea urchin)		0.127+/-0.127	223+/-292 ug/g	Windom In Prep
0.0002 +/-0.00004	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.0002 +/-0.00004	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.0002 +/-0.00004	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.0002 +/-0.00004	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.00039 +/-0.00022	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not significantly toxic (10+/-2.77% mortality)	Menidia berllina (silverside)		1.42+/-1.11	10655+/-13994 ug/g	Windom In Prep
.000404 +/-0.00023	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not significantly toxic (6.33+/-2.34% mortality)	Mysidopsis bahia (mysid)		1.4+/-1.1	10566+/-14023 ug/g	Windom In Prep
.000411 +/-0.00021	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.1+/-3.53% mortality)	Ampelisca abdita (amphipod)		1.46+/-1.02	10070+/-12868 ug/g	Windom In Prep
.000411 +/-0.00021	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.29+/-3.25% mortality)	Mysidopsis bahia (mysid)		1.46+/-1.02	10070+/-12868 ug/g	Windom In Prep
0.00046	SG	Brunswick Harbor Entrance, GA	COA	96-h	Significantly toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
0.00051 +/-0.00016	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
0.00055	SG	Brunswick Harbor Entrance, GA	COA	96-h	Significantly toxic (22.3% mortality)	Menidia berllina (silverside)		1.71	6562 ug/g	Windom In Prep

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le 45. A summary of the available data on the biological effects associated with sediment-sorbed TOTAL 2,3,7,8-T4CDF (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

tal 2,3,7,8-T4CDF Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
0.00019 +/-0.00006	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (88.2+/-4.24% normal development)	Arbacia punctulata (sea urchin)		0.127+/-0.127	223+/-292 ug/g	Windom In Prep
0.0003 +/-0.0013	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.0003 +/-0.0013	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.0003 +/-0.0013	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.0003 +/-0.0013	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
0.0012 +/-0.00087	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not significantly toxic (10+/-2.77% mortality)	Menidia berllina (silverside)		1.42+/-1.11	10655+/-13994 ug/g	Windom In Prep
0.00121 +/-0.00088	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not significantly toxic (6.33+/-2.34% mortality)	Mysidopsis bahia (mysid)		1.4+/-1.1	10566+/-14023 ug/g	Windom In Prep
0.00124 +/-0.0008	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.1+/-3.53% mortality)	Ampelisca abdita (amphipod)		1.46+/-1.02	10070+/-12868 ug/g	Windom In Prep
0.00124 +/-0.0008	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.29+/-3.25% mortality)	Mysidopsis bahia (mysid)		1.46+/-1.02	10070+/-12868 ug/g	Windom In Prep
0.0014	SG	Brunswick Harbor Entrance, GA	COA	96-h	Significantly toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
0.0015	SG	Brunswick Harbor Entrance, GA	COA	96-h	Significantly toxic (22.3% mortality)	Menidia berllina (silverside)		1.71	6562 ug/g	Windom In Prep
0.00166 +/-0.00044	*	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep

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e 46. A summary of the available data on the biological effects associated with sediment-sorbed BIS(2-ethylexyl)PHTHALATE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

:(2-ethylexyl)phthalate Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
8.14 +/-2.45	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8.14 +/-2.45	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8.14 +/-2.45	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
8.14 +/-2.45	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
182		*TEL*								
2647		*PEL*								

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le 47. A summary of the available data on the biological effects associated with sediment-sorbed DIMETHYL PHTHALATE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

methyl Phthalate Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
70.6 +/-10.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
70.6 +/-11.2	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.364	90.5+/-78.4 ug/g	Windom In Prep
71.7 +/-12.9	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
71.9 +/-10.3	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.31% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
128 +/-179	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
128 +/-179	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
128 +/-179	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
128 +/-179	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992

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le 48. A summary of the available data on the biological effects associated with sediment-sorbed DI-N-BUTYL PHTHALATE (ppb) used to support the derivation of regional sediment quality guidelines for marine and estuarine ecosystems.

i-n-butyl Phthalate Conc.+/-SD	Hit	Area	Analysis Type	Test Type	End-Point Measured	Species	Life Stage	TOC (%)	AVS (umol/g)	Reference
60	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (18% mortality)	Ampelisca abdita (amphipod)		0.028	9 ug/g	Windom In Prep
60	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (0% mortality)	Arbacia punctulata (sea urchin)		0.03	19 ug/g	Windom In Prep
67.5 +/-2.89	NE	Brunswick Harbor Entrance, GA	COA	48-h	Not significantly toxic (86.6+/-4.25% normal development)	Arbacia punctulata (sea urchin)		0.181+/-0.162	182+/-208 ug/g	Windom In Prep
68.3 +/-2.89	NC	Savannah River Entrance Channel, GA	COA	10-d	Significantly toxic (28.3+/-6.11% mortality)	Mysidopsis bahia (mysid)		0.246+/-0.051	127+/-24 ug/g	Windom In Prep
70 +/-9.57	NE	Savannah River Entrance Channel, GA	COA	48-h	Not significantly toxic (91.3+/-2.91% normal development)	Arbacia punctulata (sea urchin)		0.299+/-0.251	114+/-68.4 ug/g	Windom In Prep
71.7 +/-9.31	SG	Savannah River Entrance Channel, GA	COA	48-h	Significantly toxic (25.4+/-7.66% mortality)	Arbacia punctulata (sea urchin)		0.344+/-0.242	129.5+/-59.3 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (10.6+/-3.17% mortality)	Ampelisca abdita (amphipod)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
90.6 +/-24.3	NE	Brunswick Harbor Entrance, GA	COA	10-d	Not significantly toxic (8.00+/-2.92% mortality)	Mysidopsis bahia (mysid)		1.19+/-1.04	7864+/-11973 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (5.43+/-3.21% mortality)	Mysidopsis bahia (mysid)		1.21+/-1.13	9096+/-13378 ug/g	Windom In Prep
92.9 +/-25.6	NE	Brunswick Harbor Entrance, GA	COA	96-h	Not toxic (9.61+/-2.7% mortality)	Menidia beryllina (silverside)		1.22+/-1.13	9172+/-13363 ug/g	Windom In Prep
94.4 +/-77.6	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (9.78+/-5.33% mortality)	Mysidopsis bahia (mysid)		0.24+/-0.247	91.9+/-73.4 ug/g	Windom In Prep
97.5 +/-82.4	NE	Savannah River Entrance Channel, GA	COA	96-h	Not significantly toxic (4+/-2.83% mortality)	Menidia beryllina (silverside)		0.243+/-0.264	90.5+/-78.4 ug/g	Windom In Prep
98.8 +/-81.8	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (11.6+/-4.33% mortality)	Ampelisca abdita (amphipod)		0.267+/-0.25	102+/-71.1 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (16% mortality)	Mysidopsis bahia (mysid)		1.8	7095 ug/g	Windom In Prep
100	SG	Brunswick Harbor Entrance, GA	COA	96-h	Toxic (22.3% mortality)	Menidia beryllina (silverside)		1.71	6562 ug/g	Windom In Prep
108 +/-95	NE	Savannah River Entrance Channel, GA	COA	10-d	Not significantly toxic (27.5+/-10.6% mortality)	Mysidopsis bahia (mysid)		0.237+/-0.311	74.6+/-85.5 ug/g	Windom In Prep
109 +/-14.7	SG	Brunswick Harbor Entrance, GA	COA	48-h	Significantly toxic (14.6+/-18.9% normal development)	Arbacia punctulata (sea urchin)		1.99+/-0.562	14009+/-13434 ug/g	Windom In Prep
718 +/-151	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (5.8+/-3.7% mortality)	Rhepoxynius abronius (amphipod)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
718 +/-151	NE	Wilmington Harbor, NC	COA	10-d	Not significantly toxic (3.4+/-1.82% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
718 +/-151	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (11.2+/-3.7% mortality)	Nereis virens (polychaete)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992
718 +/-151	NE	Wilmington Harbor, NC	COA	28-d	Not significantly toxic (3.52+/-1.66% mortality)	Macoma nasuta (clam)		2.83+/-0.459	16.3+/-9.58	Ward et al. 1992

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