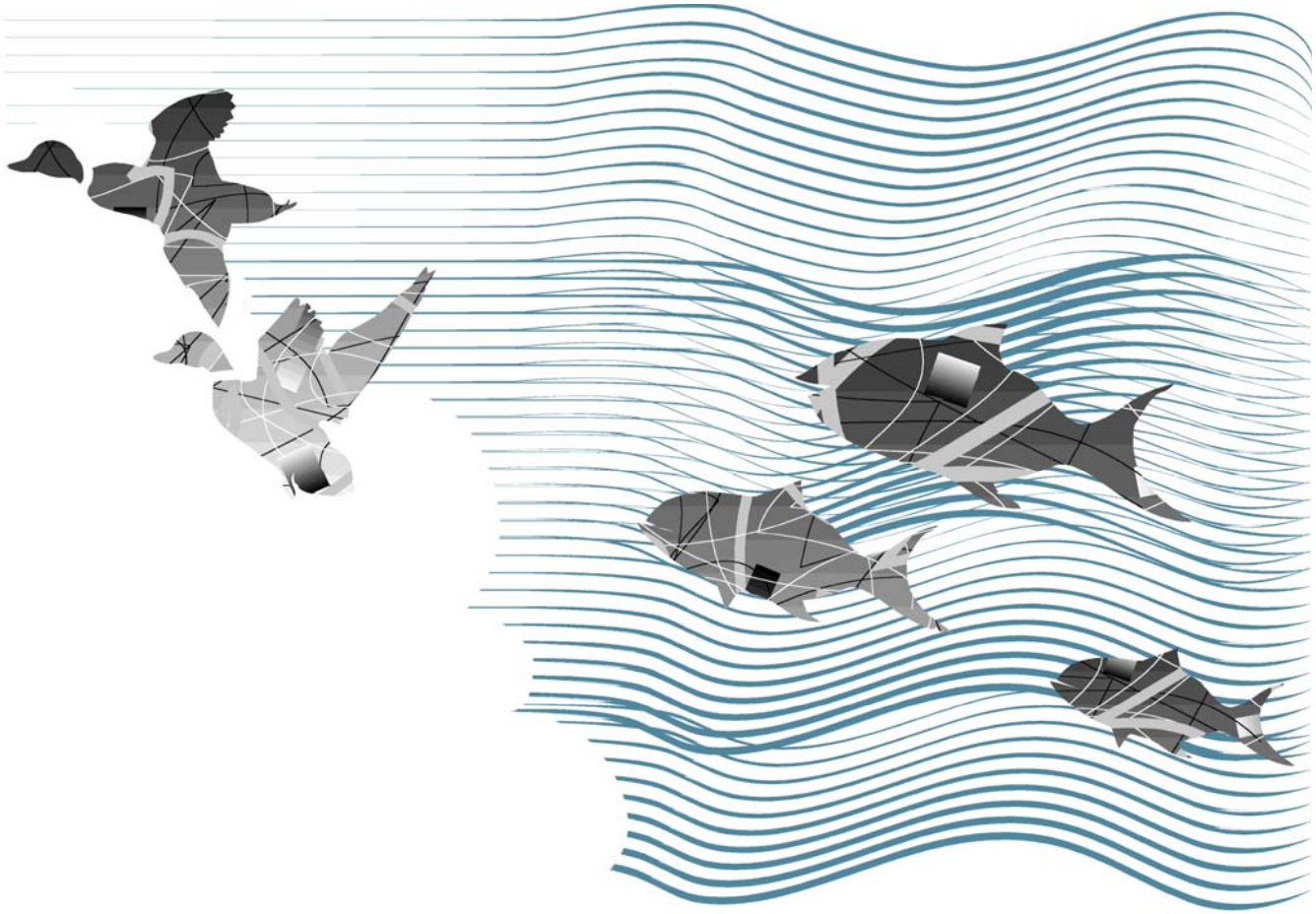
U.S. Fish and Wildlife Service

Baseline Human Health Risk Assessment

West Branch of the Grand Calumet River, Lake County, Indiana

October 2005



TETRA TECH EC, INC.

GSA Contract No. GS-10F-0208J
Task Order 98500-03-Y033

WEST BRANCH
OF THE GRAND CALUMET RIVER
LAKE COUNTY, INDIANA

BASELINE HUMAN HEALTH RISK ASSESSMENT

October 2005

Prepared by

TETRA TECH EC, INC.

12100 NE 195th Street
Bothell, Washington 98011
(425) 482-7600
(425) 482-7652 (Fax)

Prepared for

U.S. Fish & Wildlife Service
Bloomington Field Office
620 South Walker Street
Bloomington, Indiana 47403

Under Contract to

U.S. Fish & Wildlife Service
Environmental and Facility Compliance Branch
P.O. Box 25207
7333 W. Jefferson Avenue, Suite 375
Denver, Colorado 80225-0207

Contract No.: GS-10F-0208J
Task Order No. 98500-03-Y033

TABLE OF CONTENTS

1. INTRODUCTION 1-1
1.1 SITE DESCRIPTION 1-1
1.1.1 General Area 1-1
1.1.2 West Branch Grand Calumet River 1-3
1.2 SITE HISTORY 1-3
1.2.1 General Area 1-3
1.2.2 West Branch Grand Calumet River 1-4
1.3 OBJECTIVES 1-4
1.4 RISK ASSESSMENT METHODOLOGY 1-7

2. DATA EVALUATION 2-1
2.1 DATA SOURCES 2-1
2.2 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN 2-4
2.3 EXPOSURE POINT CONCENTRATIONS 2-8

3. EXPOSURE ASSESSMENT 3-1
3.1 SITE DESCRIPTION 3-1
3.1.1 Exposure Setting 3-1
3.1.2 Environmental Setting 3-4
3.2 CONCEPTUAL SITE MODEL 3-5
3.2.1 Potential Source Areas and Release Mechanisms 3-7
3.2.2 Exposure Pathways and Receptors 3-8
3.3 FATE AND TRANSPORT MODELS 3-8
3.4 EXPOSURE PARAMETERS 3-9
3.4.1 Active Angler 3-9
3.4.1.1 Adult Active Angler 3-11
3.4.1.2 Child Anglers 3-12
3.4.2 Residents 3-13
3.4.2.1 Adult Residents 3-13
3.4.2.2 Child Resident 3-14
3.4.3 Maintenance/Utility Worker 3-16

4. TOXICITY ASSESSMENT 4-1
4.1 NON-CARCINOGENIC EFFECTS 4-1
4.1.1 Oral/Dermal Non-Carcinogenic Effects 4-1
4.1.2 Inhalation Non-Carcinogenic Effects 4-2
4.2 CARCINOGENIC EFFECTS 4-3
4.2.1 Oral/Dermal Carcinogenic Effects 4-3
4.2.2 Inhalation Carcinogenic Effects 4-4
4.3 SPECIAL CASES 4-5
4.3.1 Evaluation of Lead 4-5
4.3.2 Evaluation of Polychlorinated Biphenyls (PCBs) 4-6
4.3.3 Dioxins and Furans 4-7

5. HUMAN RISK CHARACTERIZATION 5-1
5.1 RISK CHARACTERIZATION METHODS 5-1
5.1.1 Calculation of Non-Cancer Health Effects 5-1

TABLE OF CONTENTS

5.1.2 Calculation of Cancer Health Effects 5-2
5.1.3 Weighting of Risk Estimates 5-3
5.2 RESULTS OF RISK CALCULATIONS 5-4
5.2.1 Residents 5-5
5.2.2 Active Angler 5-6
5.2.3 Maintenance/Utility Workers 5-6
5.2.4 Evaluation of Lead 5-6

6. UNCERTAINTY ANALYSIS 6-1
6.1 UNCERTAINTY IN THE DATA AND COPC SELECTION METHODOLOGY 6-1
6.2 EXPOSURE AND INTAKE UNCERTAINTIES 6-2
6.2.1 Exposure Frequency and Exposure Duration 6-2
6.2.2 Body Weight 6-3
6.2.3 Dermal Absorption 6-3
6.2.4 Exposure Point Concentrations 6-3
6.3 TOXICOLOGICAL INFORMATION AND MODELS 6-4
6.3.1 Contaminant-Specific Toxicological Uncertainty 6-6
6.4 RISK CHARACTERIZATION 6-7

7. SUMMARY AND CONCLUSIONS 7-1

8. REFERENCES 8-1

Note: All tables are provided at the end of the main document.

APPENDICES

APPENDIX A TOXICITY PROFILES
APPENDIX B SURFACE AREA COMPUTATIONS
APPENDIX C IEUBK MODEL OUTPUT

FIGURES

Figure 1-1. West Branch of the Grand Calumet River and Roxana Marsh Indiana 1-2
Figure 1-2. Map of Study Area Showing the Locations of Discharges to Receiving Waters 1-5
Figure 1-3. Human Health Risk Assessment Process 1-8
Figure 3-1. Conceptual Site Model 3-6

TABLES

Note: All tables are provided at the end of the main document.

Table 2.1 Occurrence, Distribution, and Selection of COPCs, Reach 1 Surface Sediment
Table 2.2 Occurrence, Distribution, and Selection of COPCs, Reach 2 Surface Sediment
Table 2.3 Occurrence, Distribution, and Selection of COPCs, Reach 3 Surface Sediment
Table 2.4 Occurrence, Distribution, and Selection of COPCs, Reach 4 Surface Sediment
Table 2.5 Occurrence, Distribution, and Selection of COPCs, Reach 5 Surface Sediment
Table 2.6 Occurrence, Distribution, and Selection of COPCs, Reach 6 Surface Sediment
Table 2.7 Occurrence, Distribution, and Selection of COPCs, Reach 7 Surface Sediment
Table 2.8 Occurrence, Distribution, and Selection of COPCs, Roxana Marsh Surface Sediment
Table 2.9 Occurrence, Distribution, and Selection of COPCs, Reach 1 Surface Water
Table 2.10 Occurrence, Distribution, and Selection of COPCs, Reach 4 Surface Water
Table 2.11 Occurrence, Distribution, and Selection of COPCs, Reach 6 Surface Water
Table 2.12 Occurrence, Distribution, and Selection of COPCs, Reach 5 Surface Water
Table 2.13 Occurrence, Distribution, and Selection of COPCs, Reach 1 Carp Fillet
Table 2.14 Occurrence, Distribution, and Selection of COPCs, Reach 1 Chinook Fillet
Table 2.15 Occurrence, Distribution, and Selection of COPCs, Reach 1 Goldfish Fillet
Table 2.16 Occurrence, Distribution, and Selection of COPCs, Reach 1 Steelhead Fillet
Table 2.17 Occurrence, Distribution, and Selection of COPCs, Reach 2 Chinook Fillet
Table 2.18 Occurrence, Distribution, and Selection of COPCs, Reach 2 Goldfish Fillet
Table 2.19 Occurrence, Distribution, and Selection of COPCs, Reach 6 Carp Fillet
Table 2.20 Occurrence, Distribution, and Selection of COPCs, Reach 7 Carp Fillet
Table 2.21 Occurrence, Distribution, and Selection of COPCs, Reach 7 Goldfish Fillet

TABLES (Continued)

Table 3.1 Exposure Point Concentration Summary, Reach 1 Surface Sediment
Table 3.2 Exposure Point Concentration Summary, Reach 2 Surface Sediment
Table 3.3 Exposure Point Concentration Summary, Reach 3 Surface Sediment
Table 3.4 Exposure Point Concentration Summary, Reach 4 Surface Sediment
Table 3.5 Exposure Point Concentration Summary, Reach 5 Surface Sediment
Table 3.6 Exposure Point Concentration Summary, Reach 6 Surface Sediment
Table 3.7 Exposure Point Concentration Summary, Reach 7 Surface Sediment
Table 3.8 Exposure Point Concentration Summary, Roxana Marsh Surface Sediment
Table 3.9 Exposure Point Concentration Summary, Surface Water
Table 3.10 Exposure Point Concentration Summary, Reach 1 Carp Fillet
Table 3.11 Exposure Point Concentration Summary, Reach 1 Chinook Fillet
Table 3.12 Exposure Point Concentration Summary, Reach 1 Goldfish Fillet
Table 3.13 Exposure Point Concentration Summary, Reach 1 Steelhead Fillet
Table 3.14 Exposure Point Concentration Summary, Reach 2 Chinook Fillet
Table 3.15 Exposure Point Concentration Summary, Reach 2 Goldfish Fillet
Table 3.16 Exposure Point Concentration Summary, Reach 6 Carp Fillet
Table 3.17 Exposure Point Concentration Summary, Reach 7 Carp Fillet
Table 3.18 Exposure Point Concentration Summary, Reach 7 Goldfish Fillet
Table 4.1 Sediment Values Used for Daily Intake Calculations RME
Table 4.2 Surface Water Values Used for Daily Intake Calculations RME
Table 4.3 Fish Values Used for Daily Intake Calculations RME
Table 4.4 Particulate Emission Factor Development for Wind Resuspension
Table 4.5 Chemical-Specific Dermal Absorption Factors
Table 4.6 Values Used for Absorbed Dose Calculation
Table 4.7 Values Used and Results for IEUBK Child Lead Model – Child Resident Wader – Reach 3
Table 4.8 Values Used and Results for IEUBK Child Lead Model – Child Active Angler – Reach 1
Table 4.9 Adult Lead Model Output – Adult Active Angler
Table 5.1 Non-Cancer Toxicity Data – Oral/Dermal
Table 5.2 Non-Cancer Toxicity Data – Inhalation
Table 6.1 Cancer Toxicity Data – Oral/Dermal
Table 6.2 Cancer Toxicity Data – Inhalation

TABLES (Continued)

Table 7.1 Calculation of Chemical Cancer Risks and Non-Cancer Hazards RME – Resident Wader – Adult

Table 7.2 Calculation of Chemical Cancer Risks and Non-Cancer Hazards RME – Resident Wader – Child

Table 7.3 Calculation of Chemical Cancer Risks and Non-Cancer Hazards RME – Active Angler – Adult

Table 7.4 Calculation of Chemical Cancer Risks and Non-Cancer Hazards RME – Active Angler – Child

Table 7.5 Calculation of Chemical Cancer Risks and Non-Cancer Hazards RME – Maintenance/Utility Worker – Adult

Table 9.1 Summary of Receptor Risks and Hazards for COPCs RME – Resident Wader – Adult

Table 9.2 Summary of Receptor Risks and Hazards for COPCs RME – Resident Wader – Child

Table 9.3 Summary of Receptor Risks and Hazards for COPCs RME – Active Angler – Adult

Table 9.4 Summary of Receptor Risks and Hazards for COPCs RME – Active Angler – Child

Table 9.5 Summary of Receptor Risks and Hazards for COPCs RME – Maintenance/ Utility Worker – Adult

ACRONYMS AND ABBREVIATIONS

ABS	Absorption Factor
ALM	Adult Lead Model
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BHHRA	Baseline Human Health Risk Assessment
BOD	biological oxygen demand
Cal EPA	California Environmental Protection
Cas	concentrations
CDI	chronic daily intake
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
cm^2	square centimeter
COC	chemical of concern
COPC	chemical of potential concern
CSM	conceptual site model
CSO	combined sewer overflow outfalls
m^3/hour	cubic meter per hour
df	degrees of freedom
EBGCR	East Branch of the Grand Calumet River
EF	event frequency
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
FI	fraction ingested
FWENC	Foster Wheeler Environmental Corporation
GCR	Grand Calumet River
GCRRF	Grand Calumet River Restoration Fund
GI	gastrointestinal
gpd	gram per day
HEAST	Health Effects Assessment Summary Tables
HI	hazard index
HQ	hazard quotient
HSD	Hammond Sanitary District
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
IEUBK	Integrated Exposure Uptake Biokinetic

ACRONYMS AND ABBREVIATIONS (Continued)

IHC	Indiana Harbor Canal
IRIS	Integrated Risk Information System
kg	kilogram
kg/m^3	kilogram per cubic meter
L	liter
LDC	Laboratory Data Consultants, Inc.
LOAEL	Lowest Observable Adverse Effects Level
mg/cm^2	milligrams per square meter
mg/day	milligrams per day
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MESL	MacDonald Environmental Sciences Limited
MGP	Manufactured Gas Plant
MRL	minimal risk level
NAPL	non-aqueous phase liquid
NECA	National Center for Environmental Assessment
NFG	National Functional Guidelines
NOAEL	No Observable Adverse Effects Level
NPDES	National Pollutant Discharge Elimination System
PAH	Polycyclic Aromatic Hydrocarbon
PCB	polychlorinated biphenyl
PEF	particulate emission factor
PPRTV	Provisional Peer Reviewed Toxicity Value
PRG	Preliminary Remediation Goal
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RAGS	Risk Assessment Guidance for Superfund
RAO	Remedial Action Objective
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RfC	reference concentration
RfD	reference dose
RME	reasonable maximum exposure
SF	slope factor
SQL	sample quantitation limit

ACRONYMS AND ABBREVIATIONS (Continued)

SVOC	semivolatile organic compound
TCDD	tetrachlorodibenzo-p-dioxin
TEF	toxicity equivalency factor
TEQ	toxicity equivalent
TtEC	Tetra Tech EC, Inc. (formerly FWENC)
TOC	total organic carbon
TSS	total suspended solids
UCL	upper confidence limit
UR	unit risk
USFDA	United States Food and Drug Administration
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
WBGCR	West Branch of the Grand Calumet River
WHO	World Health Organization
WWTP	wastewater treatment plant

1. INTRODUCTION

Settlement with Industrial Users of the Hammond Sanitary District (HSD) in February 1997, resulted in establishment of a Trust Agreement for Grand Calumet River Restoration Fund (GCRRF). Following this settlement, a Memorandum of Understanding among The U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (USFWS), Indiana Department of Natural Resources (IDNR), and Indiana Department of Environmental Management (IDEM) created the GCRRF Council and provided guidelines for the Council's management of the fund and implementation of activities to address the effects of sediment contamination in the West Branch of the Grand Calumet River (WBGCR).

Currently, the GCRRF Council implements activities related to this project per the Memorandum of Understanding. The goal of the parties is to address the effects of sediment contamination in the WBGCR, specifically for the purpose of addressing and correcting environmental contamination in the area of concern, including the cleanup of contaminated sediments in the Grand Calumet River (GCR), and the remediation and restoration of natural resource damages within the area of concern.

This human health risk assessment addresses potential current and future exposure by human receptors to constituents in sediments, surface water, and fish tissue. The primary objective of the Baseline Human Health Risk Assessment (BHHRA) is to provide an analysis of potential health risks posed by hazardous substances at the site in the absence of any future response action (i.e., establish a baseline risk determination) in order to evaluate, select, and design remedial actions that will be protective of human health.

1.1 SITE DESCRIPTION

1.1.1 General Area

The Great Lakes Water Quality Agreement of 1978 identified the GCR and Indiana Harbor Canal (IHC) as one of 43 areas of concern having one or more specific impairments to beneficial uses of Great Lakes waters. The Agreement directed that a Remedial Action Plan (RAP) be developed and implemented at each area of concern in order to restore the beneficial uses. IDEM submitted a Stage 1 RAP to the International Joint Commission in 1991 and a Stage 2 RAP in 1997.

The Grand Calumet River is located in Lake County in northwestern Indiana (Figure 1-1). The river's watershed is relatively flat and comprises approximately 22 square miles of northern

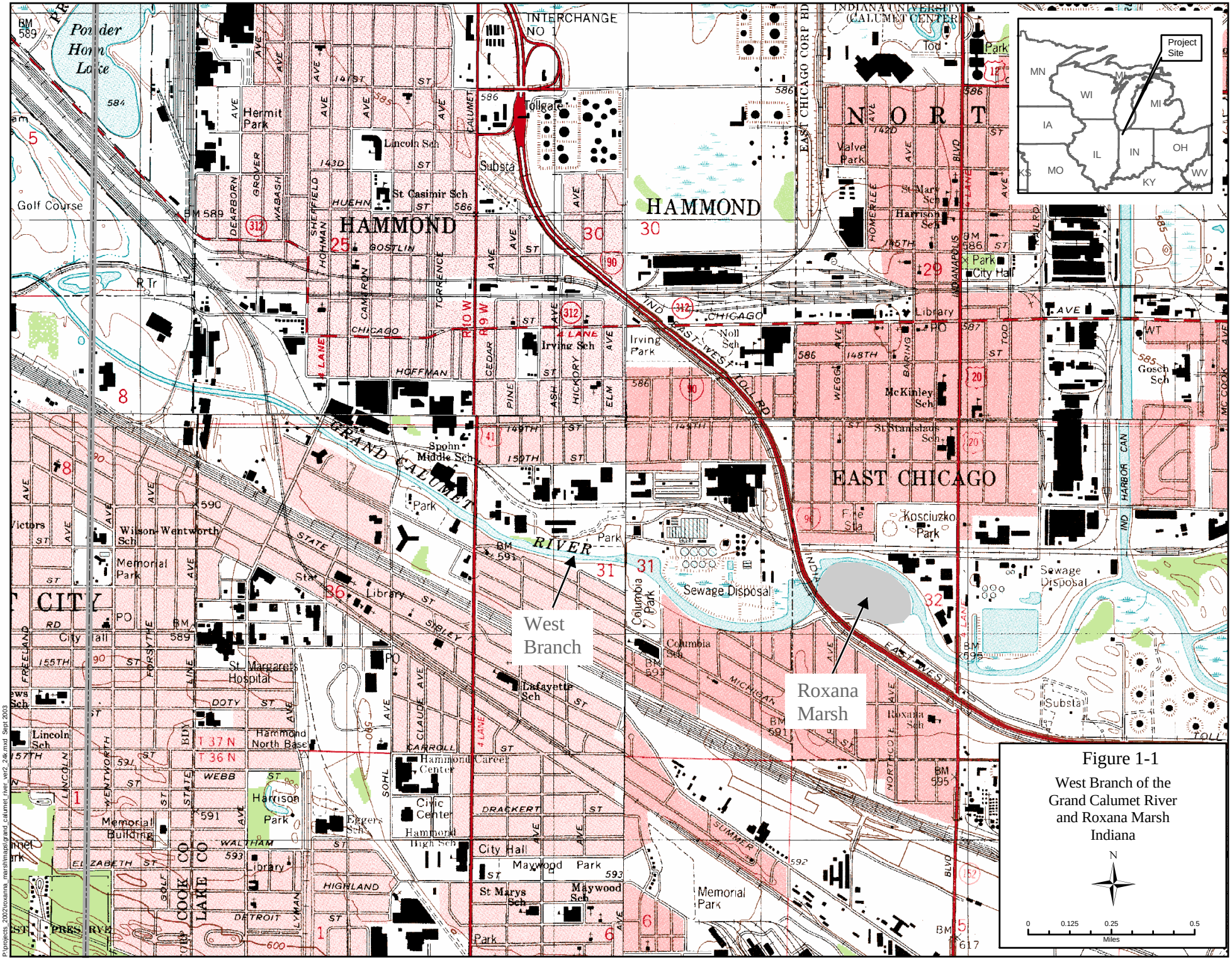


Figure 1-1

West Branch of the Grand Calumet River and Roxana Marsh Indiana

P:\projects_2002\roxana_marsh\maps\grand_calumet_river_ver2_24k.mxd Sept 2003

Indiana. The GCR comprises two east-west oriented branches that meet at the southern end of the IHC. The site vicinity and project area are shown in Figure 1-1. The East Branch of the Grand Calumet River (EBGCR) originates at the Grand Calumet River Lagoons, just east of the United States Steel Gary Works facility. The EBGCR flows west from this point for approximately 10 miles to its confluence with the IHC. The WBGCR usually flows both east and west, with a hydraulic divide typically present in the vicinity of the HSD outfall east of Columbia Avenue. Historically, the volume and direction of water flow through the river were determined by Lake Michigan water levels. During periods of high lake levels, flow may be to the west throughout the WBGCR. Drops in the level of Lake Michigan since 1997 have resulted in reduced water levels in the river.

The surrounding area, which represents one of the most heavily industrialized areas in the United States, contains steel mills and heavy manufacturing sites associated with the steel industry, petroleum-related land uses, packaging operations, chemical processing plants, and other industrial land uses. The land surrounding the river is primarily industrial and commercial interspersed with residential areas.

1.1.2 West Branch Grand Calumet River

The project area evaluated in this phase of work includes the west branch of the river extending from Indianapolis Boulevard west to the Indiana/Illinois state line.

The sediments throughout the WBGCR are highly contaminated with heavy metals and various organic compounds, including semivolatile organic compounds (SVOCs), chlorinated pesticides, and polychlorinated biphenyls (PCBs).

1.2 SITE HISTORY

1.2.1 General Area

There has been a long history of industrial activities within the Grand Calumet River basin, with the land located north of the river being one of the most heavily industrialized areas in the United States (Natural Resources Trustees 1997). In response to concerns regarding environmental contamination and associated impairment of beneficial uses, IDEM and its partners developed a Stage 1 RAP for the IHC, the Grand Calumet River, and nearshore Lake Michigan in 1991 (IDEM 1991). As part of this effort, IDEM (2004) compiled information on potential contaminant sources within the Area of Concern, which included eight major permitted industrial point source dischargers [i.e., permitted under the National Pollutant Discharge Elimination System (NPDES), including U.S. Steel, LTV Steel, ISPAT Inland Steel, PRAXAIR, CERESTA, BP Amoco, NIPSCO, and State Line Energy] and many minor discharges.

Contamination problems within the area are extensive. Within the environs are: 52 properties that were listed in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) as containing potentially uncontrolled hazardous wastes that require investigation; and more than 400 facilities that were subject to regulation under the Resource Conservation and Recovery Act (RCRA), which means that they generate, transport, treat, store, or dispose of hazardous wastes; and, three municipal wastewater treatment plants (WWTP) (i.e., that are operated by the Hammond, Gary, and East Chicago Sanitary Districts).

In total, it was estimated that the Grand Calumet River and the IHC also received more than 11 billion gallons/year of untreated stormwater via 12 combined sewer overflow outfalls (CSO) (IDEM 1991). The locations of existing and historic outfalls within the Area of Concern are shown in Figure 1-2. Discharges of oil and releases of other hazardous substances from both historic and ongoing contaminant sources have resulted in the presence of a variety of toxic and/or bioaccumulative substances in the receiving water systems within the Area of Concern. Some of the substances that have been released include total organic carbons (TOC), nutrients, metals, oil and grease, phenolics, polycyclic aromatic hydrocarbons (PAHs), phthalates, pesticides, and PCBs (FWENC 2003).

1.2.2 West Branch Grand Calumet River

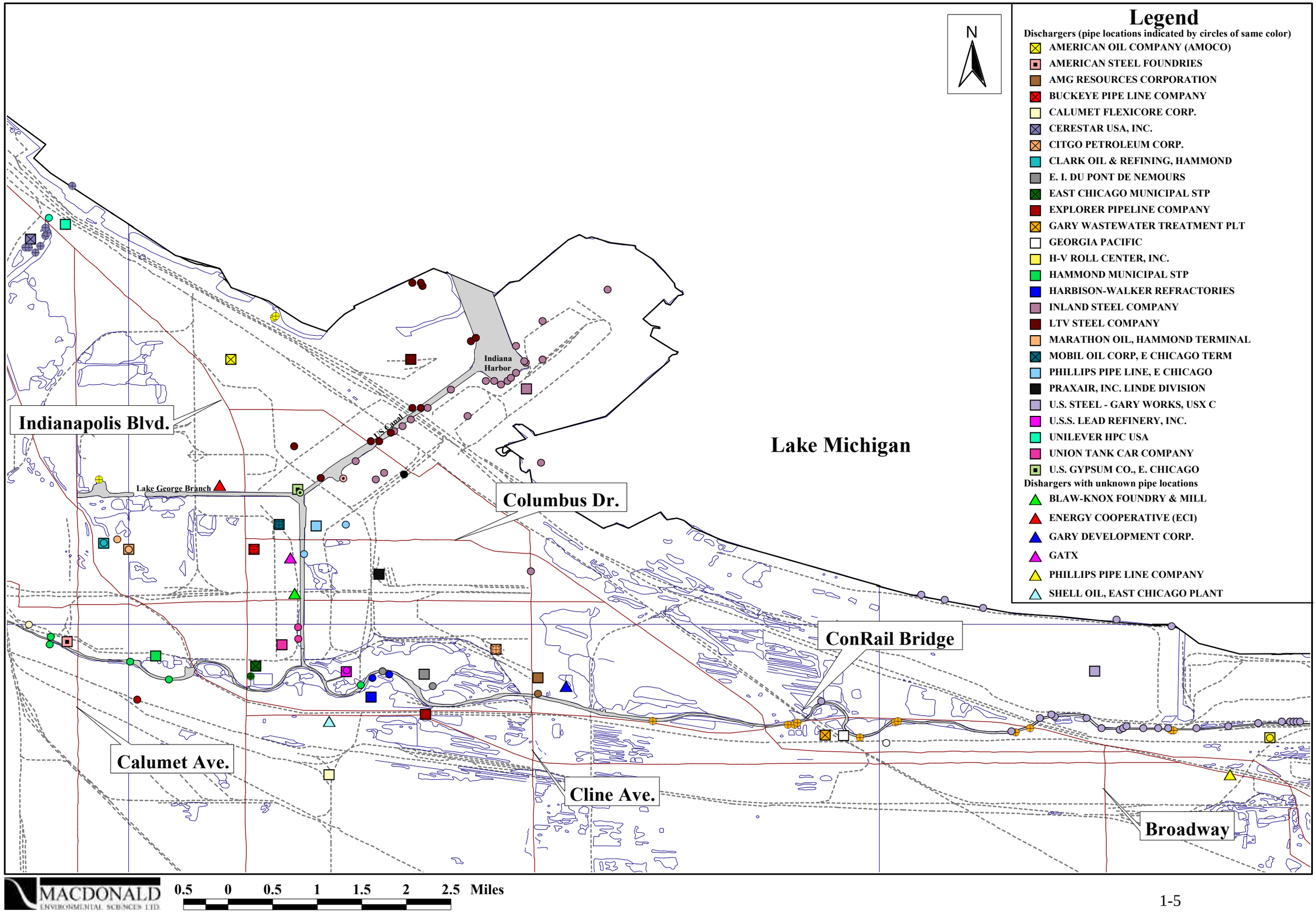
The WBGCR has received inputs of contaminants from several sources over the past century. First, the HSD has discharged effluent from its wastewater treatment plant to the WBGCR in the vicinity of Columbia Avenue. This source is particularly important because the HSD facility receives both municipal sewage and industrial wastewaters and is known to have released metals and PAHs and other hazardous substances into the WBGCR. In addition, CSOs (e.g., at Johnson Avenue, Sohl Avenue, and Columbia Avenue) discharge stormwater and untreated wastewater to the river during periods of high precipitation (FWENC 2003).

Additional details of the site operational history, aerial photographs, previous investigations, and detailed descriptions of each reach can be found in the WBGCR Site Characterization Report (FWENC 2003).

1.3 OBJECTIVES

The purpose of the BHHRA was to estimate and characterize potential human cancer risks and non-cancer adverse health effects associated with exposure to contaminants at the WBGCR. Risks were estimated for reasonably impacted receptor populations under both current and assumed future site conditions. Potential risks were estimated relative to potentially complete

Figure 1-2. Map of Study Area Showing the Locations of Discharges to Receiving Waters



MACDONALD ENVIRONMENTAL SCIENCES LTD.

exposure pathways involving contaminated sediment, and surface water, and fish tissue at the WBCGR. Risk associated with groundwater and soil was not evaluated because potential exposure to these media is beyond the scope of this study.

1.4 RISK ASSESSMENT METHODOLOGY

This BHHRA was conducted in accordance with the EPA Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual, Part A (EPA 1989), Part D (EPA 2001a), and Part E (EPA 2004a), and in accordance with methodologies approved by EPA Region 5 and IDEM. The risk assessment methodology used in this BHHRA involved a four-step process: data evaluation, exposure assessment, toxicity assessment, and risk characterization (see Figure 1-3). The BHHRA is divided into the following sections and supporting appendices:

1. Evaluate analytical data, identify the chemicals of potential concern (COPCs), and calculate exposure point concentrations (EPCs) in each impacted medium (see Section 2);
2. Identify potential receptors and complete pathways of exposure in terms of a conceptual site model and quantify exposures (i.e., develop receptor-specific exposure parameters) (see Section 3);
3. Evaluate the toxicity and environmental mobility of the COPCs (see Section 4);
4. Quantify human contaminant intakes and calculate human health risks and identify chemicals of concern (COCs) (see Section 5); and
5. Analyze uncertainty (see Section 6).

A brief summary of the BHHRA findings and a discussion of other risk assessments for the area is provided in Section 7. References cited in the BHHRA are listed in Section 8. It should be noted that the numbering of tables follows the RAGS-D format. Consequently, there are no tables numbered as “Table 8” as Table 8 is for radiological risk characterization, which is not applicable to this BHHRA.

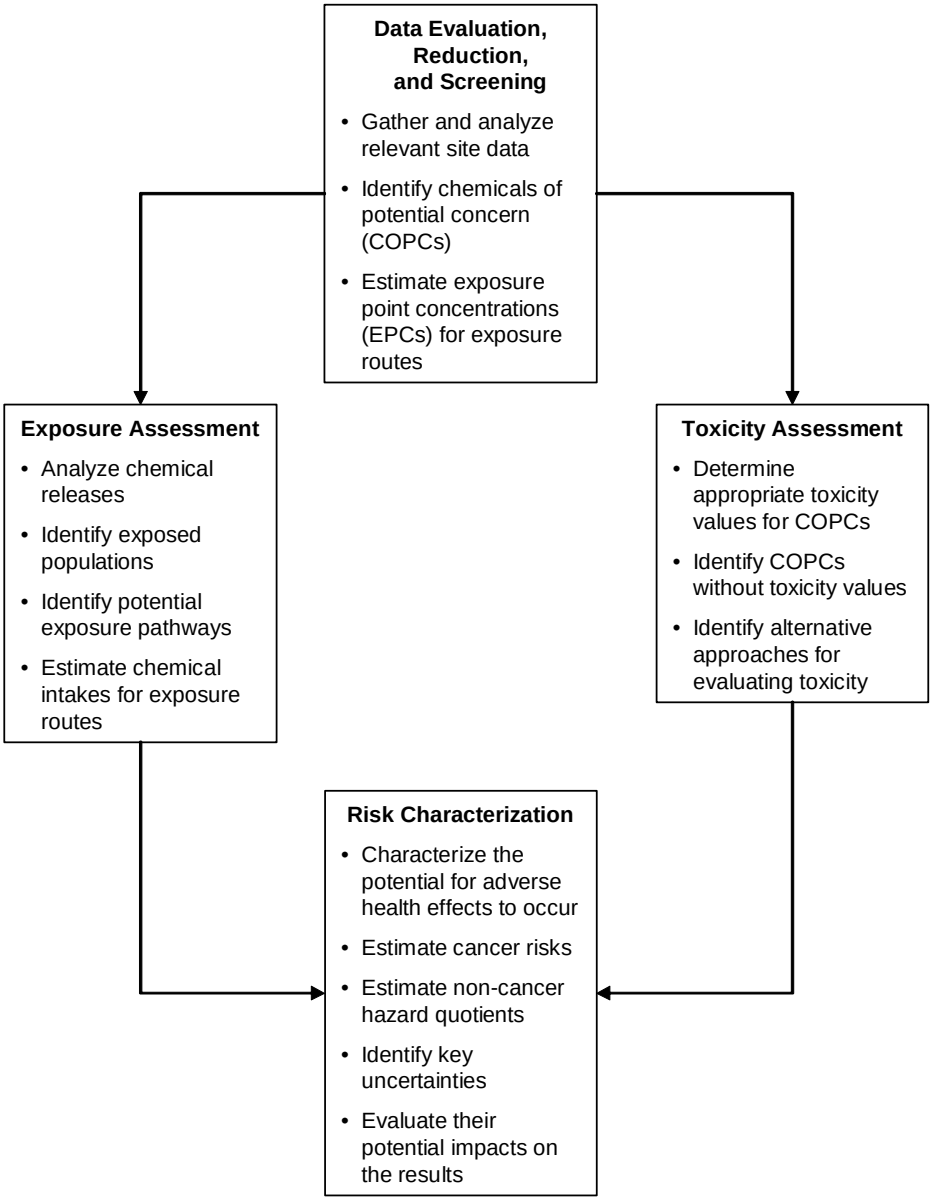


Figure 1-3. Human Health Risk Assessment Process

2. DATA EVALUATION

This chapter summarizes results of the data evaluation step of the risk assessment process. In this step, site investigation results are evaluated to assess data quality (analytical methods, quantitation limits, use of qualifiers and codes, and field and laboratory contamination) and usability; develop a database; and select COPCs for environmental media in different reaches of the WBGCR. The approach to COPC selection was based on EPA guidance.

2.1 DATA SOURCES

The Grand Calumet River system has been sampled frequently over the past 30 years to monitor contaminant concentrations in water, sediment, and fish. Water quality data have indicated contamination problems with both conventional pollutants (e.g., ammonia, dissolved oxygen) as well as hazardous substances. Sediment quality monitoring has identified toxic substances including PCBs, PAHs, dioxins, and heavy metals. Although PCBs have historically been the contaminant of greatest concern, large areas of apparently petroleum-saturated sediments were identified along with contamination by heavy metals (EPA 1994).

Based on a preliminary analysis of potential restoration technologies, the physical site conditions, and waterway setting, Tetra Tech EC, Inc. (TtEC, formerly Foster Wheeler Environmental Corporation [FWENC]) proposed dividing approximately 2-1/2 miles of the WBGCR, located between Indianapolis Boulevard and the Indiana/Illinois state line, into the following project reaches (FWENC 2002a):

Reach 1: from the Indianapolis Boulevard Bridge to the Interstate 90 Bridge,

Reach 2: from the Interstate 90 Bridge to the Columbia Avenue Bridge,

Reach 3: from the Columbia Avenue Bridge to the Calumet Avenue Bridge,

Reach 4: from the Calumet Avenue Bridge to the Sohl Road Bridge,

Reach 5: from the Sohl Road Bridge to the Hohman Avenue Bridge,

Reach 6: from the Hohman Avenue Bridge to the railroad bridge, and

Reach 7: from the railroad bridge to the Indiana/Illinois state line.

The southern bank of Reach 1 is contiguous with an area identified as Roxana Marsh. Investigation of Roxana Marsh and site characterization of the WBGCR were conducted following the GCRRF Council-approved work plans. Media sampled included sediment and surface water. Environmental media sampling events included the collection of trip and/or equipment blanks and the analysis of method blanks for the purposes of quality control (QC).

The site characterization involved collection of samples from shallow sediment samples (0 to 2 feet below ground surface [bgs] or below the mudline), deeper sediment samples (extending from the surface to greater than 7 feet bgs) from Reaches 1 to 7 and Roxana Marsh, an area contiguous with the southern bank of Reach 1, and two surface water samples. Sample interval lengths varied with the thickness of the homogeneous surficial sediment layer. Historical sediment data from the Sediment Injury Report (MacDonald and Ingersoll 2000) Database were included. Historical results include surface sediment samples, shallow sediment samples (extending from the surface to up to 2 feet bgs), and some deeper sediment samples (from the surface to up to 5 feet bgs). There are a few historical sediment sample results that extend from the surface to 9 feet bgs. These results (UH9.4, UG 9-all, UH 8.5, UH 9.2-all, UH 9.4-all, UH9.1, UH9.2, and UH9.3) were not utilized in the BHHRA because the boring logs were not available and therefore it could not be determined if the sampled interval was relatively homogeneous.

Background concentrations of inorganic compounds were estimated from samples collected from Lake Mary. These data were provided to TtEC by the USFWS and IDEM.

Surface water data were obtained from several sources. Two samples were collected during the site characterization, one from Reach 1 and one from Reach 4. These samples were analyzed for pesticides/PCBs, SVOCs, and metals. Surface water samples were collected from Reach 6 pursuant to an investigation of the former Manufactured Gas Plan (MGP) site in this area. These samples were analyzed for VOCs, SVOCs, metals, and total cyanide. The U.S. Geological Survey (USGS) fixed station monitor (#05536357) at Hohman Ave in Reach 5 is sampled monthly for dissolved and total metals, and various other parameters such as phenol, alkalinity, biological oxygen demand (BOD), total suspended solids (TSS), and *E. coli.* These data were obtained from EPA's STORET database by IDEM and provided to TtEC for incorporation into the WBGCR database.

Fish samples have been collected on several occasions. Typically whole fish samples were analyzed. In the fall of 2002, the USFWS and IDEM conducted fish sampling. These samples were filleted, and only the edible portions of fish tissue were submitted for analysis. As fillet samples are more representative of what would be ingested by fish consumers, this data set was utilized for this BHHRA. The USFWS/IDEM fish tissue samples were analyzed for PAHs, SVOCs, pesticides, PCBs (both as Aroclors and as congeners), and metals.

Complex mixtures, such as Aroclors, can be altered by bioaccumulation and bioconcentration. Consequently, PCB results reported as specific Aroclors may be inexact. The risk assessment-preferred approach for tissue samples is to analyze for each PCB congener and then evaluate the results based on their structural similarity to 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-

TCDD), which is commonly referred to as "dioxin." PCBs that are structurally similar to 2,3,7,8-TCDD are computed as dioxin toxicity equivalents (Dioxin-TEQs). PCBs that are not structurally similar to 2,3,7,8-TCDD are described as "Nondioxin-like PCBs." Nondioxin-like PCBs are evaluated as the sum of all the nondioxin-like PCBs. Dioxin TEQs are evaluated as the concentration of a specific congener multiplied by a toxicity equivalency factor (TEF). The products of each congener times its TEF are then summed together. The specific factors used to compute Dioxin TEQs for PCB congeners are (EPA 1996a):

Analyte	PCB Number	TEF[1/]
3,3',4,4' – TeCB	77	0.0005
2,3,3',4,4' – PeCB	105	0.0001
2,3,4,4',5 – PeCB	114	0.0005
2,3",4,4',5 – PeCB	118	0.0001
2',3,4,4',5 – PeCB	123	0.0001
3,3',4,4',5 – PeCB	126	0.1
2,3,3',4,4',5 – HxCB	156 (+157)	0.0005
2,3,3',4,4',6 – HxCB	158	0
2,3',4,4',5,5' – HxCB	167	0.00001
3,3',4,4',5,5'-HxCB	169	0.01
2,2',3,3',4,4',5 – HpCB	170	0.0001
2,2',3,4,4',5,5' – HpCB	180 (+193)	0.00001
2,3,3',4,4',5,5' – HpCB	189	0.0001

[1/] The toxicity equivalency factors (TEFs) used are from references cited in IRIS (EPA 2004b).

Laboratory analytical data for the WBGCR site characterization and Roxana Marsh investigation were uploaded electronically into an Access© database from laboratory provided electronic deliverables. Sediment samples were analyzed by Severn Trent Laboratories and EnChem Laboratory, respectively. Surface water samples were analyzed by Columbia Analytical Services. The historical data were entered by MacDonald Environmental Sciences Limited (MESL) and provided to TtEC electronically in a Microsoft Access© database. For quality assurance (QA)/quality control (QC) purposes, the database listings were reviewed and any abnormalities were then compared to available laboratory reports. Discrepancies were resolved in favor of the laboratory reports. When laboratory reports were not sufficient, the laboratory was contacted for further clarification. The Access© database was used by TtEC risk assessment personnel to create output files, prepare summary statistics tables using Excel©, and calculate exposure point estimates using ProUCL Version 2.1.

All Roxana investigation data and WBGCR site characterization data were validated by Laboratory Data Consultants, Inc. (LDC) in Carlsbad, California, using guidance from EPA Contract Laboratory Program National Functional Guidelines (NFG) (EPA 1994, 1999), Test Methods for Evaluating Solid Waste (EPA 1996b), and the Final QAPP (FWENC 2002b).

2.2 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

The existing analytical data are reviewed to identify those chemicals that represent more than 99 percent of the risk associated with each media of interest and distinct area of contamination. Chemicals not retained as COPCs may be considered to have minimal influence on total risk estimates. The process for selecting COPCs is defined in EPA RAGS Part A (EPA 1989). The COPC list was first generated based on the list of all chemicals detected in each medium for each reach. Detected chemicals are those constituents that were detected above the sample quantitation limit (SQL), including those that were reported with selected qualifiers (e.g., J, B, E, etc.) that imply uncertain concentration but not uncertain identity. Working from this initial list, chemicals were eliminated, provided certain criteria were met. These criteria are as follows:

- Chemicals attributable to field or laboratory contamination (e.g., organic chemicals qualified as B) based on guidance in the *Functional Guidelines for Organics* (EPA 1994) were eliminated because these are not indicators of site-related contamination.
- Chemicals that are essential nutrients were eliminated from the COPC list if on-site concentrations were consistent with naturally occurring levels. The essential nutrients eliminated on this basis include calcium, magnesium, sodium, and potassium.
- Chemicals whose maximum detected concentration in sediment or surface water was below a screening toxicity value were eliminated from the COPC list. Toxicity-based screening criteria were not available for fish; therefore, all chemicals detected in fish tissue were retained as COPCs. Selection of screening values is discussed further below.
- It should be highlighted that comparison to background was only used as a criterion for eliminating a constituent as a COPC when no anthropogenic source of that constituent could be identified and the concentrations observed within a reach were less than the maximum detected sediment concentration from Lake Mary. The only detected chemical that was eliminated based on this comparison to background was iron in Reach 7 sediments. This approach is consistent with EPA CERCLA policy (EPA 2002a).

Screening toxicity values were derived from the EPA Region 9 Preliminary Remediation Goals (PRGs) and IDEM's default residential criteria under the Risk Integrated System of Closure. The IDEM criteria are used by several programs including the State Cleanup Program and the Voluntary Remediation Program. For soil, the IDEM exposure factors were somewhat more conservative than the PRGs. Therefore, the IDEM criteria was used as the toxicity-based concentration screen after adjusting the values to represent a cancer risk level of $1x10^{-6}$ or hazard quotient of 0.1 (i.e., the current criteria divided by a factor of 10). If no IDEM criterion was available for a detected chemical, then the Region 9 PRG was used as a screening criteria.

Region 9 PRGs represent a $1x10^{-6}$ cancer risk level or hazard quotient of 1. Therefore, only those Region 9 PRGs based on non-cancer endpoints needed to be divided by 10, so that the concentration corresponds to a hazard quotient of 0.1. Sediment data were screened against IDEM criteria/Region 9 PRG established for residential soil. Surface water was screened against the IDEM criteria for residential groundwater/Region 9 PRG for drinking water. Surface water data were also screened using Great Lakes Water Quality criteria. Fish data were not screened using a toxicity-based screening criteria. The United States Food and Drug Administration (USFDA) tolerance levels were not used as screening criteria because they do not represent a uniform risk-based level.

Several detected COPCs did not have published PRGs or IDEM criteria. For these chemicals, appropriate surrogate values were utilized for COPC screening. As shown below, the surrogate compounds are either specific isomers of a parent compound, specific mixtures of a group of compounds, or in the case of endrin aldehyde and endrin ketone, a degradation product of the parent compound. In the case of chromium, toxicity values are specific to the valence state but analytical results for all media were reported as "chromium." Therefore, the same ratio of 1:6 for Cr VI : Cr III assumed in the PRG was assumed here, and the PRG for "Total Chromium" as utilized as a screening criteria for chromium. The surrogate relationships assumed were:

Detected Chemical	Surrogate
alpha-Chlordane gamma-Chlordane	Chlordane
Aroclor 1242 Aroclor 1248 Aroclor 1254 Aroclor 1260	PCBs
Chromium	Total Chromium (1:6 ratio Cr VI:Cr III)
Cyanide Cyanide (Chlorine Amenable) Cyanide (Total)	Cyanide, free
delta-BHC Hexachlorocyclohexane-all isomers	Hexachlorocyclohexane (technical grade)
Endosulfan I Endosulfan II Endosulfan sulfate	Endosulfan
Endrin aldehyde Endrin ketone	Endrin

Because there is neither an IDEM criteria nor a Region 9 PRG for titanium, the EPA Region III Risk-Based Concentration was used as a screening criterion. Tables summarizing the COPC screening process for each of the three exposure media and reach combinations are presented as Tables 2.1 through 2.21. The results are discussed further below.

As a result of the screening process, the surface sediment COPCs are:

- Reach 1 - PCBs (Aroclor 1242, Aroclor 1248, and Aroclor 1260), dieldrin, bis(2-ethylhexyl)phthalate, carbazole, PAHs (benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, and pyrene), aluminum, antimony, arsenic, cadmium, chromium, iron, lead, manganese, nickel, and zinc (Table 2.1).
- Reach 2 - PCBs (Aroclor 1248), 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD), pesticides (4,4'-DDE, Total DDT, gamma-BHC or Lindane, total chlordane, dieldrin, toxaphene, heptachlor, hexachlorocyclohexane), carbazole, PAHs (benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, phenanthrene, and pyrene), aluminum, antimony, arsenic, cadmium, chromium, iron, lead, manganese, mercury and zinc (Table 2.2).
- Reach 3 - PCBs (Aroclor 1248 and Aroclor 1260), dieldrin, PAHs (benzo(a)pyrene, benzo(a)anthracene, benzo(g,h,i)perylene, indeno(1,2,3-c,d)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and phenanthrene), arsenic, cadmium, chromium, lead, and mercury (Table 2.3).
- Reach 4 - PCBs (Aroclor 1248 and Aroclor 1260), PAHs (acenaphthene, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, 2-methylnaphthalene, naphthalene, and phenanthrene) antimony, arsenic, cadmium, chromium, iron, lead, manganese, and mercury (Table 2.4).
- Reach 5 - PCBs (Aroclor 1248), PAHs (benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene), aluminum, antimony, arsenic, cadmium, iron, lead, and manganese (Table 2.5).
- Reach 6 - benzene, PAHs (acenaphthene, benzo(a)pyrene, benzo(a)anthracene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, chrysene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene), aluminum, antimony, arsenic, cadmium, chromium, iron, lead, and manganese (Table 2.6).
- Reach 7 - PCBs (Aroclor 1248 and Aroclor 1260), pesticides (total chlordane, dieldrin, 4,4'-DDE, total DDT, heptachlor, and toxaphene), benzene, PAHs (benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene,

dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, chrysene, 2-methylnaphthalene, naphthalene, and phenanthrene) arsenic, cadmium, lead, manganese, and mercury (Table 2.7).

- Roxana Marsh – PCBs (Aroclor 1248, Aroclor 1254, and Aroclor 1260), dieldrin, PAHs (benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, and pyrene), arsenic, cadmium, chromium, iron, lead, and mercury (Table 2.8).

IDEM supplied surface water data from the STORET database for the USGS fixed station (#05536357) at Hohman Avenue. Reach 1 and 4 were collected by TtEC, and Reach 6 data were available from a former ThermoRetec investigation (ThermoRetec 1999). No surface water COPCs were identified for Reaches 2, 3, and 7 because no data were available for these reaches. Examination of Tables 2.9 to 2.12 indicates that there is little variation in the concentrations detected between the various reaches. Therefore, for the purposes of calculating exposure point concentrations, results from surface water sampling were combined (see Table 3.9). The surface water COPCs identified for each reach are:

- Reach 1 – arsenic and lead (Table 2.9).
- Reach 4 - arsenic and lead (Table 2.10).
- Reach 6 – naphthalene, chlorodibromomethane, arsenic, and lead (Table 2.11).
- Reach 5 – aluminum, arsenic, chromium, and lead (Table 2.12).

Fish data were summarized by species within each reach. PCB congener results were summarized as “Nondioxin-like PCBs” and as “Dioxin TEQs.” The detected analytes, all of which were considered COPCs, are:

- Reach 1 – four Carp Fillet composite – PCBs, pesticides (alpha- and gamma-chlordane, o,p’-DDD, p,p’-DDD, p,p’-DDE, and trans trans-nonachlor), PAHs (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, methylnaphthalene, phenanthrene, and pyrene), and metals (chromium, copper, iron, selenium, and zinc) (Table 2.13).
- Reach 1 Chinook Fillet – PCBs, pesticides (alpha- and gamma-chlordane, p,p’-DDD, p,p’-DDE, p,p’-DDT, dieldrin, and cis- and trans-nonachlor), PAHs (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, 1-methylnaphthalene, phenanthrene), and metals (chromium, copper, iron, mercury, selenium, and zinc) (Table 2.14).
- Reach 1 six Goldfish Fillet composite – PCBs, Bis(2-ethylhexyl)phthalate, PAHs (fluorene, methylnaphthalene, naphthalene), pesticides (alpha- and gamma-chlordane,

o,p'-DDD, p,p'-DDD, p,p'-DDE, and trans-nonachlor), and metals (chromium, copper, iron, lead, selenium, and zinc) (Table 2.15).

- Reach 1 Steelhead Fillet – PCBs, pesticides (alpha- and gamma-chlordane, p,p'-DDD, p,p'-DDE, p,p'DDT and cis- and trans-nonachlor), PAHs (acenaphthene, anthracene, fluoranthene, fluorene, methylnaphthalene, and phenanthrene), and metals (chromium, copper, iron, lead, mercury, selenium, and zinc) (Table 2.16).
- Reach 2 Chinook Fillet - PCBs, pesticides (alpha-chlordane, o,p'-DDD, p,p'-DDD, p,p'-DDE, p,p'-DDT, dieldrin, and cis- and trans-nonachlor), PAHs (acenaphthene, anthracene, fluoranthene, fluorene, methylnaphthalene, and phenanthrene), and metals (aluminum, chromium, copper, iron, lead, manganese, mercury, selenium, and zinc) (Table 2.17).
- Reach 2 six Goldfish Fillet composite - PCBs, pesticides (alpha- and gamma-chlordane, o,p'-DDD, p,p'-DDD, p,p'-DDE, dieldrin, gamma-BHC and trans-nonachlor), PAHs (acenaphthene, anthracene, fluorene, and methylnaphthalene), and metals (chromium, copper, iron, selenium, and zinc) (Table 2.18).
- Reach 6 two Carp Fillet composite - PCBs, pesticides (alpha- and gamma-chlordane, o,p'-DDD, p,p'-DDD, p,p'-DDE, dieldrin, and cis- and trans-nonachlor), PAHs (acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(b)fluoranthene, chrysene, fluoranthene, fluorene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene), and metals (aluminum, chromium, copper, iron, lead, selenium, and zinc) (Table 2.19).
- Reach 7 Carp Fillet - PCBs, pesticides (alpha- and gamma-chlordane, o,p'-DDD, p,p'-DDD, p,p'-DDE, dieldrin, and cis- and trans-nonachlor), PAHs (acenaphthene, benzoic acid, fluoranthene, fluorene, 1- and 2-methylnaphthalene, naphthalene, phenanthrene and pyrene), and metals (aluminum, chromium, copper, iron, lead, selenium, and zinc) (Table 2.20).
- Reach 7 Goldfish Fillet - PCBs, pesticides (chlordane, o,p'-DDD, p,p'-DDD, p,p'-DDE, dieldrin, and cis- and trans-nonachlor), PAHs (acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, chrysene, dibenzofuran, fluoranthene, fluorene, methylnaphthalene, naphthalene, phenanthrene and pyrene), and metals (chromium, copper, iron, selenium, and zinc) (Table 2.21).

2.3 EXPOSURE POINT CONCENTRATIONS

In order to quantify the magnitude of exposure that occurs to a receptor, EPCs must first be estimated for the COPCs from the available and applicable data sets. The EPC is the estimated

concentration of the COPC in a medium to which a receptor would be exposed. It is entered into equations in conjunction with other exposure factors to calculate chemical daily intakes.

EPCs were calculated using the EPA program, ProUCL (Version 2.1). After COPCs were determined within each media associated with the site, the 95 percent upper confidence limit (UCL) on the mean was calculated for each COPC based on the statistical distribution of each data set. The UCL is an upper-bound estimate of the average or mean concentration of a COPC within a specific area. One-half the SQL was used as the concentration for that sample for purposes of statistical evaluation when that constituent was not detected. In addition, samples with field duplicate samples were averaged together prior to inclusion into the statistical evaluation.

The method of calculation of the 95 percent UCL of the arithmetic mean for a data set with a normal distribution is as follows:

$$95\%\,UCL = \bar{x} + t_{df,0.05} \cdot \frac{S_x}{\sqrt{n-1}}$$

where:

$\bar{x}$	=	Arithmetic mean of the sample results
S_x	=	Standard deviation of the sample results
n	=	Number of sample results
$t_{df,0.05}$	=	Student's distribution parameter; depends on the degrees of freedom (df) and for a 95 percent confidence level, $\alpha = 0.05$

The method of calculation of the 95 percent UCL of the arithmetic mean for a data set with a log-normal distribution is as follows:

$$Lognormal\ 95\%\,UCL = exp\left(\bar{y} + 0.5S_y^2 + \frac{S_y H_{0.95}}{\sqrt{n}}\right)$$

where:

$\bar{y}$	=	Arithmetic mean of the transformed results [$y_i = \ln X_I$]
S_y	=	Standard deviation of the transformed results [$y_i = \ln X_I$]
n	=	Number of sample results
$H_{0.95}$	=	H statistic depends on S_y and n for the 95 percent confidence level

Using ProUCL, a statistical test was performed to determine if the distribution for a COPC followed a normal or log-normal distribution. Based on this determination, the 95 percent UCL was calculated by one of the above equations. If a data set was found to be neither normally or log-normally distributed, a UCL was calculated based on the standard deviation value of the log-normally transformed data set. Depending on the standard deviation, a 95 percent, 97.5 percent, or 99 percent Chebyshev UCL was calculated and recommended as the EPC by the ProUCL

software (EPA 2001b). If the recommended 95 percent UCL was greater than the maximum detected concentration, then the maximum detected concentration was used as the EPC.

Tables 3.1 through 3.18 summarize the EPC development process and the resulting EPCs for each chemical in each of the three exposure media (sediment, surface water, and fish tissue).

3. EXPOSURE ASSESSMENT

The exposure assessment describes, both qualitatively and quantitatively, the most significant potential pathways through which people may contact contamination in various media at the Site. The exposure assessment considers site conditions associated with both current and reasonably foreseeable future uses. A complete human exposure pathway is composed of the following elements (EPA 1989):

- A source and mechanism of chemical release to the environment;
- An environmental transport medium for the released chemical or mechanisms of transfer of the chemical from one medium to another;
- A point of potential contact by humans with the contaminated medium; and
- An effective route of exposure (i.e., ingestion, dermal absorption, or inhalation) for that chemical.

This section presents the exposure assessment step of the BHHRA. The purpose of the exposure assessment was to identify the populations that may come into contact with the COPCs at the site and the pathways by which they may be exposed. The extent of the exposures was then quantified.

Section 3.1 reviews the environmental setting and land use at the WBGCR. Section 3.2 includes the potential source areas, release mechanisms, receptor populations, and exposure pathways to be carried through the evaluation. Section 3.3 presents the calculation of the concentrations of the COPCs potentially present at the points of exposure. Section 3.4 presents the chronic daily intake (CDI) calculations (i.e., the amount of COPCs that an individual would be exposed to each day) for each route of exposure using population-specific exposure factors and presents the input values obtained using the population-specific exposure factors.

3.1 SITE DESCRIPTION

3.1.1 Exposure Setting

The first step was to characterize the site and human populations on and near the site. Information for this step is presented in Sections 1 and 3 of the Site Characterization Report (FWENC 2003), including: surface features, meteorology, surface water hydrology, geology, soil characteristics, demography and land use, and ecology. This exposure setting information supports the identification of potential exposure pathways described in Section 3.2.

Land use in the site environs includes residential, recreational, and commercial/industrial uses. The following characterizes land use for each of the seven reaches and Roxana Marsh based on review of aerial photographs and observations made by TtEC personnel during the site characterization and site reconnaissance. Observations regarding the River depth and width are those conditions that existed at the time of the sampling; the same conditions may not exist today or in the future.

- Reach 1 – The WBGCR is approximately 1 to 2 feet deep in this area, but may be as much as 3 to 4 feet deep in channelized areas near the abandoned trestles. Industrial land use predominates on the northeastern side of the WBGCR. On the northwest end there is open land with three sets of railroad tracks; just north of this area are single-family residences. The south side of the WBGCR is contiguous with Roxana Marsh. The land surface adjacent to the river is well vegetated. There are several small business located on the eastern end, including National Recovery Systems, TopBulb, the National Briquette Company, and the Ki-Yowga Club. To the north of the HSD is Kosciuszko Park, which includes ball fields, slides, and other recreational facilities.
- Reach 2 – Water is typically 2 to 3 feet deep in this area but may be as much as 9 to 12 feet deep near the HSD outfall. The outfall forms a watershed divide in the middle of Reach 2, with the east side of the reach flowing predominantly east and the west side of the reach flowing west. The south side of the WBGCR is primarily single-family residential, and includes Roxana Park, a recreational area adjacent to I-90. The park includes a playground and other recreational facilities including picnic tables; there is an opening in the fence allowing access to footpaths along the southern bank of the WBGCR. A pipeline runs between the park and the WBGCR and crosses over the river east of the HSD outfall. On the western end of the south bank of Reach 2 is Columbia Park, which includes ball fields. The north bank includes the HSD outfall and former sludge lagoons. To the east, Niagara-LaSalle Steel abuts the HSD property. The surrounding area is primarily single-family residential.
- Reach 3 – The river is only about 6 to 12 inches deep and 10 feet wide in this area. Land use south of the WBGCR includes an industrial area next to the Columbia Avenue Bridge as well as residential areas including multi-family dwellings. Eddie's Asphalt, and the Super Duper gas station face Columbia Avenue just south of the WBGCR. Single-family residential neighborhood is adjacent to the south bank of the river between Eddie's Asphalt and the auto repair shop at Calumet Avenue. On the eastern end of the north bank are ball fields (Irving Baseball Complex), as well as a large warehouse utilized for sewer maintenance by the HSD. There are also vacant lots are on the western end of the south side of the river.

- Reach 4 – Historically, water flows freely between Reaches 3, 4, and 5. There is an open area to the south of Reach 4. Water levels in Reach 4 are typically one foot or less, but were higher during the site characterization, when the culvert to Reach 5 was observed to be blocked. On the eastern end of the north bank facing Calumet Avenue is a school (City Baptist Schools) with recreational facilities, including athletic fields. A chain-link fence separates the school property from the river, although breeches in the fence were observed; to the south is Peoples Park which includes soccer fields and provides access to the Grand Calumet River Trail. Immediately west of the park is a recently constructed outdoor skate or roller blade facility (Turner Field Skate Park), and a large maintenance or storage area. Farther west of Turner Park are small businesses and residential housing, primarily single family. Hammond Elderly Housing is south of Michigan Road.
- Reach 5 – Water levels in Reach 5 are typically 1 foot or less. Land use near the south bank is primarily multi-family residential and includes a recreation area on the eastern side; to the north, land use is primarily industrial. Parking for American Steel Foundries is adjacent to the river. North of American Steel Foundries on the other side of Hoffman Avenue are residential areas, but the industrial areas are fenced, limiting access. The Hubert Humphrey Building, senior citizen housing, is located at the far western end of Reach 5, adjacent to Hohman Avenue.
- Reach 6 – Water levels in Reach 6 are typically 1 foot or less. The vacant lot on the south side was the location of a former manufactured gas plant owned by the Hammond Electric Company in the early 1900s, and later part of NIPSCO. The manufactured gas plant has been demolished and fenced off with a 6- to 8-foot chain-link fence topped with barbed wire; south of this area is an auto salvage or body shop. There is a transportation operation covering most of the north bank, Djuric Trucking; farther north on the other side of Sheffield Avenue is a residential area. On the far west end of Reach 6 is an abandoned former industrial area.
- Reach 7 – Water levels in Reach 7 are typically 1 to 2 feet. On the eastern end of Reach 7 are the bridge abutments for a turning bridge. There is graffiti and other nuisance indications of human activity. The south bank includes a salvage yard (Midwest Salvage) and large industrial buildings to the west. One block south of the salvage yard is a grocery store, pharmacy, and other retail establishments. Land use on the north bank is primarily industrial – Carlson-Reid, a concrete pipe manufacturer. Beyond Reach 7, to the west is Dynagel manufacturing; 1 to 2 blocks to the south (approximately one-quarter mile) is residential single-family housing. To the north there is a swampy area, railroad tracks, and abandoned land continuing for about one-half mile.

- Roxana Marsh – This area is generally not covered by water, but is often saturated under a mat of thick vegetation with several small meandering channels. Although access to this area is limited to a gated dirt road off of the adjacent paved road, this area is used for recreational purposes. Evidence of dumping was observed during site reconnaissance, including building debris and graffiti. Several utilities are also present: NIPSCO has power lines on overhead towers; and Wolverine and Amoco pipelines pass through the area. The Knights of Columbus meeting hall has parking on the other side of the adjacent paved road.

Recreational uses of the river include angling, boating, hiking, walking and use of adjacent parks. Despite annual fish consumption advisories dating from 1986, not all anglers are aware of the advisory and even some of those who are aware of the advisory do not necessarily follow the consumption advisory (Williams et al. 2000). Fish have been documented in reaches 1, 2, 6, and 7. Reaches 3, 4, and 5 currently may be isolated and/or too shallow for fish of edible size. Residential areas abut the River in reaches 2, 3, 4, and 5. There are residential areas within approximately ¼ mile of reaches 1, 6 and 7. In general, direct access to the River is limited by topography, brush, and/or fencing but is not precluded. Utility pipelines run adjacent to and cross the River in Reaches 1, 2 and Roxana Marsh in several locations, and there are culverts at most of the roads that divide the various reaches.

3.1.2 Environmental Setting

Two geohydrologic units underlie the WBGCR: an unconsolidated surficial sand aquifer (Calumet aquifer) and a carbonate-bedrock aquifer (Silurian-Devonian aquifer). In most of the area, these aquifers are separated by a confining unit of silty clay. The Calumet aquifer is described as an unconfined, or water table, aquifer. The Calumet aquifer is recharged by direct infiltration of precipitation. The average depth to water is typically less than 10 feet. Discharge from the Calumet aquifer is primarily to surface water.

The WBGCR usually flows both east and west, with a hydraulic divide typically present in the vicinity of the HSD outfall east of Columbia Avenue. Historically, the volume and direction of water flow through the river were determined by Lake Michigan water levels. During periods of high lake levels, flow may be to the west throughout the WBGCR. Drops in the level of Lake Michigan since 1997 have resulted in reduced water levels in the river.

There is relatively little topographic relief in the area. During the site characterization study, the water level varied from 578 feet to 580 feet. Both riverbanks slope upward from this elevation to an elevation between 582 feet and 585 feet. Beyond the riverbank, the study area is relatively flat. Excluding manmade objects, ground elevations within the study area do not exceed 590

feet. There is no pronounced slope to the topography along the length of the river, and elevations of the flood plains on both sides of the river are similar (FWENC 2003).

During the site characterization study, non-aqueous phase liquid (NAPL) materials or significant petroleum sheen were encountered in many of the sediment core samples, primarily in the upper 4 to 8 feet of sediments.

3.2 CONCEPTUAL SITE MODEL

Development of the human health risk assessment requires an understanding of the pathways through which identified receptors are exposed to COPCs. In turn, the identification of key exposure pathways requires an understanding of the sources and releases of environmental contaminants and the fate of these substances. This section is intended to identify the key exposure pathways and receptor groups in the WBGCR.

The conceptual site model (CSM) is used to identify pathways of contaminant migration. Only those pathways with a complete exposure route are selected for evaluation. Figure 3-1 shows the potential pathways for contaminant migration to human receptors for the current principal contaminant sources. These pathways include direct contact with impacted surface water and sediments and consumption of fish. Direct contact includes incidental ingestion and dermal contact with sediments, and potentially inhalation of airborne particulate-bound COPCs or volatile COPCs. Surface or shallow sediments are considered to be any core sample that includes the uppermost interval. As stated previously, in general the highest concentrations of contaminants were detected within the uppermost 4 to 8 feet of sediments. Potential exposures to deeper sediments, soil, and groundwater are beyond the scope of this BHHRA, which is focused only upon the reaches of the river system.

The pathway screening step involves systematic examination of each contaminated environmental medium, contaminant transport pathway, and exposed population to define which combinations should be evaluated quantitatively. The combinations to be considered are those that represent current complete pathways or future pathways (using realistic assumptions about future land use). The following sections discuss the results of the pathway analysis steps in terms of potential source areas and release mechanisms (Section 3.2.1) and exposure pathways and receptors (Section 3.2.2).

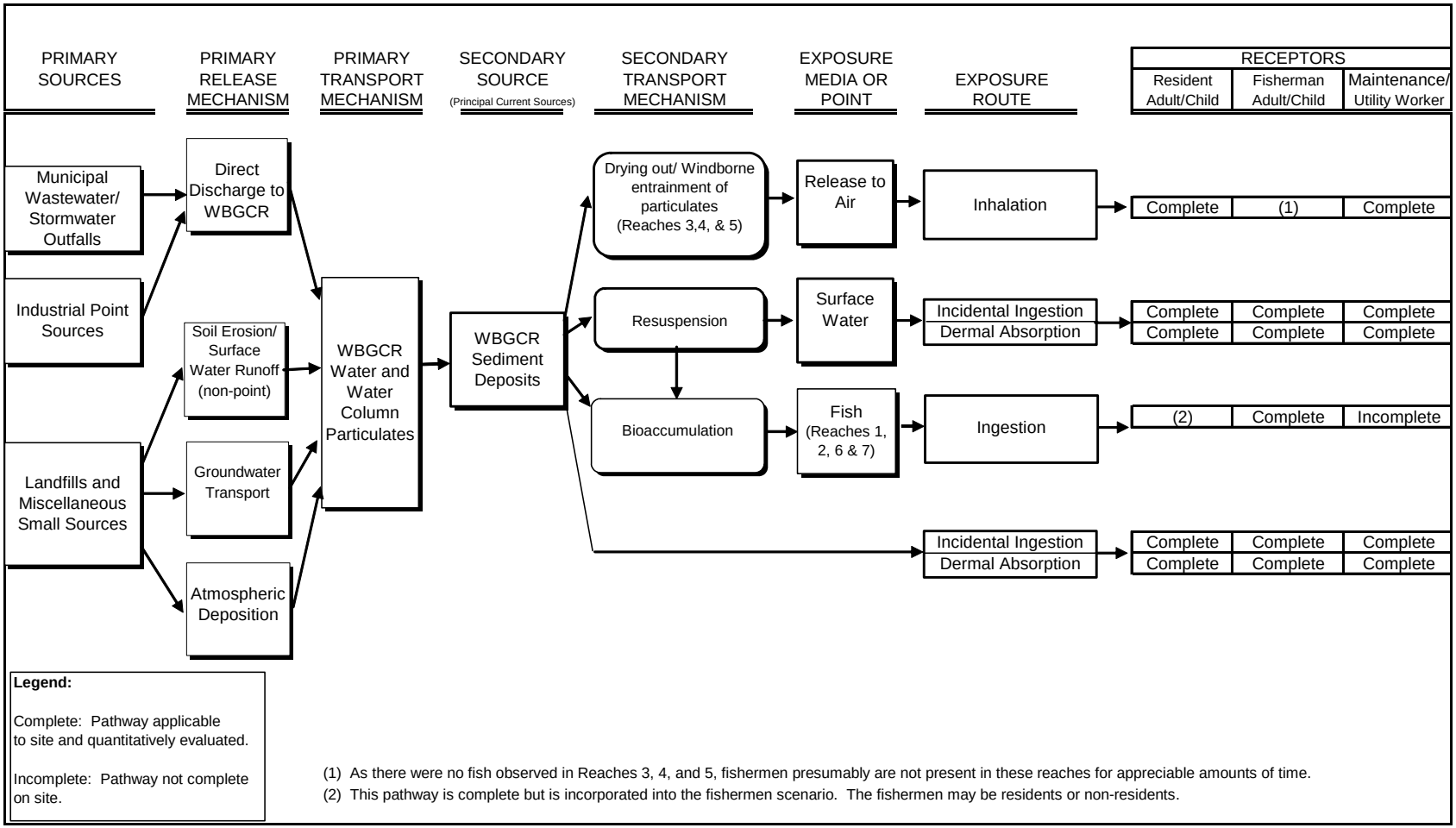


Figure 3-1. Conceptual Site Model

3.2.1 Potential Source Areas and Release Mechanisms

The principal current sources of COPCs are sediment deposits found in the seven reaches of the WBGCR and Roxana Marsh. The principal exposure medium is sediment. Exposures to sediment-related COPCs can also occur when sediments are resuspended in the water. Sediment-related COPCs are also taken up by micro and macrofauna that are subsequently ingested by fish. Therefore, fish are a secondary exposure medium.

Most of the area is water-covered throughout the year. Reaches 3, 4, and 5 generally have very low water levels, and during periods of limited precipitation, may dry out. During these times, it is possible that the particulate-bound COPCs could be entrained in ambient air. Therefore, entrained dusts are a secondary exposure medium. Although Roxana Marsh is not water-covered, nearly all of this area is covered with thick vegetation, which minimizes dust generation.

Only one volatile organic compound, benzene, was detected and is a COPC in Reach 6 and 7 sediments. These areas are typically water-covered, and therefore significant volatilization to ambient air is unlikely because the benzene would first be released to pore water, then to surface water, and ultimately to the atmosphere. Benzene has not been detected in surface water samples. Therefore, this pathway appears to be incomplete under current site conditions.

As mentioned previously, sediments may become resuspended in surface water and therefore surface water is a secondary exposure medium. COPCs for surface water, combined for all reaches, are: aluminum, arsenic, chromium, lead, naphthalene, and chlorodibromomethane. Three VOCs were detected in surface water: chlorodibromomethane, bromoform, and naphthalene. Apparently, the chlorodibromomethane and bromoform are present as artifacts of disinfection of the HSD NPDES discharge, because trihalomethanes have not been identified in sediments and are not associated with the industrial discharges to the WBGCR. In general, VOCs can volatilize from surface water to ambient air. Both chlorodibromomethane and naphthalene were selected as COPCs for surface water. Neither compound meets the "volatile" criteria of having a Henry's Law constant greater than 10^{-5} (atm-m^3/mol) and a molecular weight less than 200 g/mole. Therefore, potential transport from surface water to ambient air is likely to be insignificant due to both the low volatilization potential of these compounds and the rather low concentrations detected.

Although there may be other impacted environmental media (i.e., groundwater) associated with the WBGCR, evaluation of potential human health risks associated with groundwater exposures are beyond the scope of this study.

3.2.2 Exposure Pathways and Receptors

Receptors identified for the BHHRA are adult municipal workers or utility workers performing maintenance activities within the WBGCR and Roxana Marsh, adult and child residents who may use the WBGCR and Roxana Marsh for recreation, and active anglers from the surrounding area. Exposure pathways associated with maintenance activities include direct contact with sediments and surface water. Direct contact includes both incidental ingestion of sediment and surface water as well as dermal absorption of COPCs in these media. When working in Reaches 3, 4, and 5 during extended dry periods, exposure may also include inhalation of windborne entrained particulate-bound COPCs. Similarly, adult and child residents may also be exposed to sediment and surface water through direct contact with these media. Anglers may directly contact sediment and surface water, and would also ingest fish caught from the area. Although residents may also consume fish, the additional risk associated with fish ingestion will be calculated in the active angler scenario, and discussed as an additional component of the risk characterization. Anglers may also be residents, but the exposure factors for the active angler already incorporate exposure from wading in the WBGCR. The "resident" is intentionally assumed to be a non-anglers, so that risks associated with different uses of the WBGCR can be evaluated distinctly (i.e., recreational contact or "swimable" versus fishing and recreational contact or "fishable/swimable").

3.3 FATE AND TRANSPORT MODELS

The intermedia transfer of contaminants at the WBGCR was identified to include transfers from:

- resuspension from sediments to surface water;
- bioaccumulation from sediments and surface water to fish; and
- particulate transfers from sediment to ambient air.

Both surface water and fish have been characterized directly by sampling and analysis. Therefore, empirical data were used to estimate exposure point concentrations rather than fate and transport modeling. The approach used to estimate transfers from sediment to ambient air is summarized below.

Sediment particles may be released into the ambient air as the result of wind erosion and entrainment where they may be inhaled by a person. In order for wind erosion to occur, the sediments would need to become exposed for a sufficient length of time such that they would dry out. Wind erosion was modeled using the quantitative approach described in EPA's Supplemental Soil Screening Guidance (EPA 2002c). This approach uses a particulate emission factor (PEF) to define the relationship between the concentration of a chemical in exposed soil

and the concentration of wind-entrained dust particles in the air. The reciprocal of the PEF is coupled with the concentration of the contaminant in soil to estimate a resulting concentration in air. Consequently, lower PEFs are associated with higher air concentrations. The parameters used to calculate a site-specific PEF are presented in Table 4.4. The equation for the PEF is the following:

$$PEF = \frac{Q}{C} \cdot \frac{3{,}600\ sec/hr}{0.036 \cdot (1-V) \cdot \left(U_m / U_t \right)^3 \cdot F(x)}$$

where:

Q/C	=	Inverse of the Mean Concentration at Center of Square Source [g/m^2-sec per kilogram per cubic meter (kg/m^3)]
U_m	=	Mean Annual Wind Speed [m/s]
U_t	=	Equivalent Threshold Value of Wind Speed at 10 m [m/s]
V	=	Wind Speed in Mixing Zone [m/s]
F(x)	=	Function Dependent on U_m/U_t [unitless]

The wind erosion intermedia transfer applies to the potential exposures to the Resident and Maintenance/Utility Worker in Reaches 3, 4, and 5. Fishing may occur in these reaches but as no data are available, an EPC could not be calculated and therefore the active angler scenario is not evaluated for these reaches. Values for V, Um, Ut, and F(x) used to calculate Q/C were based on climate data for Chicago, Illinois. The calculated PEF was 1.78E9 m^3/kg for Reaches 3, 4, and 5. PEF calculations can be found in Table 4.4.

3.4 EXPOSURE PARAMETERS

The estimation of chemical intakes for each of the routes of exposure identified in the CSM requires the specification of parameters that define the scenarios of potential current or future exposure for each of the identified receptors. As described in the Remedial Action Objectives (RAO) document (TtEC 2005), reasonable maximum exposure (RME) assumptions were specified for the BHHRA. The RME assessment parameter values were selected so that risk estimates are likely to result in an overestimate of risk so that a conservative approach would be taken. These parameter assumptions are summarized in the sections that follow.

3.4.1 Active Angler

Fish consumption rates for the angler populations evaluated in this BHHRA were based on the assumption that the population of interest comprises active anglers. Because site-specific information on fish consumption rates have not been collected as part of this project, data from other studies throughout the Great Lakes region were evaluated. Several locations within the

Gary area, including the Hammond Marina, were included in a study funded by IDEM (Williams et al. 2000).

Although this study did not explicitly distinguish between recreational and subsistence anglers, the study design was such that more active anglers were more likely to be included in the survey. The study was intended to investigate the consumption patterns of minority and low-income anglers. "Minority active consuming-anglers" had a mean gram per day (gpd) consumption of 27.2 grams, which is significantly higher than the "white active-consuming-anglers" who averaged 20.0 gpd. Although there was a significant difference in consumption rates based on income, the highest income groups reported the highest consumption rates (more than twice the rates of the lowest income groups). Included in the results were percentile estimates for fish consumption rates for "active consumers" and "potential and active consumers" for various breakdowns including: three different regions of Indiana (north, central, and south), and awareness of fish consumption advisories (not aware, generally aware, and very aware). Based on the data presented, a fish consumption rate of 37.8 gpd was selected as the adult RME consumption rate. The level corresponds to the 95th percentile for active consumers in northern Indiana. It also corresponds to the 80th percentile of active consumers very aware of consumption advisories. The same survey was used to establish an estimate of fishing frequency. The 93rd percentile of fishing frequency was 2 to 4 days per week and the 100th percentile was 5 to 7 days per week. Therefore a fishing frequency of 4 days per week (or 208 days per year) was selected for the RME case.

These estimates (37.8 gpd and 4 days per week) are consistent with other estimates of fish consumption rates. EPA-RAGS-A includes an estimate of 38 gpd as the 50th percentile for fish consumption (EPA 1991). EPA currently recommends a default fish consumption rate of 17.5 gpd for general populations and recreational fishers, which is the 90th percentile of recreational or sport fishers (USDA/ARS, 1998) and of the average consumption of uncooked fish and shellfish from estuarine and fresh waters by recreational fishers (EPA 2000). A survey of Michigan anglers (West et al. 1993) estimated a mean sport fish consumption rate of 43.1 gpd for low-income minority anglers.

Due to the proximity of the WBGCR to Indiana Harbor, it is assumed that fishermen spend half of their time fishing in the WBGCR and consequently only half of their annual consumption of self-caught fish comes from the WBGCR. This assumption is reflected in the use of fractional adjustment in the estimates of CDI. For ingestion exposures including incidental ingestion of sediment and surface water, as well as fish, the fractional adjustment takes the form of "Fraction Ingested" (FI). For dermal contact exposures it takes the form of "Event Frequency" (EF).

3.4.1.1 Adult Active Angler

For the purposes of this risk assessment, it was assumed that the adult active angler may be exposed to sediment and surface water and fish in Reaches 1, 2, 6, and 7. See Tables 4.1, 4.2, and 4.3 for a summary of the exposure factors discussed below.

A total frequency of exposure to sediment and surface water was conservatively assumed to be 208 days/year. This value corresponds to a fishing frequency of 4 days per week.

The exposure duration for the anglers was assumed to be 30 years for RME, the default value for residents (EPA 2002c). The adult angler's body weight was assumed to be 70 kilogram (kg), the default value for residents (EPA 2002c). The averaging time for non-carcinogenic effects was set equal to the exposure duration by definition (EPA 1989). The averaging time for carcinogenic effects was assigned a lifetime value of 70 years (EPA 1989).

The incidental ingestion rate of sediment by the adult anglers was assumed to be 100 milligrams per day (mg/day). The 100 mg/day value represents EPA's recommended soil ingestion rate for residents (EPA 2002b). The fraction of contaminated soil or sediment ingested was conservatively assumed to be 0.5, based on the assumption that the active angler would divide his time between the WBGCR and Indiana Harbor or other fishing areas.

The fishermen were assumed to typically wear a short-sleeved shirt, shorts, and shoes. Thus, the exposed skin surface area (5,700 square centimeters [cm^2]) was the sum of the average of the 50th percentile surface area for adult males and females for the head, hands, and forearms and legs. This value is the recommended exposed surface area for RME for residents (EPA 2002b). The soil-to-skin adherence factor was assumed to be 0.07 milligrams per square meter (mg/cm^2)-event (EPA 2004a, 2002b). These values correspond to the recommended soil adherence factors for an adult resident. Dermal exposures to sediments will differ from exposure to soil due to differences in their physical properties and differences in the conditions under which these types of exposures occur. Studies of dermal exposures to sediments are quite limited, and therefore EPA recommends the same risk assessment approach for sediments as for soils (EPA 2001a). Specific uncertainties associated with dermal exposure to sediments are discussed in Section 6.

Sediments in Reaches 1, 2, 6 and 7 are assumed to be sufficiently wet, so as not to emit particulates into the ambient air as a result of wind erosion. Therefore, inhalation exposures to wind-borne particulates were not quantified for the active angler.

When working in areas in the WBGCR, it was assumed that the angler's forearms, hands, feet, and lower legs may be frequently submerged, so a total exposed skin surface area of 5,700 cm^2 was assumed to have prolonged contact with surface water (EPA 2004a).

The incidental ingestion rate of surface water was conservatively assumed to be 0.05 L/hour, the default value for swimming (EPA 1989). Any contact by this potential receptor with the surface water would be incidental because the anglers cannot actually swim in the WBGCR. In fact, surface water in the WBGCR is very shallow and it is quite unlikely that any ingestion would occur. The total event duration and exposure time was assumed to be 2 hours, based on professional judgment.

As discussed previously, the fish consumption rate was assumed to be an annual average of 37.8 grams per day, with a fractional adjustment of 0.5 to account for fishing at other locales. The exposure frequency is assumed to be 365 days per year to correspond to the use of an annual average consumption rate.

3.4.1.2 Child Anglers

The child active anglers are assumed to be children aged 6 to 10. Younger children are unlikely to fish with such frequency, and exposures to older children (e.g., ages 11 to 15 and 16 to 17) are comparable to those for adult active anglers. The child active angler may be exposed to sediment and surface water and fish in Reaches 1, 2, 6, and 7. See Tables 4.1, 4.2, and 4.3 for a summary of the exposure factors discussed below.

A total frequency of exposure to sediment and surface water, was conservatively assumed to be 208 days/year. This value corresponds to a fishing frequency of 4 days per week.

The exposure duration for the child active angler was assumed to be 5 years, consistent with the assumed age range. The child angler's body weight was assumed to be 25.9 kg, the suggested value for this age group (EPA 2001d). The averaging time for non-carcinogenic effects was set equal to the exposure duration by definition (EPA 1989). The averaging time for carcinogenic effects was assigned a lifetime value of 70 years (EPA 1989).

The incidental ingestion rate of sediment by the child angler was assumed to be 187 mg/day. The 187 mg/day value represents EPA's recommended 90th percentile soil ingestion rate for children aged 6 to 10 (EPA 2001d). The fraction of contaminated soil or sediment ingested was conservatively assumed to be 0.5, based on the assumption that the child fishermen would divide his time between the WBGCR and Indiana Harbor or other fishing areas.

The child anglers were assumed to typically wear short-sleeved shirts, shorts, and shoes. Thus, the exposed skin surface area (3,000 cm^2) was the sum of the average of the 50th percentile surface area for children aged 6 to 10, for the hands, forearms, lower legs and feet. The soil-to-skin adherence factor was assumed to be 0.07 mg/cm^2-event (EPA 2004a, 2002b). These values correspond to the recommended soil adherence factors for children age 7 and up.

Sediments in Reaches 1, 2, 6, and 7 are assumed to be sufficiently wet, so as not to emit particulates into the ambient air as a result of wind erosion. Therefore, inhalation exposures to wind-borne particulates were not quantified for the child active angler.

When fishing in the WBGCR, it was assumed that the child angler's forearms, hands, lower legs, and feet may be frequently submerged, so a total exposed skin surface area of 3,000 cm^2 was assumed to have prolonged contact with surface water (EPA 2004a).

The incidental ingestion rate of surface water was conservatively assumed to be 0.05 L/hour, the default value for swimming (EPA 1989). Any contact by this potential receptor with the surface water would be incidental because the child will not actually be swimming in the surface water bodies. In fact, surface water in the WBGCR is very shallow and it is quite unlikely that any ingestion would occur. The total event duration and exposure time was assumed to be 2 hours, based on professional judgment.

As discussed previously, the fish consumption rate was assumed to be proportional by body weight to that of the adult active angler, resulting in an intake rate of 14 grams per day, with a fractional adjustment of 0.5 to account for fishing at other locales. The exposure frequency is assumed to be 365 days per year to correspond to the use of an annual average consumption rate.

3.4.2 Residents

There are residential areas on the south side of Reaches 2, 3, 4, and 5. There are also residential areas within approximately one-quarter mile of Reaches 1, 6, and 7. The following sections discuss specific exposure factors used to quantify exposures associated with wading in the WBGCR.

3.4.2.1 Adult Residents

The adult resident was assumed to be a current or potential future receptor who lives in the housing near the WBGCR. For the purposes of this risk assessment, it was assumed that the adult resident may be exposed to sediment and surface water while wading in the Grand Calumet River. See Tables 4.1 and 4.2 for a summary of the exposure factors discussed below.

The frequency and duration of exposure to surface water and sediment was assumed to be 12 days/year and 1 hour per event consistent with EPA's default exposure factors for swimming (EPA 1997a).

The exposure duration for the adult resident was assumed to be 30 years, the default values for an adult resident (EPA 2002b). Body weight was assumed to be 70 kg, the default value for an adult resident (EPA 2002b). The averaging time for non-carcinogenic effects was set equal to

the exposure duration by definition (EPA 1989). The averaging time for carcinogenic effects was assigned a lifetime value of 70 years (EPA 2002b).

The incidental ingestion rate for sediment by the adult resident was assumed to be 100 mg/day for RME, the default value for soil ingestion (EPA 2002b). The fraction of the daily intake from the contaminated source was assumed to be 1, or 100 percent.

The adult resident was assumed to typically wear a short-sleeved shirt, shorts, and shoes. Thus, the exposed skin surface area (5,700 cm^2) was the sum of the average of the 50th percentile surface area for adult males and females for the forearms, hands, lower legs, and feet (EPA 2004a). This value is the recommended exposed surface area for RME (EPA 2002b). The soil-to-skin adherence factor was assumed to be 0.07 mg/cm^2-event. This value corresponds to the recommended adherence factors for a resident. As discussed in Section 3.4.1.1, there are specific uncertainties associated with dermal absorption from sediments; these uncertainties are discussed in Section 6.0.

Inhalation exposures of particulates emitted from exposed sediments in Reaches 3, 4, and 5 are calculated using a particulate emission factor to estimate the resulting air concentration. As discussed in Section 3.3, the PEF for the resident was 1.78E9 kg/m^3. An inhalation rate of 20 m^3/day (0.83 cubic meter per hour [m^3/hour] for 24 hours) was assumed. This value is EPA's recommended residential inhalation rate (EPA 2002b). Sediments in Reaches 1, 2, 6, and 7 are assumed to be sufficiently wet, so as not to emit particulates into the ambient air as a result of wind erosion. Sediments in Roxana Marsh are covered with a thick layer of vegetation that also minimizes or prevents wind erosion.

When wading in the WBGCR, it was assumed that the adult resident's forearms, hands, lower legs, and feet may contact the surface water, so a total exposed skin surface area of 5,700 cm^2 was assumed for contact with surface water. The WBGCR is very shallow, typically l to 2 feet deep.

The incidental ingestion rate of surface water was conservatively assumed to be 0.05 L/hour, the default value for swimming (EPA 1989). Any contact with the surface water would be incidental because the adult resident will not actually be swimming in the WBGCR. The total event duration and exposure time to surface water was assumed to be 1 hour, 12 times a year. These values correspond to EPA's recommended frequency and duration for swimming (EPA 1997a).

3.4.2.2 Child Resident

The child resident was assumed to be a current or potential future receptor who lives in the housing near the WBGCR. For the purposes of this risk assessment, it was assumed that the

child resident may be exposed to surface water and sediments while wading in the Grand Calumet River. A child is defined as an individual between 3 and 5 years of age. This age group was selected for quantification because this group spends a larger amount of time outdoors than either younger or older children (EPA 2001d). See Tables 4.1 and 4.2 for a summary of the exposure factors discussed below.

The RME frequency of exposure to surface water and sediment was assumed to be 12 days/year consistent with EPA's default exposure frequency for swimming (EPA 1997a). The exposure time was assumed to be 1 hour per event.

The exposure duration for the child resident was assumed to be 3 years to correspond with the assumed age range of 3 to 5 years old. Body weight was assumed to be 16.05 kg, the default value for this age group resident (EPA 2001d). The averaging time for non-carcinogenic effects was set equal to the exposure duration by definition (EPA 1989). The averaging time for carcinogenic effects was assigned a lifetime value of 70 years (EPA 1989).

The incidental ingestion rate for sediment by the child resident was assumed to be 150 mg/day, the 90th percentile recommended value for this age group (EPA 2001d). One hundred percent of the daily intake was assumed to come from the contaminated source.

The child resident was assumed to typically wear a short-sleeved shirt, shorts, and no shoes. Thus, the exposed skin surface area (3,300 cm^2) was the average of the 50th percentile surface area for the forearms, hands, legs, and feet for males and females (EPA 2004a, 2001d). The soil-to-skin adherence factor was assumed to be 0.2 mg/cm^2-event (EPA 2004a, 2002b). These values correspond to the recommended adherence factors for a resident child ages 1 to 6.

Inhalation exposures of particulates emitted from exposed sediments in Reaches 3, 4, and 5 are calculated using a particulate emission factor to calculate the resulting air concentration. As discussed in Section 3.3.3, the PEF for the resident is 1.78E9 kg/m^3. An inhalation rate of 14 m^3/day (0.58 m^3/hour for 24 hours) was assumed. This value is EPA's recommended inhalation rate for children ages 3 to 5 (EPA 2001d). Sediments in Reaches 1, 2, 6, and 7 are assumed to be sufficiently wet, so as not to emit particulates into the ambient air as a result of wind erosion. Sediments in Roxana Marsh are covered with a thick layer of vegetation that also minimizes or prevents wind erosion.

When wading in the WBGCR, it was assumed that a child's face, forearms, hands, legs, and feet may contact the surface water, so a total exposed skin surface area of 3,300 cm^2 was assumed for contact with surface water (EPA 2004a, 2001d).

The incidental ingestion rate of surface water was conservatively assumed to be 0.05 L/hour, the default value for swimming (EPA 1989). Any contact with the surface water would be

incidental because the child resident will not actually be swimming in the WBGCR. The total event duration and exposure time to surface water was assumed to be 1 hour, 12 times a year. These values correspond to EPA's recommended frequency and duration for swimming (EPA 1997a).

3.4.3 Maintenance/Utility Worker

For the purposes of this risk assessment, it was assumed that the worker may be exposed to sediment and surface water and ambient air as the result of general maintenance activities within all seven reaches and Roxana Marsh. See Tables 4.1 and 4.2 for a summary of the exposure factors discussed below.

A total frequency of exposure to sediment and particulates entrained in ambient air and surface water, was conservatively assumed to be 8 days/year for RME exposures. This value is a site-specific assumption that culvert maintenance or similar activity is required for 2 days each quarter. Each workday was assumed to last for 8 hours.

The exposure duration for the worker was assumed to be 25 years for RME, the default value for commercial/industrial workers (EPA 2004a). The worker's body weight was assumed to be 70 kg, the default value for commercial/industrial workers (EPA 1991). The averaging time for non-carcinogenic effects was set equal to the exposure duration by definition (EPA 1989). The averaging time for carcinogenic effects was assigned a lifetime value of 70 years (EPA 1989).

The incidental ingestion rate of sediment by the worker was assumed to be 100 mg/day for RME. The 100 mg/day value represents EPA's recommended soil ingestion rate for outdoor workers (EPA 2002b). The fraction of contaminated sediment ingested was conservatively assumed to be 1, implying that all soil, sediment, or dust contacted and incidentally ingested would be from the contaminated area.

The on-site worker was assumed to typically wear a short-sleeved shirt, long pants, and shoes. Thus, the exposed skin surface area (3,300 cm^2) was the sum of the average of the 50th percentile surface area for adult males and females for the face, forearms, and hands (EPA 2002b). The soil-to-skin adherence factor was assumed to be 0.2 mg/cm^2-event (EPA 2004a, 2002b). These values correspond to the recommended adherence factors for an adult commercial/industrial worker.

Inhalation exposures of particulates emitted from sediments in Reaches 3, 4, and 5 are calculated using a particulate emission factor to calculate the resulting air concentration. As described in Section 3.3.1, a PEF of 1.78E9 kg/m^3 for particulate emissions associated with wind erosion from exposed surface sediments was calculated. An inhalation rate of 20 m^3/workday or 2.5 m^3/hour for an 8-hour workday was assumed for RME exposures. This value is EPA's

recommended outdoor worker inhalation rate (EPA 2002b). Sediments in Reaches 1, 2, 6, and 7 are assumed to be sufficiently wet, so as not to emit particulates into the ambient air as a result of wind erosion. Sediments in Roxana Marsh are covered with a thick layer of vegetation that minimizes or prevents wind erosion.

When working in areas in the WBGCR, it was assumed that the worker's hands, feet, and lower legs may be frequently submerged, so a total exposed skin surface area of 4,499 cm^2 was assumed to have prolonged contact with surface water.

The incidental ingestion rate of surface water was conservatively assumed to be 0.05 L/hour, the default value for swimming (EPA 1989). Any contact by this potential receptor with the surface water would be incidental because the maintenance/utility worker will not actually be swimming in the surface water bodies. In fact, surface water in the WBGCR is very shallow (typically 1 to 2 feet deep) and it is quite unlikely that any ingestion would occur. The total event duration and exposure time was assumed to be 8 hours, based the on site-specific assumptions that contact is a full workday.

4. TOXICITY ASSESSMENT

The toxicological information used for this site is based on non-carcinogenic (threshold) and carcinogenic (non-threshold) effects caused by exposure to chemicals that have been observed in humans and/or laboratory animals associated with a particular dose of that compound. The toxicological information is used in conjunction with the exposure assessment to characterize risk associated with each COPC via the identified exposure pathways. Toxicity profiles for COPCs can be found in Appendix A. Chemical-specific toxicological parameters (i.e., non-carcinogenic reference doses [RfDs] and reference concentrations [RfCs] and cancer slope factors [SFs] and unit risks [URs]) were obtained from established EPA sources with the following priority (EPA 2003a):

- Tier 1: Integrated Risk Information System (IRIS) (EPA 2004b);
- Tier 2: Provisional Peer Reviewed Toxicity Values (PPRTVs) from EPA's Superfund Technical Support Center at the National Center for Environmental Assessment;
- Tier 3: Other Toxicity Values, such as Health Effects Assessment Summary Tables (HEAST) (EPA 1997b), ATSDR Minimal Risk Levels (MRLs), and California Environmental Protection (Cal EPA) toxicity values.

4.1 NON-CARCINOGENIC EFFECTS

The non-carcinogenic toxicological factors are based on the assumption that there is a level of chemical dose or intake below which no adverse health effects would be expected. RfDs and RfCs that are associated with threshold effects provide the estimate of the daily dose of the chemical to which an individual may be exposed without an appreciable risk of adverse health effects, including organ damage or reproductive effects. The chronic RfD and RfC are derived from either an available No Observable Adverse Effects Level (NOAEL) or the Lowest Observable Adverse Effects Level (LOAEL). Uncertainty and modifying factors are applied to the NOAEL and LOAEL to account for interspecies differences, the duration of the critical study, protection of sensitive subpopulations, and any additional uncertainties associated with the principal study on which the toxicological factor was based.

4.1.1 Oral/Dermal Non-Carcinogenic Effects

The chronic oral RfD values used in the risk assessment are listed on Table 5.1. These values were compiled from the hierarchy of sources listed in Section 4.0. Some chemicals did not have published oral RfD values. The following surrogate values were deemed to be appropriate to use

for the following chemicals relative to the oral RfD because the COPC is either a specific isomer of the surrogate chemical or the surrogate chemical is a particular mixture or form of the COPC.

COPC	Surrogate
Chlordane – Alpha	Chlordane
Chlordane – Gamma	Chlordane
Nondioxin-like PCBs	Aroclor 1254
Mercury	Mercuric sulfide

The chronic dermal RfD values are also listed on Table 5.1. These values were calculated from the oral RfD value using an oral-to-dermal adjustment factor. The oral-to-dermal adjustment factor is based on the gastrointestinal absorption efficiencies listed in EPA RAGS Part E, Exhibit 4.1 (EPA 2004a). The methodologies developed for evaluating dermal absorption are based on an estimation of absorbed dose. The IRIS-verified RfDs are typically based on an administered dose. Therefore, an adjustment of the oral toxicological factor to represent an absorbed, rather than an administered, dose is necessary. The adjustment accounts for the absorption efficiency in the critical clinical or epidemiological study forming the basis of the published toxicity factor. The magnitude of the toxicity factor adjustment is inversely proportional to the absorption fraction in the critical study. As the absorption efficiency decreases, the difference between the absorbed dose and administered dose increases. Consistent with RAGS Part E (EPA 2004a), an adjustment was made when the following conditions were met:

- The toxicity value derived from the critical study is based on an administered dose (e.g., delivery in diet or by gavage) in its study design; and
- A scientifically defensible database demonstrates that the gastrointestinal (GI) absorption of the chemical in question from a media (e.g., water, feed) similar to the one employed in the critical study is significantly less than 100 percent (i.e., <50 percent).

If these conditions were not met, complete (i.e., 100 percent) absorption was assumed and no adjustment of the oral toxicity value was made to obtain a toxicity value to be used for the dermal absorption route.

4.1.2 Inhalation Non-Carcinogenic Effects

The chronic inhalation RfC and RfD values used in the HHRA are listed on Table 5.2. The RfCs were compiled from the hierarchy of sources listed in Section 4.0. The inhalation RfD values were calculated from the RfCs using the standard inhalation rate of 20 m^3/day and a body weight of 70 kg. This relationship is shown below:

$$RfD_I\left[\frac{mg}{kg-day}\right] = RfC\left[\frac{\mu g}{m^3}\right]\cdot\frac{20\left[\frac{m^3}{day}\right]}{70[kg]}\cdot 0.001\left[\frac{mg}{\mu g}\right]$$

Some chemicals do not have published inhalation RfD or RfC values. The following surrogate values were deemed to be appropriate to use for the following chemicals relative to the inhalation RfC as the COPC is a specific isomer of the surrogate chemical:

COPC	Surrogate
Chlordane – alpha	Chlordane
Chlordane – gamma	Chlordane

4.2 CARCINOGENIC EFFECTS

EPA uses a system for classifying chemicals according to their likelihood as a human carcinogen. This system is based on five categories that make up the "weight-of-evidence" system of carcinogenicity that are used to classify each compound. The weight-of-evidence classification system is summarized below.

Group	Classification
A	This category indicates there is sufficient evidence from epidemiological studies to support a causal association between an agent and human cancer.
B1	This category generally indicates there is at least limited evidence from epidemiologic studies of carcinogenicity to humans.
B2	This category generally indicates, in the absence of data on humans, there is sufficient evidence of carcinogenicity in animals.
C	This category indicates that there is limited evidence of carcinogenicity in animals in the absence of data on humans.
D	This category indicates that the evidence for carcinogenicity in animals is inadequate, or no data are available.
E	This category indicates that there is evidence of noncarcinogenicity in at least two adequate animal tests in different species or in both epidemiologic and animal studies.

The toxicity values used to evaluate carcinogenicity are SFs and URs. These values reflect the relative probability that the incidence of cancer is increased in target populations exposed to that chemical. Only COPCs with an EPA weight-of-evidence classification of A, B1, or B2 were evaluated as carcinogens in this risk assessment.

4.2.1 Oral/Dermal Carcinogenic Effects

The oral SF values used in this risk assessment are listed in Table 6.1. These values were compiled from the hierarchy of sources listed in Section 4.0. Some chemicals did not have published oral SF values. The following surrogate values were deemed to be appropriate to use

for the following chemicals relative to the oral SF, because the COPC is a specific isomer of the surrogate chemical:

COPC	Surrogate
Chlordane – alpha	Chlordane
Chlordane – gamma	Chlordane
o,p'-DDD	p,p'-DDD

The toxicities of the various carcinogenic PAHs were evaluated using toxicity equivalency factors (TEFs). The most common PAHs are a set of 13 compounds, 7 of which are known or suspected of being human carcinogens. Benzo(a)pyrene is considered to be one of the most potent PAH carcinogens. As such, the toxicity of the other carcinogenic PAHs is typically expressed relative to the toxicity of benzo(a)pyrene through the use of a TEF. The TEF is the ratio of the toxicity of the carcinogenic PAH to the toxicity of benzo(a)pyrene. The TEFs for the carcinogenic PAHs are shown in the table below (EPA 1993).

PAH	Surrogate Chemical	Toxicological Factor	Toxicity Equivalency Factor
Benzo(a)pyrene	Benzo(a)pyrene	Oral SF	1.0
Benzo(a)anthracene	Benzo(a)pyrene	Oral SF	0.1
Benzo(b)fluoranthene	Benzo(a)pyrene	Oral SF	0.1
Benzo(k)fluoranthene	Benzo(a)pyrene	Oral SF	0.01
Chrysene	Benzo(a)pyrene	Oral SF	0.001
Dibenz(a,h)anthracene	Benzo(a)pyrene	Oral SF	1.0
Indeno(1,2,3-cd)pyrene	Benzo(a)pyrene	Oral SF	0.1

The SF used in the risk calculations for each carcinogenic PAH was the current slope factor for benzo(a)pyrene multiplied by the TEF for that PAH. These calculated PAH-specific SFs are shown on Table 6.1.

The dermal SF values also are listed on Table 6.1. These values were calculated from the oral SF value using an oral-to-dermal adjustment factor. This adjustment for the oral SFs was performed using the same general process applied for the oral RfDs, as described in Section 4.1.1. It is noted, however, that adjustment of the RfD required its multiplication with the oral-to-dermal adjustment factor, while adjustment of the SF requires its division by the oral-to-dermal adjustment factor.

4.2.2 Inhalation Carcinogenic Effects

The inhalation SF and UR values used in the HHRA are listed on Table 6.2. The URs were compiled from the hierarchy of sources listed in Section 4.0. The inhalation SF values were

calculated from the URs using an inhalation rate of 20 m^3/day and a body weight of 70 kg. This relationship is shown below:

$$SF_I\left[\left(\frac{mg}{kg-day}\right)^{-1}\right] = UR\left[\left(\frac{\mu g}{m^3}\right)^{-1}\right]\cdot\frac{70[kg]}{20\left[\frac{m^3}{day}\right]}\cdot 1{,}000\left[\frac{\mu g}{mg}\right]$$

Some chemicals did not have published inhalation SF and UR values. The following surrogate values were deemed to be appropriate to use for the following chemicals relative to the inhalation UR, because the COPC is an isomer of the surrogate chemical:

COPC	Surrogate
Chlordane- alpha	Chlordane
Chlordane – gamma	Chlordane
o,p'-DDD	p,p'-DDD

4.3 SPECIAL CASES

The potential risks associated with lead, PCBs, dioxins, and furans are not assessed in the same manner as the rest of the COPCs. The assessment approach applied at the WBGCR is summarized below.

4.3.1 Evaluation of Lead

Lead is typically not evaluated using standard IRIS-like toxicological parameters. The Integrated Exposure Uptake Biokinetic (IEUBK) Model for lead in children and the Adult Lead Model (ALM) (for assessing risks associated with exposures to soil) have been developed to project the behavior of lead once taken into the body of a child or adult, respectively. The IEUBK model is designed to predict the probable blood lead level for children between 6 months and 7 years of age who have been exposed to lead through environmental media (air, water, soil, dust, and diet). The highest detected concentration of lead in sediments (5,200 milligrams per kilogram [mg/kg]) was found in Reach 3. The receptor populations with the greatest potential exposure to Reach 3 sediments are adult and child residents. For the active angler, the highest EPC for lead is 4,195 mg/kg in Reach 1. The parameters used in the IEUBK model for the resident child wader are shown on Table 4.7. The IEUBK model is designed for children ages 6 months to 7 years, so it could only be used for the child active angler on a qualified basis. The parameters used in the IEUBK model for the child active angler are shown in Table 4.8. Outputs from the IEUBK model can be found in Appendix C. The ALM focuses on the estimation of the blood lead concentrations in fetuses carried by women exposed to lead-contaminated soils/sediments. Unlike the IEUPK model, the ALM does not consider contributions from other environmental media but it does account for a non-zero baseline blood-lead level. The default baseline blood lead levels were assumed. The parameters used in the ALM are shown on Table

4.9 for adult active angler. The ALM is not applicable to exposures of less than 90 days per year and therefore blood lead level modeling could not be performed for the adult resident.

4.3.2 Evaluation of Polychlorinated Biphenyls (PCBs)

The current methodology for the evaluation of PCBs is described in *PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures* (EPA 1996a). The primary approach recommended in this guidance is to evaluate PCBs in terms of the amount of individual Aroclors present in each medium. The guidance also encourages the use of congener analysis, particularly where the environmental processes such as weathering or bioaccumulation may have altered the proportion of highly chlorinated PCBs. Where congener analysis is available the risk may be evaluated separately for "dioxin-like" PCB congeners. Dioxin-like congeners are listed in Section 2.1. Dioxin-like PCBs are evaluated using TEFs to calculate dioxin toxic equivalents (TEQs). The resulting dioxin TEQ fraction is evaluated using cancer slope factors for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). The remaining "nondioxin-like" congeners are evaluated using the appropriate PCB cancer slope factor. PCB congeners were not used in calculations for sediment and surface water (Tables 3.1 – 3.9), as very limited congener specific data for sediments (8 samples) as compared to a relative large number of Aroclor results for PCBs (58 samples). PCB congener data were available for fish tissue, and the EPC for dioxin TEQ and nondioxin-like PCBs was calculated.

The selection of the appropriate slope factor to be used in risk assessment is described in the guidance and EPA's IRIS as depending on the nature of the potential PCB exposure pathway, and considering which Aroclors have been detected at the site relative to the Aroclors on which the toxicological parameters presented in the guidance were based.

The high risk and persistence, upper-bound slope factor of 2.0 $(mg/kg\text{-}day)^{-1}$ was selected for exposures to PCB-contaminated soil and sediments. The upper-bound slope factor was chosen from the range as a conservative measure. The central estimate slope factor is 1.0 $(mg/kg\text{-}day)^{-1}$. Central estimates describe a typical individual's risk, while upper bounds provide assurance that this risk is not likely to be underestimated if the underlying model used to develop the slope factor is correct (EPA 2004b). The applicable scenarios for which this high risk and persistence value is recommended in the PCB guidance (EPA 1996a) and IRIS, are:

- Sediment or soil ingestion;
- Dust or aerosol inhalation;
- Dermal exposure, if an absorption factor has been applied to reduce the external dose;
- Presence of dioxin-like congeners; and
- Early-life exposure (all pathways and mixtures).

The upper-bound slope factor was chosen from the range as a conservative measure. There are also upper-bound and central-estimate slope factors for "low risk and persistence" and "lowest risk and persistence." These values were not utilized because they are not applicable to the exposure scenarios identified for the WBGCR.

For the non-cancer assessment, Aroclor 1254 was the only PCB mixture with a published toxicological factor associated with non-carcinogenic health effects. The RfD for Aroclor 1254 is 2×10^{-5} (mg/kg-day).

4.3.3 Dioxins and Furans

EPA is currently performing a major reassessment of 2,3,7,8-TCDD and related polychlorinated dioxins and furans. The current slope factor for 2,3,7,8-TCDD is 150,000 $(\text{mg/kg-day})^{-1}$ (EPA 1997b).

5. HUMAN RISK CHARACTERIZATION

The final step in the risk assessment process is human health risk characterization. Risk characterization is performed by inputting site-specific data and assumptions into formulae developed by EPA for calculation of cancer risks and non-cancer hazards.

Potential health risks were calculated for baseline conditions and address exposures to contaminant levels at the site as they currently exist.

5.1 RISK CHARACTERIZATION METHODS

Quantitative evaluation of risks involves combining exposure point concentrations, exposure scenarios, chemical intake models, and toxicity values using methods defined by EPA to calculate potential carcinogenic and non-carcinogenic risks associated with present and future use RME scenarios.

Quantitative assessment of potential risks to human health associated with present and future use scenarios was performed by calculating CDIs for each ingestion, dermal absorption, and inhalation exposure pathway. Formulae for each exposure pathway are shown on Tables 4.1 through 4.3. CDIs are expressed as the amount of a chemical an individual would be exposed to per unit body weight per day (i.e., mg/kg-day). The CDIs are averaged over a lifetime (70 years) for carcinogens, and over the exposure duration for non-carcinogens (EPA 1989).

5.1.1 Calculation of Non-Cancer Health Effects

For non-carcinogens, exposure pathways were evaluated by comparing chemical-specific CDIs to their associated RfDs for the oral and dermal pathways and chemical-specific daily air concentrations (Cas) to RfCs for the inhalation pathways. Potential non-carcinogenic effects are evaluated as the ratio of the CDI to the RfD or the Ca to the RfC. The sum of all CDI/RfD and Ca/RfC ratios, which are referred to as Hazard Quotients (HQs), for the COPCs for each receptor in each medium is called the Hazard Index (HI) and is calculated as shown below:

$$HI = \sum_{i=1}^{n} \frac{CDI_i}{RfD_i} \qquad \text{(oral and dermal pathways)}$$

$$HI = \sum_{i=1}^{n} \frac{Ca_i}{RfC_i} \qquad \text{(inhalation pathways)}$$

where:

HI	=	Hazard Index [unitless]
CDI_i	=	Chronic daily intake for chemical i (mg/kg-day)

RfD_i	=	Reference dose for chemical i (mg/kg-day)
n	=	Number of COPCs in each medium [unitless]
Ca_i	=	Daily air concentration for chemical i (mg/m^3)
RfC_i	=	Reference concentration for chemical i (mg/m^3)

An HI less than 1.0 is unlikely to be associated with adverse health effects and is therefore less likely to be of concern than an HI greater than 1.0. However, a conclusion should not be categorically drawn that all HIs less than 1.0 are "acceptable." This is a consequence of uncertainties inherent in derivation of the RfD in the exposure assessment and uncertainties associated with adding individual terms in the HI calculation. In addition, for HIs greater than 1.0, the effect/target organ-specific HIs were evaluated (assuming that chemicals that produce adverse effects on the same target organ are dose additive). HIs cannot be summed across age groups. Tables 7.1 through 7.5 present the EPC, intake/air concentration, RfD/RfC and individual hazard quotients for each receptor, exposure medium, and pathway combination.

5.1.2 Calculation of Cancer Health Effects

The potential incremental lifetime cancer risk due to exposure to a specific carcinogenic compound is calculated by comparing chemical-specific CDIs to their associated SFs for the oral and dermal pathways and Cas to their associated URs for the inhalation pathways. Potential carcinogenic effects are evaluated as the product of the CDI and the SF or the product of the Ca and the UR. The sum of all CDI*SF products and Ca*UR products for the COPCs for each receptor in each medium is called the Excess Lifetime Cancer Risk (ELCR) and is calculated as shown below:

$$ELCR = \sum_{i=1}^{n} CDI_i \cdot SF_i \qquad \text{(oral and dermal pathways)}$$

$$ELCR = \sum_{i=1}^{n} Ca_i \cdot UR_i \qquad \text{(inhalation pathways)}$$

where:

ELCR	=	Excess lifetime cancer risk (unitless)
CDI_i	=	Chronic daily intake for chemical i (mg/kg-day)
SF_i	=	Slope factor for chemical i $(mg/kg\text{-}day)^{-1}$
n	=	Number of COPCs in each medium [unitless]
Ca_i	=	Daily air concentration for chemical i (mg/m^3)
UR_i	=	Unit risk for chemical i $(mg/m^3)^{-1}$

For the purposes of this assessment, cancer risks for exposure to multiple carcinogenic contaminants were assumed to be additive. EPA has determined that the acceptable risk range is

between $1x10^{-6}$ and $1x10^{-4}$. An ELCR below or within this range is unlikely to be associated with significant risk of cancer effects and is less likely to be of concern than an ELCR exceeding this range. Tables 7.1 through 7.5 present the EPC; intake or air concentration; SF or UR; and individual risks for each receptor, exposure medium, and pathway combination.

5.1.3 Weighting of Risk Estimates

In order to facilitate direct comparisons of risks associated with sediments between different reaches, risk estimates were computed first as if 100 percent of a receptor's exposure occurred within that specific reach. Reach-specific risk estimates are intended to facilitate the identification and selection of Restoration Action Objectives and associated PRGs for each reach. In order to compute overall risks to each receptor group, these reach-specific risk estimates were then weighted by the proportional surface area of that reach to the total area that the receptor group may be exposed to. Specifically, for adult and child residents and the maintenance/utility worker receptor groups, the total exposure area considers all seven reaches and Roxana Marsh. Therefore, the weights applied to risk estimates for each of these areas is directly proportional to the surface area of each reach or Roxana Marsh. Surface water was not evaluated on a reach-specific basis because of the limited amount of data available and the apparent lack of variation in surface water quality. Given that the HSD outfall is the principal source of surface water, it is perhaps not surprising that surface water quality does not appear to be directly related to sediment quality.

Proportional surface areas are shown in the left-most column of Tables 7.1, 7.2, and 7.5. Computations of these areas and weights can be found in Appendix B. The weights are applied to the risk estimates listed as "Weighted Sum of Risk Estimates." Unweighted risk estimates are listed by exposure route ("Exp. Route Total") and are summed across exposure routes (incidental ingestion, dermal absorption, and inhalation for Reaches 3, 4, and 5) associated with each exposure point ("Exposure Point Total"). Unweighted risk estimates are provided for each exposure medium ("Exposure Medium Total") and area ("Area Total") because area totals represent the sum or the exposure medium estimates for all media within the reach. Unweighted risk estimates for each area can be compared between reaches to identify those reaches containing impacted sediments presenting a higher or lower risk. Unweighted risk estimates also permit the evaluation of risks as if 100 percent of the receptors exposure occurred within a specific reach, and facilitate the evaluation of reach specific Restoration Action Objectives and PRGs. Because surface water could not be evaluated on a reach-specific basis, the exposure medium totals and area totals are the same. Cumulative risk estimates based on proportionate exposure to sediments in each reach appear under the heading "Weighted Sum of Risk Estimates." These risk estimates represent the total carcinogenic and non-carcinogenic risks associated with exposure to sediments and surface water in the WBGCR.

For child and adult active angler, repeated exposure is likely to occur only in Reaches 1, 2, 6, and 7 because there are no fish present in the other areas due to the shallowness of the water. Therefore risk estimates for the anglers were weighted by the size of each area relative to the total surface area of these four reaches. These weights are shown in the left-most column of Tables 7.3 and 7.4. Unweighted risk estimates for fish ingestion were developed for each species sampled ("Exp. Route Total" and "Exposure Point Total" as listed under each reach by species). These species-specific risk estimates are not weighted; that is, they represent the risks associated with exclusive ingestion of that species. Weighted risk estimates were also developed for each reach based on an equal weighting of the species sampled (e.g., if four species were sampled in a particular reach, each species was assumed to comprise 25 percent of the fish caught from that reach). These risk estimates appear under the heading "Exposure Medium Total – Weighted Sum of Risk Estimates" but are not weighted by the size of reach, only by the number or species present in that reach. The risk estimates listed under "Area Total" include risks associated with incidental ingestion and dermal contact with impacted sediments and ingestion of all species of fish found within that reach. "Area Total" risks may be compared for the various reaches to identify those reaches presenting higher or lower risks. Cumulative risk estimates based on proportionate exposure to sediments and fish appear under the heading "Weighted Sum of Risk Estimates." These risk estimates represent the total carcinogenic and non-carcinogenic risks associated with exposure to sediments, surface water, and fish within Reaches 1, 2, 6, and 7 of the WBGCR.

5.2 RESULTS OF RISK CALCULATIONS

The following paragraphs contain discussions of the results of calculations of exposure to contaminated environmental media by site receptors and identification of COCs, which are COPCs that were found to contribute significantly to site risks. The following table presents the receptor-specific summary of results of calculations of potential carcinogenic and non-carcinogenic weighted risks associated with RME exposures to COPCs for each receptor group.

Receptor Group	Cancer Risk	Hazard Index
Adult Resident	4.7×10^{-5}	0.06
Child Resident	3.2×10^{-5}	0.38
Adult Active Angler	1.7×10^{-3}	18[1/]
Child Active Angler	4.9×10^{-4}	20[2/]
Maintenance/Utility Worker	3.6×10^{-5}	0.05

[1/] When segregated by target organ, the HI for skin is 16 (see Table 9.3).
[2/] When segregated by target organ, the HI for skin 15 (see Table 9.4).

Risk estimates are typically compared with EPA's acceptable risk range of between 1×10^{-6} and 1×10^{-4}. Hazard indices are generally compared to a benchmark of 1. As shown above, both cancer risk and hazard index estimates for adult and child active angler exceed these thresholds.

Cancer risk estimates for the adult and child residents and the maintenance/utility worker receptor groups are toward the higher end of the acceptable risk range.

Specific risk estimates for each receptor group by media are discussed further in subsequent sections. Results of carcinogenic risk and HI calculations are summarized in Tables 7.1 through 7.5. The risk estimates in these tables are shown as if all of the exposure occurred within the area except for the estimates labeled "Exposure Medium Total – Weighted Sum of Risk Estimates," "Area Total," and "Weighted Sums of Risk Estimates." Surface water risks are shown separately from each reach as there was insufficient data to estimate reach-specific exposure point concentrations. Risk estimates for various species of fish are shown in Tables 7.3 and 7.4 as if that species from that reach comprised the full intake from the WBGCR. The risk estimates are proportionately weighted by the number of species observed within a reach for the computations shown as "Exposure Medium Total – Weighted Sum of Risk Estimates." The weights associated with the proportional area of the reach are applied to the risk estimates listed under "Weighted Sums of Risk Estimates." As discussed previously, application of this weighting scheme to summary risk estimates is intended to facilitate comparisons between different species and different reaches.

Chemicals that were found to individually contribute a carcinogenic risk greater than $1x10^{-6}$ or an HI greater than 1 to a particular receptor were judged to "contribute significantly" to site risks and are summarized in Tables 9.1 through 9.5 for each receptor. The risk estimates shown within these tables reflect the weighting scheme described above, and therefore represent the risk associated with each COC when the relative size of each area is considered. In addition, for the active angler, these weighted risk estimates reflect the variety of species of fish. Consequently, risk estimates shown for a COPC presented in Tables 7.1 to 7.5 may exceed $1x10^{-6}$ or 1 without the weights applied, but when presented in Tables 9.1 to 9.5 may be below these levels. It should be noted that, for many of the chemicals listed in Tables 9.1 to 9.5, the risk estimates exceed these benchmark levels.

5.2.1 Residents

The area-weighted total ELCR for the adult resident is 4.7 x 10-5 and the hazard index is 0.06. The risks are primarily associated with incidental ingestion and dermal contact with carcinogenic PAHs in sediments. Unweighted risk estimates for exposure to sediments in Reaches 1, 2, 3, 4, 6, 7 and Roxana Marsh exceed 1×10^{-5}.

The area-weighted total ELCR for the child resident is 3.2×10^{-5} and the hazard index is 0.38. As with the adult resident wader, the risks were primarily associated with incidental ingestion and dermal contact with carcinogenic PAHs in sediments. Unweighted risk estimates for exposure to sediments in Reaches 1, 2, 4, 6, 7 and Roxana Marsh exceed 1×10^{-5}.

5.2.2 Active Angler

The area-weighted total ELCR for the adult active angler is 1.7 x 10^{-3} and the corresponding hazard index is 18. Both of these values exceed acceptable risk ranges. When the hazard index is segregated by target organ, the hazard index for skin is 16 (see Table 9.3). Risks associated with direct contact (incidental ingestion and dermal absorption) with sediments in Reaches 1 and 2 exceed 1x10^{-4}. Carcinogenic PAHs are the primary contributors to risks associated with sediment. The hazard quotients for sediments are less than 1. The risks associated with every variety of fish exceed 1x10^{-4} and the hazard quotients exceed 1. PCBs are the primary contributor to carcinogenic and non-carcinogenic risks associated with fish ingestion, although risks associated with various organochlorine pesticides exceed 1 x 10^{-5}. Risks associated with direct contact with arsenic in surface water slightly exceed 1 x 10^{-6} (1.05 x 10^{-6} for incidental ingestion and 2.9 x 10^{-7} for dermal absorption).

The area-weighted ELCR for the child active angler is 4.9 x 10^{-4} and the corresponding hazard index is 20. These values exceed acceptable risk ranges. When the hazard index is segregated by target organ, the hazard index is 15 (see Table 9.4). As with the adult active angler, risks associated with direct contact with sediments in Reaches 1 and 2 exceed 1 x 10^{-4}. The hazard quotients for Reach 1 and Reach 2 exceed 1, primarily due to arsenic. Risk estimates for fish ingestion are somewhat lower than those for adults due to the shorter duration of exposure, but all exceed 1 x 10^{-5} and several exceed 1 x 10^{-4}. The associated hazard quotients are well above 1, primarily due to PCBs.

5.2.3 Maintenance/Utility Workers

The area-weighted ELCR for the maintenance/utility worker was 3.6 x 10^{-5}, and the hazard index was 0.05. Weighted risk estimates for direct contact with sediment in Reaches 1, 2, 3, 4, 6, 7, and Roxana Marsh exceed 1 x 10^{-6}, but the hazard quotients are well below 1. Carcinogenic PAHs were the primary contributors to risks associated with exposure to sediments.

5.2.4 Evaluation of Lead

Lead was selected as a sediment COPC for Reaches 1, 2, 3, 4, 5, 6, 7 and Roxana Marsh. The highest EPC for lead is 5,200 mg/kg for Reach 3. For Reach 3, the receptor groups that would experience the greatest potential exposure are the adult and child resident. For the active angler, the highest EPC for lead is 4,195 mg/kg in Reach 1. Potential hazards associated with exposure to lead are evaluated using the ALM (EPA 2003b) for adults and the IEUBK Child Lead Model for children (EPA 2001e). Both models assume that the baseline blood lead level is greater than zero, to reflect the presence of other sources of lead in the environment (e.g., house dust).

The IEUBK Child Lead Model (EPA 2001e) is designed to predict the probable blood lead levels for children between 6 months and 7 years of age who have been exposed to lead through environmental media (air, water, soil, dust, and diet). The Reach 3 sediment EPCs (5,200 mg/kg) and the child resident sediment ingestion rates (150 mg/day) were entered into the model and the blood lead level was calculated by the model for each age between 3 and 5 years. Table 4.7 presents the results of this analysis. EPA has determined that childhood blood lead levels at or above 10 µg Pb/dL present risks to children's health (EPA 1994). The results presented in Table 4.7 were compared to this level and were found to not exceed 10 µg Pb/dL under RME conditions. It should be noted that exposure to lead-contaminated sediments and surface water is assumed to begin at age 3, but exposure to contaminated house dust is assumed to occur beginning at 6 months of age. This finding is largely because exposure is assumed to occur only 12 times per year. Blood lead level modeling was not performed for the adult resident as the ALM is not applicable to exposures of less than 90 days per year. Based on the ALM results, under RME conditions the probability that the fetal blood lead level exceeds 10 µg Pb/dL, is less than 5 percent. Table 4.8 presents the results of the IEUBK modeling for the child active angler. Based on the assumed frequency of exposure (208 day/year), the highest detected concentration of lead in Reaches 1, 2, 6, and 7 (4,195 mg/kg in Reach 1), and the surface water EPC of 0.013 mg/L, the predicted blood lead concentration exceeds 10 µg Pb/dL within the first year of exposure. Table 4.9 presents the results of the ALM for the adult active angler. The results of the ALM suggest that the probability that fetal blood lead levels may exceed 10 µg Pb/dL is greater than 50 percent.

6. UNCERTAINTY ANALYSIS

All risk assessments contain elements of uncertainty. Sources and characteristics of uncertainties are examined in this section to provide perspective on the accuracy and level of conservatism inherent in the risk estimates and the underlying assumptions. The purpose of discussion of uncertainty is to assist in risk management decisions.

Most assumptions made in developing the baseline risk estimates were biased toward health protectiveness, that is, toward overestimating rather than underestimating risk. There is, therefore, a reasonable degree of certainty that actual risks to individuals exposed to contamination from the WBGCR will not be higher than those estimated in the baseline risk assessment and are likely to be much lower. Specific uncertainties are discussed in subsequent sections.

6.1 UNCERTAINTY IN THE DATA AND COPC SELECTION METHODOLOGY

A major concern of any risk assessment is the reliability of COPC identification, both in terms of ensuring that all contaminants have been correctly identified as COPCs, and ensuring that concentrations are adequately quantified. The accuracy of COPC identification is directly related to the quality of COPC characterization data, including information on contaminant identification, location, and concentrations. Because the analytical data made available for the risk assessment were originally collected in support of the NRDA reports (MacDonald and Ingersoll 2000, FWENC 2002c, 2003), they were not necessarily collected in areas specific to exposure activities for individuals fishing, wading, or working in the WBGCR. For this reason, the data were grouped to reflect the exposure activities using best professional judgment. It is possible, however, that sample locations could have been included for an exposure that could overestimate potential exposure for some populations while underestimating potential exposure for others.

Conservative screening criteria were selected from the state and federal risk-based criteria. The screening process was designed to identify those constituents that were site-specific and likely to exceed conservative risk-based criteria for residential use. In other words, the criteria reflect the more sensitive land use, as if exposure to sediments and surface was occurring 350 days per year for 30 years and surface water was used as drinking water source.

In the absence of available screening criteria for a few COPCs, appropriate screening criteria were selected based on the identification of surrogate chemicals. In general, these surrogate chemicals were either specific isomers of the detected chemical, a mixture of isomers of the same chemical, or a particular form of that chemical. Wherever more than one appropriate

surrogate could be identified, the surrogate selected was the more toxic form or mixture. This particular assumption would tend to result in the inclusion of a chemical as a COPC, but may or may not result in an overestimate of risk because there was no available toxicity information for the particular COPC.

Sediment data collected from Lake Mary were used to identify inorganic compounds present at concentrations that are representative of ambient levels and may not be indicators of site-related contamination. The only compound eliminated based on this comparison to "background" was iron in Reach 7 sediments. The concentration detected in Reach 7 sediments was also below toxicity-based screening criteria, and therefore iron would not have been identified as a COPC for Reach 7 anyhow.

6.2 EXPOSURE AND INTAKE UNCERTAINTIES

Selected exposure parameters are generally designed to be conservative so that no actual exposed population will receive greater exposures than those estimated. Exposure parameters were used to bound the upper and best estimate levels of reasonable maximum exposures. Potential exposure pathways were evaluated for all identified potential receptors. All pathways that could reasonably be complete under the land use scenarios were evaluated quantitatively for their potential to be associated with adverse health effects. There is a high degree of certainty that total exposures are not underestimated for any actual exposed population.

Future use of the site was assumed to be comparable to current use. The exposure scenarios were developed to describe a range of plausible exposures, from the relative infrequent exposures associated with wading by residents or utility/maintenance workers to the very frequent exposures for active anglers. The exposure scenario for residents is intended to describe risks associated with casual contact with the WBGCR whereas the exposure scenario for the active angler is intended to characterize risks associated with much more frequent, prolonged exposures and more intensive use of the WBGCR. The exposure scenario for utility/maintenance workers is intended to describe occupational exposures to sediments and surface water in the WBGCR in the absence of personal protective equipment.

6.2.1 Exposure Frequency and Exposure Duration

The parameters used were conservative default values obtained from EPA guidance documents and are typically used to estimate "reasonable maximum exposure." These conservative values may overestimate the risks for actual receptors.

The frequency and duration of residents' exposure to surface water and sediment is assumed to be 12 days/year per EPA's default exposure factor. Although this exposure frequency is

considered to be twice a month for six months, considering the weather conditions in Midwest it could conceivably be higher (e.g., 26 days per year, 2 day per week and 13 weeks of summer. Changing the exposure frequency to 26 days per year would slightly more than double the risk estimates.

6.2.2 Body Weight

Body weights used in the evaluation of risks were derived from standard tables for United States body weight distributions and are those recommended by EPA (EPA 1991, 2001d). Recommended values were selected from distribution midpoints because of uncertainty regarding these distributions. The actual variation for adult body weight is likely to be less than a factor of 2. The overall impact to the uncertainty is minimal.

6.2.3 Dermal Absorption

Dermal absorption of COPCs from sediments was assumed to be comparable to dermal absorption from soil. Sediments that are consistently water-covered are likely to wash off, and therefore contact time would be much shorter; consequently, the resulting intakes (and risks and hazards) would be overestimated. Also, the greater the moisture content of the sediment, the greater the difference between wet vs. dry weight contaminant concentration. Because estimates of sediment adherence reflect wet weight (i.e., in situ), and the estimated intakes are based on sediment sample results recorded in dry weight, the resulting risk estimates are over-estimated in direct proportion to the moisture content of the sediment. Conversely, increased moisture content increases the ability of sediment to adhere to skin and may also affect the relative percent absorbed. Therefore, EPA recommends the use of the same dermal absorption fraction for sediments as for soil until more information becomes available (EPA 2004a).

Permeability coefficients and dermal absorption factors for several of the COPCs (Table 4.5) were not available in the Draft RAGS Part E (Dermal Risk Assessment) (EPA 2004a). Therefore, hazards and risks could not be calculated. This results in an underestimate of risk.

6.2.4 Exposure Point Concentrations

EPCs for site media were selected to be lower of the 95 percent UCL of the arithmetic average or the maximum concentration for each chemical detected. As described in Section 2, the sampling was based on a primary objective other than a human health risk assessment (i.e., the NRDA reports). The data are considered suitable for most data quality needs for interpretation for a risk assessment, but are utilized and analyzed accordingly.

All risk computations for sediment and fish tissue were performed on a reach-specific basis and were also weighted by relative surface area of each reach in the computation of site-wide risks. This structure is intended to facilitate the evaluation of reach-specific RAOs and ultimately PRGs. Although combining reaches would result in larger data sets, and consequently EPCs based on the 95 percent UCL rather than the maximum detected, the overall impact to risk estimates is relatively small, in this case, on the order of 10 percent.

EPCs for fish tissue were typically based on one or two samples of each species of fish found in each reach. These samples were typically composite samples for smaller species (i.e., goldfish or carp) or single fish fillets for larger species (i.e., salmon or trout). Although there is uncertainty associated with the relatively small number of fish tissue sample results used to estimate EPCs, there was very little variation in the concentrations of COPCs detected in fish either between species or between reaches. For example, the dioxin TEQ for PCBs ranged from 0.000020 mg/kg in Reach 1 Carp to 0.000091 mg/kg in Reach 7 Goldfish, a difference of less than 5-fold.

EPCs for surface sediment were based on between 4 and 25 samples per reach. The EPC for smaller data sets (e.g., less than 10 samples) is often based on the maximum concentration detected. In general, EPCs estimated using larger data sets provide a more representative estimate of the actual exposure-point concentration and are typically based on the UCL of the arithmetic average, not the maximum detected.

Water quality data were limited to Reaches 1, 4, 5 and 6, and with the exception of Reach 5, were limited to a few samples. Arsenic and lead were selected as COPCs for all four reaches. Aluminum and chromium were also selected as COPCs for Reach 5. Reach 6 was the only area with VOC results for surface water. Naphthalene and chlorodibromomethane were selected as COPCs for Reach 6. Because there was little variation in the metals concentration and because there was no VOC data for the other reaches, surface water data were combined for the purposes of calculating exposure point concentrations. Consequently, risks associated with surface water were only computed on an area-wide basis. The resulting risk estimates were well below benchmark levels and comprised less than 0.02 percent of overall site risks.

6.3 TOXICOLOGICAL INFORMATION AND MODELS

RfDs and CSFs obtained from EPA were used in this BHHRA, so the toxicological evaluations upon which the risk assessment is based contribute no more uncertainty than in comparable CERCLA documents. However, the level of uncertainty in the toxicological data and models associated with a particular COPC can be substantial.

Considerable uncertainty can be associated with qualitative (hazard assessment) and quantitative (dose-response) evaluations. Hazard assessment characterizes the nature and strength of the evidence of causation or the likelihood that a chemical that induces adverse effects in animals will induce adverse effects in humans. Hazard assessment of carcinogenicity is currently evaluated as a weight-of-evidence determination, using EPA (1989) classifications. Positive results in animal cancer tests suggest humans may also manifest a carcinogenic response, but animal data cannot necessarily be used to predict target tissues in humans. In the hazard assessment of noncarcinogenic effects, positive animal test results may suggest the nature of possible human effects (i.e., target tissues and type of effects) (EPA 1989).

There are many sources of uncertainty in dose-response evaluation of carcinogenic (i.e., CSF or UR calculations) and noncarcinogenic effects (i.e., RfD or RfC calculations). The major sources are:

- Interspecies extrapolations
- Variability between species and between individuals of the same species
- Key study and database quality
- Extrapolation from high doses in animals to the dose range expected for environmentally exposed humans
- Endpoint extrapolation to NOAEL from LOAEL, and
- Wide variation in the quality and amounts of toxicological data for different chemicals.

The degree of over-conservatism in the toxicological factors is difficult to estimate because of the number of factors involved. An estimate of the overall uncertainty contributed by toxicological estimates could be a factor ranging from 10 to 100.

EPA has recently released guidance on the need for additional safety factors for children exposed to genotoxic compounds (EPA 2005). The child receptor groups included in the risk assessment include a child wader aged 3 to 6 and a child angler aged 6 to 10. Both of these receptor groups fall within ages 2 to 15, which is associated with a three-fold risk adjustment for mutagenic agents. Therefore, risk estimates for some COPCs may be underestimates. EPA is recommending age-dependent adjustment facts only for carcinogens acting through a mutagenic mode of action. Which carcinogens will be “officially” considered mutagens has not yet been resolved. The largest risk estimates were identified for PAHs in sediments and PCBs in fish. Benzo(a)pyrene and other PAHs have been shown to cause genotoxic effects in a broad range of prokaryotic and mammalian cell assay systems. PCBs generally have been negative in tests of genetic activity.

6.3.1 Contaminant-Specific Toxicological Uncertainty

Some of the PCBs are of particular toxicological interest because they have shown toxic effects (to the immune, endocrine, and reproductive systems, dermal effects, birth defects, carcinogenicity, and tumor promotion) similar to one of the major dioxin compounds (2,3,7,8-TCDD) and they are thought to have the same mechanism of action. There are 13 PCB congeners in this group referred to as dioxin-like PCBs. The World Health Organization (WHO) has developed TEFs for these compounds that provide a measure of their toxicity relative to 2,3,7,8-TCDD in 1994 and revised the values in 1998. There are slight differences in the two TEF schemes. Specifically, the 1994 TEF for PCB-77 is 0.0005 and the 1998 TEF if 0.0001, and the 1994 TEFs include values of 0.0001 for PCB-170 and 0.0001 for PCB-180 while the 1998 scheme does not include these compounds. Consistent with the IRIS citation for PCBs, which cites the sample calculations provided in EPA 1996a, the 1994 TEFs were used. This may result in a slight over-estimation of risk relative to the 1998 TEFs. Both TEF schemes assume that all exposures to dioxins, furans, and PCBs that have been assigned a weighing factor will act in "simple similar action." That is, any level of exposure to each and every one of these chemicals will increase the cancer risk in an additive fashion; there is no synergy or antagonism.

Risk estimates for dioxin-like PCBs as well as 2,3,7,8-TCDD were computed using the current slope factor for 2,3,7,8-TCDD. There is a major reassessment of 2,3,7,8-TCDD and related compounds currently underway. While major issues of the reassessment are incomplete, preliminary estimates of the slope factor are approximately 10 times higher than previous estimates (1×10^{-3} per pg TEQ/kg-BW-day versus the current slope estimate of 1.5×10^{-4} per pg TEQ/kg-BW-day) (EPA 2001f). If the preliminary slope factor holds, then risk estimates for both 2,3,7,8-TCDD and for dioxin-like PCBs would also increase by approximately one order of magnitude.

Uncertainty exists with respect to the precise toxicological characteristics of the site's inorganic COPCs given a lack of detailed speciation, especially relative to the species of arsenic. Because the published EPA toxicological parameters and bioavailability estimates for inorganics tend to be based on the more toxic species and complexes for a particular chemical, the current risk assessment would be expected to somewhat over-predict the level of risk associated with the site's inorganic chemicals. Several studies summarized by Roberts et al. (2002), suggested limited oral bioavailability of arsenic in soils from a variety of arsenic-contaminated sites. For this risk assessment, 100 percent bioavailability was used to calculate the CDIs because the chemical form of arsenic affects both bioavailability and toxicity compared to the form of chemical used in the toxicity studies. Risk from oral ingestion of arsenic-contaminated sediments and surface water, therefore, could be from 25 percent to 75 percent less than presented in the summary.

Potential hazards associated with adult residents and utility/maintenance workers exposed to lead in sediments and surface water could not be evaluated because the ALM is not applicable to exposure durations of less than 90 days per year.

6.4 RISK CHARACTERIZATION

The risk characterization bridges the gap between potential exposure and the possibility of systemic or carcinogenic human health effects, ultimately providing impetus for the remediation of the site or providing a basis for no remedial action.

Uncertainties associated with risk characterization include the assumption of chemical additivity and the inability to predict synergistic or antagonistic interactions between COPCs. These uncertainties are inherent in any inferential risk assessment. EPA-promulgated inputs to the quantitative risk assessment and toxicological indices are calculated to be protective of the human receptor and to err conservatively, so as not to underestimate the potential human health risks.

Risk estimates were initially computed as if 100 percent of a receptor's exposure to sediments was occurring with a specific reach. It would not be appropriate to sum each of these unweighted risk estimates to obtain an overall risk estimate because this approach implies that exposure is occurring independently within each area, and with much greater frequency. For example, in the case of the active angler, exposure may occur in Reaches 1, 2, 6, and 7. The assumed frequency of exposure was 50 percent of the 208 days per year spent fishing, or 104 days per year. If risk estimates for the four areas were summed without weighting, this would be equivalent to assuming exposure occurs 4 x 104 or 416 days per year. Consequently, risk estimates were weighted proportionately by the relative size of each area to the total area where exposure was assumed to occur. Similarly, fish intakes were weighted by the number of species sampled within each reach and then by the relative size of the area. Use of the weighting scheme should not result in either an under-estimate or over-estimate of risks and hazards, but does provide an opportunity to compare risks associated with each area and each species of fish sampled.

All risk computations for sediment and fish tissue were performed on a reach-specific basis and were also weighted by relative surface area of each reach in the computation of site-wide risks. This structure is intended to facilitate the evaluation of reach-specific RAOs and ultimately PRGs. Risk estimates for all reaches were combined and weighted for an overall assessment for sediment, surface water, and fish.

7. SUMMARY AND CONCLUSIONS

Exposure scenarios were developed to characterize baseline human health risks associated with various uses of the WBGCR. Casual recreational use of the area for wading was evaluated for both adult and child residents. Use of the WBGCR to supply a substantial portion (approximately one meal per week) of an adult and child active anglers' diet was also considered. These represent the plausible range of exposures that may be occurring, occasional wading in the River versus frequent exposure and consumption of fish. Occupational exposures were considered for utility/maintenance workers.

Based on the existing database and the risk characterization, several conclusions can be made. Risks for each of the receptor groups considered exceed the benchmark level of 1×10^{-6}. For all receptor groups, cumulative weighted risks associated with direct contact with impacted sediments were primarily associated with incidental ingestion and dermal absorption of carcinogenic PAHs. Risks associated with inhalation of particulate-bound wind-borne COPCs were well below 1×10^{-6}. Area-weighted risk estimates for all reaches, except Reach 5, exceed 1×10^{-6}. Unweighted risk estimates for Reach 5 also exceed 1×10^{-6}. Risk estimates were the highest in Reaches 1 and 2 and the lowest for Reach 5, but in general the risk estimates were within one order of magnitude of each other.

Risks associated with fishing exceed the upper limit of the range of acceptable risk, or 1×10^{-4}, and the associated hazard indices were substantially greater than 1. Unweighted risk estimates for every combination of reach and species were greater than 1×10^{-4}, and the associated hazard indices were greater than 1. Both dioxin-like and nondioxin-like PCBs were major contributors to these risk estimates, typically 80 percent or more. Dieldrin contributed 3 to 7 percent of the total risks. DDD, DDE, and DDT contributed 1 to 4 percent of the risks associated with fish consumption. PCBs were the largest contributor to the hazard index, typically 90 percent or more. Unweighted hazard quotients for arsenic, chromium, selenium and dieldrin sometimes exceeded 1, but all were less than 2. The corresponding weighted hazard quotients for all COPCs except for PCBs were less than 1. Risk estimates for various species of fish were within a factor of 5, and there were no obvious differences between species. Consequently, re-weighting of the fish consumption risk estimates to reflect higher consumption rates for more desirable species (such as steelhead and Chinook) and lower consumption rates for others (such as goldfish) is unlikely to significantly impact risk estimates.

This BHHRA evaluated exposure associated with fish ingestion based on an active angler scenario. Had higher fish consumption rates for active consuming anglers (i.e., subsistence anglers) been utilized, the resulting risk estimates would be approximately 3.6-fold higher.

Risks and hazards associated with exposures to COPCs in surface water do not present an unacceptable risk, based on relatively recent monitoring data. The only sediment-related COPCs detected in surface water were naphthalene, aluminum, arsenic, chromium, and lead. With the exception of aluminum, the concentrations of these COPCs are below Great Lakes Water Quality Criteria for drinking water sources. The maximum observed concentration of aluminum (3.39 mg/L) is below the Great Lakes Water Quality Criteria for non-drinking water sources.

The WBGCR was included in a baseline risk assessment of the Grand Calumet River/Indiana Harbor Canal Area of Concern performed by EPA (EPA 1994). The EPA risk assessment evaluated human health risks associated with dermal exposure to surface water and sediments and ingestion of contaminated fish. The EPA risk assessment was performed prior to the Roxana Marsh Investigation (FWENC 2002c) and the WBGCR site characterization study (FWENC 2003) and addressed a geographically larger area; consequently, the results of the two studies are not directly comparable. The EPA risk assessment did identify several species of fish associated with risks greater than 1×10^{-6}, including whole golden shiners and whole carp. PCBs were the primary contributors to risk associated with fish ingestion, consistent with the risks calculated in this BHHRA.

8. REFERENCES

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

EPA. 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors." OSWER Directive 9285.6-03. March 25.

EPA. 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. EPA/600/R-93/089. Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Cincinnati, OH.

EPA. 1994. Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children. OSWER 9285.7-15-1. February.

EPA. 1996a. PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures. EPA/600/P-96/001F. September.

EPA. 1996c. Soil Screening Guidance: Technical Background Document. Office of Solid Waste and Emergency Response. EPA/540/R95/128. May.

EPA. 1997a. Exposure Factors Handbook. Volume III – Activity Factors. EPA/600/P-95/002Fa. August.

EPA. 1997b. Health Effects Assessment Summary Tables (HEAST). Office of Research and Development. EPA/540/R-97/036. July.

EPA. 1997c. Exposure Factors Handbook. Volume I - General Factors. EPA/600/P-95002/Fa. August.

EPA. 1999. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. Office of Solid Waste and Emergency Response. EPA-540/R-94-013. February.

EPA. 2000. Exposure and Human Health Reassessment of 2,3,7,8-Tetrachloro-dibenzo-p-Dioxin (TCDD) and Related Compounds, Draft Final Report. National Center for Environmental Assessment.

EPA. 2001a. Risk Assessment Guidance for Superfund (RAGS): Volume I - Human Health Evaluation Manual (Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments) Final December 2001

EPA. 2001b. ProUCL User's Guide. May.

EPA. 2001c. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Peer Review Draft. Office of Solid Waste and Emergency Response. March.

EPA. 2001d. Technical Issue Paper: Age Group Recommendations for Assessing Childhood Exposure and the Adequacy of Existing Exposure Factors Data for Children. Risk Assessment Forum.

EPA. 2001e. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Windows Version. EPA9285.7-42. October.

EPA. 2001f. Dioxin: Scientific Highlights from Draft Reassessment (2000). Office of Research and Development. May 25.

EPA. 2002a. National Recommended Water Quality Criteria: 2002. Office of Water. November.

EPA. 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December.

EPA. 2002c. 2002 Edition of the Drinking Water Standards and Health Advisories. Office of Water.

EPA. 2003a. Human Health Toxicity Values in Superfund Risk Assessments. Office of Superfund Remediation and Technology Innovation, Office of Solid Waste and Emergency Response. OSWER Directive 9285.7-53. December.

EPA. 2003b. Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. Technical Review Workgroup. January.

EPA. 2004a. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final. Office of Emergency and Remedial Response. EPA/540/R-99/005. September.

EPA. 2004b. Integrated Risk Information System (IRIS) on-line database. Date last searched: February 2004.

EPA. 2005. Supplemental Guidance for Assessing Cancer Susceptibility from Early-Life Exposure to Carcinogens, EPA/630/R-03/003F, March 2005

FWENC (Foster Wheeler Environmental Corporation). 2002a. Sampling and Analysis Plan, West Branch of the Grand Calumet River. Prepared for the U.S. Fish and Wildlife Service by Foster Wheeler Environmental Corporation, Bothell, Washington. October.

FWENC. 2002b. Quality Assurance Project Plan, West Branch of the Grand Calumet River. Prepared for the U.S. Fish and Wildlife Service by Foster Wheeler Environmental Corporation, Bothell, Washington. October 2002.

FWENC. 2002c. Field and Laboratory Data Report for the Chemical, Physical, and Toxicological Characterization of Roxana Marsh. Prepared for the U.S. Fish & Wildlife Service by Foster Wheeler Environmental Corporation, Bothell, Washington. September 2002.

FWENC. 2003. Site Characterization Report for the West Branch Grand Calumet River, Lake County, Indiana. Prepared for the U.S. Fish & Wildlife Service by Foster Wheeler Environmental Corporation, Bothell, Washington. August 2003.

IDEM (Indiana Department of Environmental Management). 1991. The remedial action plan for the Indiana Harbor Canal, the Grand Calumet River, and nearshore Lake Michigan: Stage 1. Indianapolis, Indiana. (As cited in Natural Resources Trustees 1997).

IDEM. 2004. IDEM list of NPDES permits. Updated July 2004.

MacDonald, D.D., and C.G. Ingersoll. 2000. An Assessment of Sediment Injury in the Grand Calumet River, Indiana Harbor Canal, Indiana Harbor, and the Nearshore Areas of Lake Michigan. Prepared by Donald D. MacDonald, MacDonald Environmental Sciences Ltd., and Christopher G. Ingersoll, Columbia Environmental Research Center, U.S. Geological Survey, in association with Industrial Economics, Inc. for U.S. Fish & Wildlife Service, Bloomington, Indiana. October 2000.

Natural Resources Trustees. 1997. Assessment Plan for the Natural Resource Damage Assessment of the Grand Calumet River, Indiana Harbor Ship Canal, Indiana Harbor, and Associated Lake Michigan Environments. Prepared for U.S. Department of Interior and the State of Indiana. Indianapolis, Indiana.

NECA (National Center for Environmental Assessment). 1996. PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures. Office of Research and Development. EPA/600/P-96/001F. September.

Roberts, S.M., W.R. Weimar, J.R.T. Vinson, J.W. Munson, and R.J. Bergeron. 2002. Toxicological Sciences. "Measurement of Arsenic Bioavailability in Soil Using a Primate Model." Volume 67, pages 303-310.

TtEC (Tetra Tech EC, Inc.). 2005. Development of Remedial Action Objectives to Support the Evaluation of Restoration Alternatives for the West Branch of the Grand Calumet River, Indiana. Prepared for the U.S. Fish and Wildlife Service by Tetra Tech EC, Inc., Bothell, Washington. September 2005.

ThermoRetec Consulting Corp. 1999. River Sediment Investigation Report. Grand Calumet River. Hammond, Indiana. Prepared by ThermoRetec Consulting Corp. for Northern Indiana Public Service Company. Merrillville, Indiana. March 1999.

USDA/ARS. 1998. USDA Continuing Survey of Food Intakes by Individual (CSFII) as cited in EPA Estimated Per Capita Fish consumption in the United States, August, 2002.

West, P.C., J.M. Fly, R. Marans, F. Larkin, and D. Rosenblatt. 1993. 1991-95 Michigan Sport Anglers Fish Consumption Study. Final report to the Michigan Great Lakes Protection Fund, Michigan Department of Natural Resources. May

Williams, R.L, J.T. O'Leary, A.L. Sheaffer, and D. Mason. 2000. An Examination of Fish Consumption by Indiana Recreational Anglers: An On-Site Survey. Prepared for Indiana Department of Environmental Management. June.

TABLES

TABLE 2.1

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 1 Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Surface Sediment	11096-82-5	Aroclor 1260	670	2200	ug/kg	RO5848	5/12	6.5-3300	2.2		0.176			YES	ASL
	11097-69-1	Aroclor 1254	79	79	ug/kg	WB-08	1/12	15-3300	0.079		0.176			NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	5600 (J)	81000	ug/kg	RO5848	5/7	300-17000	81		30.45			YES	ASL
	120-12-7	Anthracene	1600	140000	ug/kg	RO5849	10/16	190-50000	140		4736.5			NO	BSL
	12672-29-6	Aroclor 1248	2187.5	7936.5	ug/kg	087-94	3/12	6-3300	7.9365		0.176			YES	ASL
	129-00-0	Pyrene	700	720000	ug/kg	RO5849	12/16	380-50000	720		548.2			YES	ASL
	132-64-9	Dibenzofuran	6600	59000	ug/kg	RO5849	5/8	150-33000	59		73.09			NO	BSL
	191-24-2	Benzo(ghi)perylene	6100	89000	ug/kg	RO5849	6/7	400-400	89		0.0505			YES	ASL
	193-39-5	Indeno(1,2,3-cd)pyrene	2700	50000	ug/kg	RO5849	9/16	300-50000	50		0.505			YES	ASL
	205-99-2	Benzo(b)fluoranthene	13000	99000	ug/kg	RO5849	7/8	290-290	99		0.505			YES	ASL
	206-44-0	Fluoranthene	3800	200000	ug/kg	RO5849	10/16	250-50000	200		631.5			NO	BSL
	207-08-9	Benzo(k)fluoranthene	5800	42000	ug/kg	RO5849	10/16	310-50000	42		5.047			YES	ASL
	208-96-8	Acenaphthylene	810	59000	ug/kg	01RC03SE00	6/16	150-33000	59		112			NO	BSL
	218-01-9	Chrysene	190 J	600000	ug/kg	RO5849	11/16	1900-50000	600		50.47			YES	ASL
	50-29-3	4,4-DDT	85	180	ug/kg	RO5850	3/11	3.4-3400	0.18		1.98			NO	BSL
	50-32-8	Benzo(a)pyrene	180 J	110000	ug/kg	RO5849	11/16	1900-50000	110		0.0505			YES	ASL
	5103-71-9	alpha-Chlordane	5.1	200	ug/kg	RO5850	4/11	13-1700	0.2		1.74			NO	BSL
	5103-74-2	gamma-Chlordane	5.1	190	ug/kg	WB-04	3/11	31.3-1700	0.19		1.74			NO	BSL
	53469-21-9	Aroclor 1242	250	6800	ug/kg	RO5850	4/12	16-3300	6.8		0.176			YES	ASL
	53-70-3	Dibenz(a,h)anthracene	750	41000	ug/kg	RO5849	7/16	300-71000	41		0.0505			YES	ASL
	56-55-3	Benzo(a)anthracene	6500	280000	ug/kg	RO5849	10/16	140-50000	280		0.505			YES	ASL
	57-12-5	Cyanide	0.98	11.1	mg/kg	087-94	4/4	*-*	11.1		365.5			NO	BSL
	60-57-1	Dieldrin	51	120	ug/kg	RO5850	2/11	2.6-3400	0.12		0.0266			YES	ASL
	71-43-2	Benzene	19	19	ug/kg	035-88	1/2	48000-48000	0.019		0.824			NO	BSL
	72-43-5	Methoxychlor	45 J(J)	45 J(J)	ug/kg	WB-43	1/7	4.2-440	0.045		91.36			NO	BSL
	72-54-8	4,4-DDD	25 (J)	310	ug/kg	RO5850	6/11	3.1-3400	0.31		2.8			NO	BSL
	72-55-9	4,4'-DDE	2.6 J	230	ug/kg	WB-04	3/11	62.5-3400	0.23		1.98			NO	BSL
	7429-90-5	Aluminum	7700	25100	mg/kg	087-94	6/6	*-*	25100	1,500	7614.2			YES	ASL
	7439-89-6	Iron	10700	85000	mg/kg	ROX2-94	8/8	*-*	85000	4,700	2346.3			YES	ASL
	7439-92-1	Lead	41 (J)	6800	mg/kg	RO5849	14/15	12-12	6800	11	40			YES	ASL
	7439-93-2	Lithium	9.9	18	mg/kg	ROX2-88	4/4	*-*	18		156.4			NO	BSL
	7439-95-4	Magnesium	9900	18000	mg/kg	ROX2-95	6/6	*-*	18000		-			NO	NUT
	7439-96-5	Manganese	425	907	mg/kg	087-94	6/6	*-*	907		176.2			YES	ASL
	7439-97-6	Mercury	0.14	5.1	mg/kg	RO5848	11/11	*-*	5.1		5.48			NO	BSL
	7439-98-7	Molybdenum	2.2	12	mg/kg	ROX2-94	4/4	*-*	12		39.11			NO	BSL
	7440-02-0	Nickel	26	1140	mg/kg	035-88	8/8	*-*	1140		692.1			YES	ASL
	7440-09-7	Potassium	780	2030	mg/kg	087-94	4/8	500-1560	2030	250	-			NO	NUT
	7440-22-4	Silver	3.1	32.3	mg/kg	087-94	10/16	0.69-18	32.3		173.0			NO	BSL

TABLE 2.1

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sedimen
Exposure Medium: Reach 1 Surface Sedimen

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	7440-24-6	Strontium	65	99	mg/kg	ROX2-94	4/4	*-*	99		4692.4			NO	BSL
	7440-28-0	Thallium	2.3	2.3	mg/kg	087-94	1/2	6.3-6.3	2.3		3.11			NO	BSL
	7440-31-5	Tin	21	359	mg/kg	01RC03SE00	5/6	6-6	359		4692.4			NO	BSL
	7440-32-6	Titanium	150	200	mg/kg	ROX2-94	4/4	*-*	200		31000			NO	BSL
	7440-36-0	Antimony	7.1	71.8	mg/kg	087-94	6/8	6-7	71.8		13.8			YES	ASL
	7440-38-2	Arsenic	6.2	210	mg/kg	RO5849	12/15	9.5-13	210	3	0.39			YES	ASL
	7440-39-3	Barium	80	782	mg/kg	087-94	15/15	*-*	782	8	2347.2			NO	BSL
	7440-41-7	Beryllium	0.4	1.8	mg/kg	087-94	5/6	1.6-1.6	1.8		67.66			NO	BSL
	7440-43-9	Cadmium	1.7	62	mg/kg	WB-43	12/15	0.18-1.6	62		1.2			YES	ASL
	7440-47-3	Chromium	31 (J)	1300	mg/kg	WB-43	15/15	*-*	1300	6	210.7			YES	ASL
	7440-48-4	Cobalt	8.8	15	mg/kg	087-94	5/6	15.6-15.6	15	2	138.0			NO	BSL
	7440-50-8	Copper	21	879	mg/kg	087-94	11/11	*-*	879	5	1280.4			NO	BSL
	7440-62-2	Vanadium	16	46.9	mg/kg	087-94	5/6	15.6-15.6	46.9		54.75			NO	BSL
	7440-66-6	Zinc	76	6000 (J)	mg/kg	WB-43	11/11	*-*	6000	41	10381.6			YES	ASL
	7440-70-2	Calcium	54000	127000	mg/kg	035-88	6/6	*-*	127000	54,000	-			NO	NUT
	7782-49-2	Selenium	1.7 B	26.1	mg/kg	087-94	11/11	*-*	26.1		173.03			NO	BSL
	83-32-9	Acenaphthene	140 J	100000	ug/kg	01RC03SE00	8/16	1900-33000	100		947.31			NO	BSL
	85-01-8	Phenanthrene	370 J	1900000	ug/kg	RO5849	13/15	1900-3100	1900		111.3			YES	ASL
	86-73-7	Fluorene	2300	170000	ug/kg	RO5849	11/16	260-8200	170		631.5			NO	BSL
	86-74-8	Carbazole	3100 J(J)	47000	ug/kg	RO5849	4/7	230-340000	47		21.32			YES	ASL
	91-20-3	Naphthalene	14	1300000	ug/kg	01RC03SE00	7/16	170-71000	1300		315.6			YES	ASL
	91-57-6	2-Methylnaphthalene	1300	340000	ug/kg	RO5849	5/16	630-71000	340		365.4			NO	BSL
	DDT_SUM	Total DDT	2.6	490	ug/kg	RO5850	7/11	62.5-3400	0.49		1.981			NO	BSL
	HCCH-BETA	Hexachlorocyclohexane-beta	110	110	ug/kg	RO5849	1/4	32-41	0.11		0.3456			NO	BSL

Footnote Instructions

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High

(1) The data set includes the site characterization study as well as historical sediment sampling results.
(2) The maximum detected concentration is the concentration used for screening.
(3) The Background Value listed is the maximum detected surface sediment result from Lake Mary.
(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for soil; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were utilized.
(5) Rationale Codes:

Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.2

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 2 Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Surface Sediment	108-95-2	Phenol	70	2020	ug/kg	UG9 Top	3/18	150-54000	2.02		8774.02			NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	1800 J	9000	ug/kg	WB-14	3/4	2200-2200	9		30.4537			NO	BSL
	120-12-7	Anthracene	885 J	57000	ug/kg	MOL2-68	16/19	4600-12000	57		4736.53			NO	BSL
	12672-29-6	Aroclor 1248	845	10400	ug/kg	UG9 Top	4/7	15-52	10.4		0.176214			YES	ASL
	129-00-0	Pyrene	4400	700000	ug/kg	MOL2-68	22/22	*-*	700		548.166			YES	ASL
	132-64-9	Dibenzofuran	8500	24000 (J)	ug/kg	WB-11	3/4	100-100	24		73.0888			NO	BSL
	191-24-2	Benzo(ghi)perylene	595 J	29000	ug/kg	WB-11	4/4	*-*	29		0.0505			YES	ASL
	193-39-5	Indeno(1,2,3-cd)pyrene	455 J	26000	ug/kg	MOL2-68	13/19	6600-18000	26		0.504662			YES	ASL
	205-99-2	Benzo(b)fluoranthene	805 J	34000	ug/kg	WB-11	4/4	*-*	34		0.504662			YES	ASL
	206-44-0	Fluoranthene	310	200000	ug/kg	MOL2-68	22/22	*-*	200		631.537			NO	BSL
	207-08-9	Benzo(k)fluoranthene	1075	14000	ug/kg	WB-10	11/20	2100-54000	14		5.04662			YES	ASL
	218-01-9	Chrysene	3400	730000	ug/kg	MOL2-68	20/20	*-*	730		50.4662			YES	ASL
	2378DIB_p_DIOXIN	2,3,7,8-Dibenzo-p-dioxin	0.0000073	0.006	ug/kg	UG9-A	2/2	*-*	0.000006		3.8986E-06			YES	ASL
	50-29-3	4,4-DDT	52 (J)	1750	ug/kg	UG-9	4/6	24-29	1.75		1.98123			NO	BSL
	50-32-8	Benzo(a)pyrene	1135	206300	ug/kg	UG9 Top	20/22	6600-12000	206.3		0.050466			YES	ASL
	5103-74-2	gamma-Chlordane	90 (J)	390 (J)	ug/kg	WB-10	3/4	20-20	0.39		1.73857			NO	BSL
	53494-70-5	Endrin ketone	25 J(J)	25 J(J)	ug/kg	WB-10	1/4	21.5-27	0.025		5.48166			NO	BSL
	53-70-3	Dibenz(a,h)anthracene	350 J-J	26000	ug/kg	MOL2-68	8/19	2900-18000	26		0.050466			YES	ASL
	56-55-3	Benzo(a)anthracene	1650	420000	ug/kg	MOL2-68	19/20	12000-12000	420		0.504662			YES	ASL
	58-89-9	gamma-BHC (Lindane)	40 (J)	3160	ug/kg	UG-9	5/7	23.5-29	3.16		0.478521			YES	ASL
	60-57-1	Dieldrin	3210	4250	ug/kg	UG9 Top	3/7	16-23	4.25		0.026647			YES	ASL
	71-43-2	Benzene	57	57	ug/kg	ROX1-21A	1/4	67-160	0.057		0.8242			NO	BSL
	72-43-5	Methoxychlor	46 J(J)	210 (J)	ug/kg	WB-11	3/4	29-29	0.21		91.361			NO	BSL
	72-54-8	4,4-DDD	10	130	ug/kg	UG9 Top	5/6	21.5-21.5	0.13		2.798			NO	BSL
	72-55-9	4,4'-DDE	62.5 (J)-(J)	8840	ug/kg	UG9 Top	4/6	15-21	8.84		1.98123			YES	ASL
	7421-36-3	Endrin aldehyde	30 (J)	47 (J)	ug/kg	WB-14	2/4	21.5-23	0.047		5.48166			NO	BSL
	7429-90-5	Aluminum	2800	11000	mg/kg	MOL2-70	15/15	*-*	11000	1,500	7614.19509			YES	ASL
	7439-89-6	Iron	6940	260000	mg/kg	MOL2-70	17/17	*-*	260000	4,700	2346.31846			YES	ASL
	7439-92-1	Lead	150	12000	mg/kg	MOL2-70	21/21	*-*	12000	11	40			YES	ASL
	7439-93-2	Lithium	2.7	18	mg/kg	MOL2-68	15/15	*-*	18		156.428082			NO	BSL
	7439-95-4	Magnesium	3100	15000	mg/kg	MOL2-68	17/17	*-*	15000		-			NO	NUT
	7439-96-5	Manganese	190	1700	mg/kg	MOL2-48	17/17	*-*	1700		176.235319			YES	ASL
	7439-97-6	Mercury	2.3	7.2	mg/kg	WB-10	4/4	*-*	7.2		5.48119			YES	ASL
	7439-98-7	Molybdenum	2.1	39	mg/kg	MOL2-48	15/15	*-*	39		39.1071123			NO	BSL
	7440-02-0	Nickel	20	428	mg/kg	UG9-A	17/17	*-*	428		692.107			NO	BSL
	7440-09-7	Potassium	210	1200	mg/kg	MOL2-68	10/15	300-900	1200	250	-			NO	NUT
	7440-22-4	Silver	2.2	39	mg/kg	WB-14	19/19	*-*	39		173.027			NO	BSL

TABLE 2.2

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 2 Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	7440-24-6	Strontium	14	80	mg/kg	MOL2-70	15/15	*-*	80		4692.41673			NO	BSL
	7440-31-5	Tin	29	350	mg/kg	MOL2-48	15/15	*-*	350		4692.41673			NO	BSL
	7440-32-6	Titanium	75	290	mg/kg	MOL2-70	15/15	*-*	290		31000			NO	BSL
	7440-36-0	Antimony	9	99	mg/kg	MOL2-70	15/15	*-*	99		13.8421			YES	ASL
	7440-38-2	Arsenic	5.3	180	mg/kg	MOL2-70	16/19	5-11	180	3	0.39			YES	ASL
	7440-39-3	Barium	87	590	mg/kg	MOL2-70	19/19	*-*	590	8	2347.19			NO	BSL
	7440-41-7	Beryllium	0.3	1.5	mg/kg	MOL2-70	15/15	*-*	1.5		67.6572			NO	BSL
	7440-42-8	Boron	9.5	13	mg/kg	COL2-37	2/6	3.9-4	13		1562.18391			NO	BSL
	7440-43-9	Cadmium	2.5	89	mg/kg	WB-14	21/21	*-*	89		1.2			YES	ASL
	7440-47-3	Chromium	44	1200	mg/kg	WB-14	21/21	*-*	1200	6	210.67535			YES	ASL
	7440-48-4	Cobalt	3.1	18	mg/kg	ROX2-71	15/15	*-*	18	2	138.027617			NO	BSL
	7440-50-8	Copper	71	710	mg/kg	MOL2-70	21/21	*-*	710	5	1280.4			NO	BSL
	7440-62-2	Vanadium	8.8	49	mg/kg	MOL2-70	15/15	*-*	49		54.74994			NO	BSL
	7440-66-6	Zinc	450	11000	mg/kg	MOL2-70	21/21	*-*	11000	41	10381.6			YES	ASL
	7440-70-2	Calcium	8000	44000	mg/kg	MOL2-68	15/15	*-*	44000	54,000	-			NO	NUT
	76-44-8	Heptachlor	1720	4610	ug/kg	UG9 Top	3/7	15-21	4.61		0.053618			YES	ASL
	7782-49-2	Selenium	1.95	11	mg/kg	WB-14	4/4	*-*	11		173.027			NO	BSL
	8001-35-2	Toxaphene	3320	6350	ug/kg	UG9 Top	3/7	73-100	6.35		0.38608			YES	ASL
	83-32-9	Acenaphthene	680 J	35000	ug/kg	MOL2-70	12/19	2100-54000	35		947.306			NO	BSL
	85-01-8	Phenanthrene	2000	1070000	ug/kg	MOL2-68	21/22	11000-11000	1070		111.3			YES	ASL
	86-73-7	Fluorene	775 J	80000 (J)	ug/kg	WB-11	15/19	2100-12000	80		631.537			NO	BSL
	86-74-8	Carbazole	4600 J	33000 (J)	ug/kg	WB-11	3/4	155-155	33		21.3176			YES	ASL
	91-20-3	Naphthalene	1700	8800	ug/kg	WB-11	9/22	120-54000	8.8		315.559			NO	BSL
	91-57-6	2-Methylnaphthalene	1500	22000	ug/kg	WB-10	11/19	440-54000	22		365.444			NO	BSL
	DDT_SUM	Total DDT	40	10300	ug/kg	UG9 Top	6/6	*-*	10.3		1.98123			YES	ASL
	HCCH-SUM	exachlorocyclohexane-all isome	3160	3160	ug/kg	UG-9	1/1	*-*	3.16		0.31575442			YES	ASL

Footnote Instructions:

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High

(1) The data set includes the site characterization study as well as historical sediment sampling results.
(2) The maximum detected concentration is the concentration used for screening.
(3) The Background Value listed is the maximum detected surface sediment result from Lake Mary.
(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for soil; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were utilized.
(5) Rationale Codes:

Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 3 Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Surface Sediment	11096-82-5	Aroclor 1260	190	550 (J)	ug/kg	WB-23	3/4	24-24	0.55		0.176214	-	-	YES	ASL
	117-81-7	bis(2-Ethylhexyl)phthalate	760 J	13000 (J)	ug/kg	WB-23	4/4	*-*	13		30.4537	-	-	NO	BSL
	120-12-7	Anthracene	2400	18000	ug/kg	WB-23	4/4	*-*	18		4736.53	-	-	NO	BSL
	12672-29-6	Aroclor 1248	390	1200 (J)	ug/kg	WB-23	3/4	22-22	1.2		0.176214	-	-	YES	ASL
	129-00-0	Pyrene	10000	72000	ug/kg	WB-23	4/4	*-*	72		548.166	-	-	NO	BSL
	132-64-9	Dibenzofuran	610	2800 J(J)	ug/kg	WB-21	3/4	260-260	2.8		73.0888	-	-	NO	BSL
	191-24-2	Benzo(ghi)perylene	1600	6700 (J)	ug/kg	WB-23	4/4	*-*	6.7		0.0505	-	-	YES	ASL
	193-39-5	Indeno(1,2,3-cd)pyrene	1300	4900 (J)	ug/kg	WB-23	4/4	*-*	4.9		0.504662	-	-	YES	ASL
	205-99-2	Benzo(b)fluoranthene	2600	12000 (J)	ug/kg	WB-23	4/4	*-*	12		0.504662	-	-	YES	ASL
	206-44-0	Fluoranthene	6600	36000	ug/kg	WB-23	4/4	*-*	36		631.537	-	-	NO	BSL
	207-08-9	Benzo(k)fluoranthene	2800	11000 (J)	ug/kg	WB-23	4/4	*-*	11		5.04662	-	-	YES	ASL
	218-01-9	Chrysene	8400	68000	ug/kg	WB-23	4/4	*-*	68		50.4662	-	-	YES	ASL
	50-32-8	Benzo(a)pyrene	3200	16000 (J)	ug/kg	WB-23	4/4	*-*	16		0.050466	-	-	YES	ASL
	5103-74-2	gamma-Chlordane	150 (J)	150 (J)	ug/kg	WB-23	1/4	18-52	0.15		1.73857	-	-	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	910	4000 (J)	ug/kg	WB-23	3/4	500-500	4		0.050466	-	-	YES	ASL
	56-55-3	Benzo(a)anthracene	5600 (J)	27000	ug/kg	WB-23	4/4	*-*	27		0.504662	-	-	YES	ASL
	58-89-9	gamma-BHC (Lindane)	39 (J)	39 (J)	ug/kg	WB-23	1/4	21-61	0.039		0.478521	-	-	NO	BSL
	60-57-1	Dieldrin	28 J	28 J	ug/kg	WB-23	1/4	16-47	0.028		0.026647	-	-	YES	ASL
	72-43-5	Methoxychlor	45 J(J)	45 J(J)	ug/kg	WB-23	1/4	26-76	0.045		91.361	-	-	NO	BSL
	72-54-8	4,4-DDD	73 (J)	73 (J)	ug/kg	WB-23	1/4	20-57	0.073		2.798	-	-	NO	BSL
	72-55-9	4,4'-DDE	38 (J)	81	ug/kg	WB-21	3/4	45-45	0.081		1.98123	-	-	NO	BSL
	7439-92-1	Lead	450	5200	mg/kg	WB-19	4/4	*-*	5200	11	40	-	-	YES	ASL
	7439-97-6	Mercury	7.1	15	mg/kg	WB-23	4/4	*-*	15		5.48119	-	-	YES	ASL
	7440-22-4	Silver	5.8	18	mg/kg	WB-23	4/4	*-*	18		173.027	-	-	NO	BSL
	7440-38-2	Arsenic	10	110	mg/kg	WB-19	4/4	*-*	110	3	0.39	-	-	YES	ASL
	7440-39-3	Barium	220	840	mg/kg	WB-19	4/4	*-*	840	8	2347.19	-	-	NO	BSL
	7440-43-9	Cadmium	4.5	36	mg/kg	WB-19	4/4	*-*	36		1.2	-	-	YES	ASL
	7440-47-3	Chromium	89	410	mg/kg	WB-23	4/4	*-*	410	6	210.67535	-	-	YES	ASL
	7440-50-8	Copper	300	950	mg/kg	WB-23	4/4	*-*	950	5	1280.4	-	-	NO	BSL
	7440-66-6	Zinc	470	7200 (J)	mg/kg	WB-19	4/4	*-*	7200	41	10381.6	-	-	NO	BSL
	7782-49-2	Selenium	1.6	8.8	mg/kg	WB-19	4/4	*-*	8.8		173.027	-	-	NO	BSL
	83-32-9	Acenaphthene	1200	5500 J(J)	ug/kg	WB-21	4/4	*-*	5.5		947.306	-	-	NO	BSL
	85-01-8	Phenanthrene	1900	120000	ug/kg	WB-23	4/4	*-*	120		111.3	-	-	YES	ASL
	86-73-7	Fluorene	2200	9100	ug/kg	WB-23	4/4	*-*	9.1		631.537	-	-	NO	BSL
	86-74-8	Carbazole	1600 (J)	2800 J(J)	ug/kg	WB-21	3/4	340-340	2.8		21.3176	-	-	NO	BSL
	91-20-3	Naphthalene	470 J	2300	ug/kg	WB-23	2/4	290-300	2.3		315.559	-	-	NO	BSL
	91-57-6	2-Methylnaphthalene	2000	2000	ug/kg	WB-17	1/4	950-1100	2		365.444	-	-	NO	BSL
	DDT_SUM	Total DDT	41	111	ug/kg	WB-23	3/4	61-61	0.111		1.98123	-	-	NO	BSL

Footnote Instructions:

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimatec
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High

(1) The data set includes the site characterization study as well as historical sediment sampling results.
(2) The maximum detected concentration is the concentration used for screening.
(3) The Background Value listed is the maximum detected surface sediment result from Lake Mary
(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for soil; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were utilized
(5) Rationale Codes:

Selection Reason:
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 4 Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Surface Sediment	11096-82-5	Aroclor 1260	290	290	ug/kg	WB-28	1/2	10-10	0.29		0.176214	-	-	YES	ASL
	117-81-7	bis(2-Ethylhexyl)phthalate	8700 (J)	8700 (J)	ug/kg	WB-28	1/2	920-920	8.7		30.4537	-	-	NO	BSL
	120-12-7	Anthracene	4400	320000	ug/kg	SOHL2-21	6/6	*-*	320		4736.53	-	-	NO	BSL
	12672-29-6	Aroclor 1248	400	400	ug/kg	WB-28	1/2	9.4-9.4	0.4		0.176214	-	-	YES	ASL
	129-00-0	Pyrene	17000	410000	ug/kg	SOHL2-21	6/6	*-*	410		548.166	-	-	NO	BSL
	132-64-9	Dibenzofuran	4600	7600	ug/kg	WB-27	2/2	*-*	7.6		73.0888	-	-	NO	BSL
	191-24-2	Benzo(ghi)perylene	8000	9100	ug/kg	WB-27	2/2	*-*	9.1		0.0505	-	-	YES	ASL
	193-39-5	Indeno(1,2,3-cd)pyrene	3400	43000	ug/kg	SOHL2-21	5/6	46000-46000	43		0.504662	-	-	YES	ASL
	205-99-2	Benzo(b)fluoranthene	13000	17000	ug/kg	WB-27	2/2	*-*	17		0.504662	-	-	YES	ASL
	206-44-0	Fluoranthene	14000	270000	ug/kg	SOHL2-21	6/6	*-*	270		631.537	-	-	NO	BSL
	207-08-9	Benzo(k)fluoranthene	1700	27000	ug/kg	SOHL2-21	5/6	46000-46000	27		5.04662	-	-	YES	ASL
	208-96-8	Acenaphthylene	3900	35000	ug/kg	SOHL2-21	3/6	4600-81000	35		112	-	-	NO	BSL
	218-01-9	Chrysene	10000	190000	ug/kg	SOHL2-21	6/6	*-*	190		50.4662	-	-	YES	ASL
	50-29-3	4,4-DDT	250 (J)	250 (J)	ug/kg	WB-28	1/2	53-53	0.25		1.98123	-	-	NO	BSL
	50-32-8	Benzo(a)pyrene	4200	98000	ug/kg	SOHL2-21	6/6	*-*	98		0.050466	-	-	YES	ASL
	5103-71-9	alpha-Chlordane	89 (J)	89 (J)	ug/kg	WB-28	1/2	38-38	0.089		1.73857	-	-	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	3300	4500	ug/kg	WB-27	3/6	5800-46000	4.5		0.050466	-	-	YES	ASL
	56-55-3	Benzo(a)anthracene	8500	170000	ug/kg	SOHL2-21	6/6	*-*	170		0.504662	-	-	YES	ASL
	71-43-2	Benzene	16	16	ug/kg	SOHL1-09	1/1	*-*	0.016		0.8242	-	-	NO	BSL
	72-55-9	4,4'-DDE	110	110	ug/kg	WB-28	1/2	39-39	0.11		1.98123	-	-	NO	BSL
	7429-90-5	Aluminum	3400	7100	mg/kg	SOHL2-21	4/4	*-*	7100	1,500	7614.19509	-	-	NO	BSL
	7439-89-6	Iron	15000	64000	mg/kg	SOHL2-21	4/4	*-*	64000	4,700	2346.31846	-	-	YES	ASL
	7439-92-1	Lead	180	1000 (J)	mg/kg	WB-27	6/6	*-*	1000	11	40	-	-	YES	ASL
	7439-93-2	Lithium	3	7.8	mg/kg	SOHL2-27	4/4	*-*	7.8		156.428082	-	-	NO	BSL
	7439-95-4	Magnesium	8800	13000	mg/kg	SOHL2-33	4/4	*-*	13000		-	-	-	NO	NUT
	7439-96-5	Manganese	330	890	mg/kg	SOHL2-33	4/4	*-*	890		176.235319	-	-	YES	ASL
	7439-97-6	Mercury	5.4	12	mg/kg	WB-27	2/2	*-*	12		5.48119	-	-	YES	ASL
	7439-98-7	Molybdenum	3.2	8	mg/kg	SOHL2-21	4/4	*-*	8		39.1071123	-	-	NO	BSL
	7440-02-0	Nickel	19	100	mg/kg	SOHL2-21	4/4	*-*	100		692.107	-	-	NO	BSL
	7440-09-7	Potassium	220	630	mg/kg	SOHL2-21	3/4	800-800	630	250	-	-	-	NO	NUT
	7440-22-4	Silver	2.2	65	mg/kg	SOHL2-33	6/6	*-*	65		173.027	-	-	NO	BSL
	7440-24-6	Strontium	32	52	mg/kg	SOHL2-33	4/4	*-*	52		4692.41673	-	-	NO	BSL
	7440-31-5	Tin	15	72	mg/kg	SOHL2-21	4/4	*-*	72		4692.41673	-	-	NO	BSL
	7440-32-6	Titanium	110	180	mg/kg	SOHL2-33	4/4	*-*	180		31000	-	-	NO	BSL
	7440-36-0	Antimony	28	280	mg/kg	SOHL1-09	4/4	*-*	280		13.8421	-	-	YES	ASL
	7440-38-2	Arsenic	26	40 (J)	mg/kg	WB-27	4/6	4-6.2	40	3	0.39	-	-	YES	ASL

TABLE 2.4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 4 Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	7440-39-3	Barium	110	450 (J)	mg/kg	WB-28	6/6	*-*	450	8	2347.19	-	-	NO	BSL
	7440-41-7	Beryllium	0.5	0.7	mg/kg	SOHL2-33	4/4	*-*	0.7		67.6572	-	-	NO	BSL
	7440-42-8	Boron	15	19	mg/kg	SOHL2-21	3/4	4-4	19		1562.18391	-	-	NO	BSL
	7440-43-9	Cadmium	1.9	23	mg/kg	WB-28	6/6	*-*	23		1.2	-	-	YES	ASL
	7440-47-3	Chromium	50	250	mg/kg	WB-28	6/6	*-*	250	6	210.67535	-	-	YES	ASL
	7440-48-4	Cobalt	3.5	11	mg/kg	SOHL2-21	4/4	*-*	11	2	138.027617	-	-	NO	BSL
	7440-50-8	Copper	140	580 (J)	mg/kg	WB-27	6/6	*-*	580	5	1280.4	-	-	NO	BSL
	7440-62-2	Vanadium	12	22	mg/kg	SOHL2-21	4/4	*-*	22		54.74994	-	-	NO	BSL
	7440-66-6	Zinc	420	3500	mg/kg	SOHL2-21	6/6	*-*	3500	41	10381.6	-	-	NO	BSL
	7440-70-2	Calcium	22000	40000	mg/kg	SOHL2-33	4/4	*-*	40000	54,000	-	-	-	NO	NUT
	7782-49-2	Selenium	3.2 B	3.7 (J)	mg/kg	WB-28	2/2	*-*	3.7		173.027	-	-	NO	BSL
	83-32-9	Acenaphthene	7200	1300000	ug/kg	SOHL2-21	6/6	*-*	1300		947.306	-	-	YES	ASL
	85-01-8	Phenanthrene	22000	1400000	ug/kg	SOHL2-21	6/6	*-*	1400		111.3	-	-	YES	ASL
	86-73-7	Fluorene	3100	400000	ug/kg	SOHL2-21	6/6	*-*	400		631.537	-	-	NO	BSL
	86-74-8	Carbazole	2400	8400	ug/kg	WB-27	2/2	*-*	8.4		21.3176	-	-	NO	BSL
	91-20-3	Naphthalene	4800	2900000	ug/kg	SOHL2-21	6/6	*-*	2900		315.559	-	-	YES	ASL
	91-57-6	2-Methylnaphthalene	4100	2000000	ug/kg	SOHL2-21	6/6	*-*	2000		365.444	-	-	YES	ASL
	DDT_SUM	Total DDT	360	360	ug/kg	WB-28	1/2	53-53	0.36		1.98123	-	-	NO	BSL

Footnote Instructions:

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High

(1) The data set includes the site characterization study as well as historical sediment sampling results.
(2) The maximum detected concentration is the concentration used for screening.
(3) The Background Value listed is the maximum detected surface sediment result from Lake Mary.
(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for soil; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were utilized.
(5) Rationale Codes:

Selection Reason:
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.5

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 5 Surface Sedimen

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Surface Sedime	11096-82-5	Aroclor 1260	110 (J)	140	ug/kg	WB-32	2/3	641-641	0.14		0.176214	-	-	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	3500	5000	ug/kg	WB-36	2/2	*-*	5		30.4537	-	-	NO	BSL
	120-12-7	Anthracene	670	26000	ug/kg	SD-98-25/0-2'	5/5	*-*	26		4736.53	-	-	NO	BSL
	12672-29-6	Aroclor 1248	250	676.3	ug/kg	050-88	3/3	*-*	0.6763		0.176214	-	-	YES	ASL
	129-00-0	Pyrene	5800	59000	ug/kg	SD-98-25/0-2'	5/5	*-*	59		548.166	-	-	NO	BSL
	132-64-9	Dibenzofuran	210 J	2300	ug/kg	SD-98-26/0-2'	3/4	66000-66000	2.3		73.0888	-	-	NO	BSL
	191-24-2	Benzo(ghi)perylene	1400	2200 J	ug/kg	WB-36	2/2	*-*	2.2		0.0505	-	-	YES	ASL
	193-39-5	Indeno(1,2,3-cd)pyrene	1300	1800 J	ug/kg	WB-36	2/5	11000-66000	1.8		0.504662	-	-	YES	ASL
	205-99-2	Benzo(b)fluoranthene	3500	4600	ug/kg	WB-36	2/2	*-*	4.6		0.504662	-	-	YES	ASL
	206-44-0	Fluoranthene	5300	30000	ug/kg	SD-98-25/0-2'	5/5	*-*	30		631.537	-	-	NO	BSL
	207-08-9	Benzo(k)fluoranthene	2100	4600	ug/kg	WB-36	3/5	33000-66000	4.6		5.04662	-	-	NO	BSL
	208-96-8	Acenaphthylene	610	610	ug/kg	050-88	1/5	79-66000	0.61		112	-	-	NO	BSL
	218-01-9	Chrysene	3900	37000	ug/kg	SD-98-25/0-2'	5/5	*-*	37		50.4662	-	-	NO	BSL
	50-32-8	Benzo(a)pyrene	2900	7200	ug/kg	WB-36	3/5	33000-66000	7.2		0.050466	-	-	YES	ASL
	5103-71-9	alpha-Chlordane	10 J(J)	10 J(J)	ug/kg	WB-36	1/3	13-32.1	0.01		1.73857	-	-	NO	BSL
	5103-74-2	gamma-Chlordane	27 (J)	27 (J)	ug/kg	WB-36	1/3	16-32.1	0.027		1.73857	-	-	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	620	620	ug/kg	WB-32	1/5	1100-66000	0.62		0.050466	-	-	YES	ASL
	56-55-3	Benzo(a)anthracene	2800	20000	ug/kg	SD-98-25/0-2'	5/5	*-*	20		0.504662	-	-	YES	ASL
	58-89-9	gamma-BHC (Lindane)	26 (J)	240.4	ug/kg	050-88	2/3	19-19	0.2404		0.478521	-	-	NO	BSL
	72-54-8	4,4-DDD	13 J(J)	198.7	ug/kg	050-88	2/3	17-17	0.1987		2.798	-	-	NO	BSL
	72-55-9	4,4'-DDE	27 (J)	27 (J)	ug/kg	WB-36	1/3	14-64.1	0.027		1.98123	-	-	NO	BSL
	7429-90-5	Aluminum	9900	9900	mg/kg	050-88	1/1	*-*	9900	1,500	7614.195085	-	-	YES	ASL
	7439-89-6	Iron	33000	33000	mg/kg	050-88	1/1	*-*	33000	4,700	2346.318462	-	-	YES	ASL
	7439-92-1	Lead	120	600	mg/kg	WB-36	5/5	*-*	600	11	40	-	-	YES	ASL
	7439-95-4	Magnesium	12700	12700	mg/kg	050-88	1/1	*-*	12700		-	-	-	NO	NUT
	7439-96-5	Manganese	2860	2860	mg/kg	050-88	1/1	*-*	2860		176.2353193	-	-	YES	ASL
	7439-97-6	Mercury	0.69	3.67	mg/kg	050-88	5/5	*-*	3.67		5.48119	-	-	NO	BSL
	7440-02-0	Nickel	10.5	68.9	mg/kg	SD-98-25/0-2'	3/3	*-*	68.9		692.107	-	-	NO	BSL
	7440-22-4	Silver	1.3	7.7	mg/kg	050-88	3/3	*-*	7.7		173.027	-	-	NO	BSL
	7440-36-0	Antimony	212	212	mg/kg	050-88	1/1	*-*	212		13.8421	-	-	YES	ASL
	7440-38-2	Arsenic	2.2	20.5	mg/kg	SD-98-25/0-2'	5/5	*-*	20.5	3	0.39	-	-	YES	ASL
	7440-39-3	Barium	74	500	mg/kg	050-88	3/3	*-*	500	8	2347.19	-	-	NO	BSL
	7440-43-9	Cadmium	0.94	10.3	mg/kg	050-88	5/5	*-*	10.3		1.2	-	-	YES	ASL
	7440-47-3	Chromium	28.5	207	mg/kg	050-88	5/5	*-*	207	6	210.6753498	-	-	NO	BSL
	7440-50-8	Copper	65	490	mg/kg	050-88	5/5	*-*	490	5	1280.4	-	-	NO	BSL
	7440-62-2	Vanadium	29.5	29.5	mg/kg	050-88	1/1	*-*	29.5		54.74994005	-	-	NO	BSL
	7440-66-6	Zinc	270 (J)	1320	mg/kg	SD-98-25/0-2'	5/5	*-*	1320	41	10381.6	-	-	NO	BSL
	7440-70-2	Calcium	51900	51900	mg/kg	050-88	1/1	*-*	51900	54,000	-	-	-	NO	NUT
	7782-49-2	Selenium	1.6 B	1.6 B	mg/kg	WB-36	1/3	0.49-8.1	0.0016		173.027	-	-	NO	BSL
	83-32-9	Acenaphthene	810	61000	ug/kg	SD-98-25/0-2'	4/5	11000-11000	61		947.306	-	-	NO	BSL
	85-01-8	Phenanthrene	3400	110000	ug/kg	SD-98-25/0-2'	5/5	*-*	110		111.3	-	-	NO	BSL
	86-73-7	Fluorene	460 J	27000	ug/kg	SD-98-25/0-2'	4/5	11000-11000	27		631.537	-	-	NO	BSL

TABLE 2.5

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 5 Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	86-74-8	Carbazole	870 (J)	3600 (J)	ug/kg	WB-36	2/2	*-*	3.6		21.3176	-	-	NO	BSL
	91-20-3	Naphthalene	130 J	130000	ug/kg	SD-98-25/0-2'	4/5	11000-11000	130		315.559	-	-	NO	BSL
	91-57-6	2-Methylnaphthalene	2000	79000	ug/kg	SD-98-25/0-2'	3/5	340-2300	79		365.444	-	-	NO	BSL
	DDT_SUM	Total DDT	40	198.7	ug/kg	050-88	2/3	19-19	0.1987		1.98123	-	-	NO	BSL

Footnote Instructions:
Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:
- U - Undetected
- B - Blank Contaminant
- J - Positive Result is Estimated
- UJ - Quantitation Limit is Estimated
- L - Positive Result is Biased Low
- UL - Quantitation Limit is Biased Low
- K - Positive Result is Biased High

(1) The data set includes the site characterization study as well as historical sediment sampling results.
(2) The maximum detected concentration is the concentration used for screening.
(3) The Background Value listed is the maximum detected surface sediment result from Lake Mary.
(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for soil; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were utilized.
(5) Rationale Codes:

Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)

Deletion Reason:
- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.6

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 6 Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Surface Sediment	120-12-7	Anthracene	790	540000	ug/kg	STATE2-07	14/15	33000-33000	540		4736.53	-	-	NO	BSL
	129-00-0	Pyrene	3600	830000	ug/kg	STATE2-07	14/15	33000-33000	830		548.166	-	-	YES	ASL
	132-64-9	Dibenzofuran	160	29000	ug/kg	SD-98-20/0-2'	9/9	*-*	29		73.0888	-	-	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	12000	23000	ug/kg	STATE1-05	2/13	660-440000	23		0.504662	-	-	YES	ASL
	206-44-0	Fluoranthene	2800	520000	ug/kg	STATE2-07	14/15	33000-33000	520		631.537	-	-	NO	BSL
	207-08-9	Benzo(k)fluoranthene	580	22000	ug/kg	SD-98-19/0-2'	6/15	26000-440000	22		5.04662	-	-	YES	ASL
	208-96-8	Acenaphthylene	170	25000	ug/kg	SD-98-19/0-2'	5/15	22000-440000	25		112	-	-	NO	BSL
	218-01-9	Chrysene	2400	320000	ug/kg	STATE2-07	14/15	33000-33000	320		50.4662	-	-	YES	ASL
	50-32-8	Benzo(a)pyrene	1400	160000	ug/kg	STATE2-07	12/15	33000-130000	160		0.050466	-	-	YES	ASL
	53-70-3	Dibenz(a,h)anthracene	7200	7200	ug/kg	STATE1-05	1/13	660-440000	7.2		0.050466	-	-	YES	ASL
	56-55-3	Benzo(a)anthracene	1600	330000	ug/kg	STATE2-07	14/15	33000-33000	330		0.504662	-	-	YES	ASL
	57-12-5	Cyanide	1.8	2.8	mg/kg	SD-15	3/6	0.5-0.5	2.8		365.457	-	-	NO	BSL
	71-43-2	Benzene	270	44000	ug/kg	SD-98-20/0-2'	8/12	80-50000	44		0.8242	-	-	YES	ASL
	7429-90-5	Aluminum	7100	13000	mg/kg	STATE2-20	4/4	*-*	13000	1,500	7614.19509	-	-	YES	ASL
	7439-89-6	Iron	39000	160000	mg/kg	STATE2-19	4/4	*-*	160000	4,700	2346.31846	-	-	YES	ASL
	7439-92-1	Lead	119	3400	mg/kg	STATE2-19	15/15	*-*	3400	11	40	-	-	YES	ASL
	7439-93-2	Lithium	7.4	20	mg/kg	STATE2-20	4/4	*-*	20		156.428082	-	-	NO	BSL
	7439-95-4	Magnesium	7300	13000	mg/kg	STATE2-20	4/4	*-*	13000		-	-	-	NO	NUT
	7439-96-5	Manganese	300	980	mg/kg	STATE2-19	4/4	*-*	980		176.235319	-	-	YES	ASL
	7439-97-6	Mercury	0.59	4.4	mg/kg	SD-98-21/0-2'	11/11	*-*	4.4		5.48119	-	-	NO	BSL
	7439-98-7	Molybdenum	4.5	22	mg/kg	STATE2-19	4/4	*-*	22		39.1071123	-	-	NO	BSL
	7440-02-0	Nickel	7.8	160	mg/kg	STATE2-19	13/13	*-*	160		692.107	-	-	NO	BSL
	7440-09-7	Potassium	740	1400	mg/kg	STATE2-20	3/4	700-700	1400	250	-	-	-	NO	NUT
	7440-22-4	Silver	2	15	mg/kg	STATE2-19	5/6	0.5-0.5	15		173.027	-	-	NO	BSL
	7440-24-6	Strontium	70	130	mg/kg	STATE2-20	4/4	*-*	130		4692.41673	-	-	NO	BSL
	7440-31-5	Tin	66	180	mg/kg	STATE2-19	4/4	*-*	180		4692.41673	-	-	NO	BSL
	7440-32-6	Titanium	160	220	mg/kg	STATE2-19	4/4	*-*	220		31000	-	-	NO	BSL
	7440-36-0	Antimony	28	69	mg/kg	STATE2-19	4/4	*-*	69		13.8421	-	-	YES	ASL
	7440-38-2	Arsenic	5.9	96	mg/kg	STATE2-19	14/15	25-25	96	3.1	0.39	-	-	YES	ASL
	7440-39-3	Barium	52	700	mg/kg	STATE2-19	6/6	*-*	700	8.1	2347.19	-	-	NO	BSL
	7440-41-7	Beryllium	0.6	1.2	mg/kg	STATE2-19	4/4	*-*	1.2		67.6572	-	-	NO	BSL
	7440-42-8	Boron	6.4	15	mg/kg	STATE2-07	3/4	11-11	15		1562.18391	-	-	NO	BSL
	7440-43-9	Cadmium	0.89	75	mg/kg	STATE2-19	15/15	*-*	75		1.2	-	-	YES	ASL
	7440-47-3	Chromium	13.8	340	mg/kg	STATE2-19	15/15	*-*	340	5.6	210.67535	-	-	YES	ASL
	7440-48-4	Cobalt	7.4	14	mg/kg	STATE2-19	4/4	*-*	14	2.1	138.027617	-	-	NO	BSL

TABLE 2.6

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 6 Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	7440-50-8	Copper	81.5	670	mg/kg	STATE2-19	13/13	*-*	670	5.1	1280.4	-	-	NO	BSL
	7440-62-2	Vanadium	19	35	mg/kg	STATE2-19	4/4	*-*	35		54.74994	-	-	NO	BSL
	7440-66-6	Zinc	419	7900	mg/kg	STATE2-19	13/13	*-*	7900	41	10381.6	-	-	NO	BSL
	7440-70-2	Calcium	24000	50000	mg/kg	STATE2-20	4/4	*-*	50000	54,000	-	-	-	NO	NUT
	7782-49-2	Selenium	25	25	mg/kg	SD-10	2/2	*-*	25		173.027	-	-	NO	BSL
	83-32-9	Acenaphthene	1600	1400000	ug/kg	STATE2-07	14/15	33000-33000	1400		947.306	-	-	YES	ASL
	85-01-8	Phenanthrene	2200	1900000	ug/kg	STATE2-07	14/15	33000-33000	1900		111.3	-	-	YES	ASL
	86-73-7	Fluorene	790	590000	ug/kg	STATE2-07	14/15	33000-33000	590		631.537	-	-	NO	BSL
	91-20-3	Naphthalene	3900	3800000	ug/kg	STATE2-07	14/15	33000-33000	3800		315.559	-	-	YES	ASL
	91-57-6	2-Methylnaphthalene	1400	3400000	ug/kg	STATE2-07	13/15	33000-33000	3400		365.444	-	-	YES	ASL

Footnote Instructions:

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High

(1) The data set includes the site characterization study as well as historical sediment sampling results.
(2) The maximum detected concentration is the concentration used for screening
(3) The Background Value listed is the maximum detected surface sediment result from Lake Mary.
(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for soil; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were utilized.
(5) Rationale Codes:

Selection Reason
- Infrequent Detection but Associated Historically (HIST)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)

Deletion Reason
- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.7

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 7 Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Surface Sediment	105-67-9	2,4-Dimethylphenol	93000	93000	ug/kg	WB-37	1/2	1200-1200	93		365.444	-	-	NO	BSL
	106-44-5	4-Methylphenol	7200	7200	ug/kg	WB-37	1/2	650-650	7.2		91.361	-	-	NO	BSL
	108-95-2	Phenol	5100	6180	ug/kg	UG10 Top	2/6	250-66000	6.18		8774.02	-	-	NO	BSL
	11096-82-5	Aroclor 1260	360	360	ug/kg	WB-40	1/2	7.5-7.5	0.36		0.176214	-	-	YES	ASL
	117-81-7	bis(2-Ethylhexyl)phthalate	3900	11000	ug/kg	WB-40	2/2	*-*	11		30.4537	-	-	NO	BSL
	120-12-7	Anthracene	5400	130000	ug/kg	SD-98-17S/0-2'	4/4	*-*	130		4736.53	-	-	NO	BSL
	12672-29-6	Aroclor 1248	490	13650	ug/kg	UG10 Top	3/4	6.9-6.9	13.65		0.176214	-	-	YES	ASL
	129-00-0	Pyrene	4200	190000	ug/kg	SD-98-17S/0-2'	6/6	*-*	190		548.166	-	-	NO	BSL
	132-64-9	Dibenzofuran	1800 J	22000	ug/kg	SD-98-17S/0-2'	4/4	*-*	22		73.0888	-	-	NO	BSL
	191-24-2	Benzo(ghi)perylene	4400	6500	ug/kg	WB-40	2/2	*-*	6.5		0.0505	-	-	YES	ASL
	193-39-5	Indeno(1,2,3-cd)pyrene	3900	4700	ug/kg	WB-40	2/4	3300-66000	4.7		0.504662	-	-	YES	ASL
	205-99-2	Benzo(b)fluoranthene	5400	7500	ug/kg	WB-40	2/2	*-*	7.5		0.504662	-	-	YES	ASL
	206-44-0	Fluoranthene	5900	120000	ug/kg	SD-98-17S/0-2'	6/6	*-*	120		631.537	-	-	NO	BSL
	207-08-9	Benzo(k)fluoranthene	1400	14000	ug/kg	SD-98-17S/0-2'	5/5	*-*	14		5.04662	-	-	YES	ASL
	208-96-8	Acenaphthylene	3200	33000	ug/kg	SD-98-17S/0-2'	2/4	300-3300	33		112	-	-	NO	BSL
	218-01-9	Chrysene	2570	68000	ug/kg	SD-98-17S/0-2'	5/5	*-*	68		50.4662	-	-	YES	ASL
	2378DIB_p_DIOXIN	2,3,7,8-Dibenzo-p-dioxin	0.0000073	0.0000073	ug/kg	UG-10	1/1	*-*	7.3E-09		3.89857E-06	-	-	NO	BSL
	50-29-3	4,4-DDT	90	2610	ug/kg	UG10 Top	2/4	3.9-37	2.61		1.98123	-	-	YES	ASL
	50-32-8	Benzo(a)pyrene	3600	109500	ug/kg	UG10 Top	6/6	*-*	109.5		0.050466	-	-	YES	ASL
	53-70-3	Dibenz(a,h)anthracene	1600 J	2200	ug/kg	WB-37	2/4	3300-66000	2.2		0.050466	-	-	YES	ASL
	56-55-3	Benzo(a)anthracene	170	66000	ug/kg	SD-98-17S/0-2'	5/5	*-*	66		0.504662	-	-	YES	ASL
	57-12-5	Cyanide	1	1	mg/kg	SD-98-16/0-2'	1/1	*-*	1		365.457	-	-	NO	BSL
	58-89-9	gamma-BHC (Lindane)	50	260	ug/kg	UG-10	2/4	3.9-37	0.26		0.478521	-	-	NO	BSL
	60-57-1	Dieldrin	1140	2830	ug/kg	UG10 Top	2/4	3-28	2.83		0.026647	-	-	YES	ASL
	71-43-2	Benzene	1000	25000	ug/kg	SD-98-17S/0-2'	2/2	*-*	25		0.8242	-	-	YES	ASL
	72-55-9	4,4'-DDE	3.8 J(J)	6800	ug/kg	UG10 Top	4/4	*-*	6.8		1.98123	-	-	YES	ASL
	7439-89-6	Iron	2310	2310	mg/kg	UG-10	1/1	*-*	2310	4,700	2346.318462	-	-	NO	BKG
	7439-92-1	Lead	184	1306	mg/kg	UG-10	5/5	*-*	1306	11	40	-	-	YES	ASL
	7439-95-4	Magnesium	7239	7239	mg/kg	UG-10	1/1	*-*	7239		-	-	-	NO	NUT
	7439-96-5	Manganese	614	614	mg/kg	UG-10	1/1	*-*	614		176.2353193	-	-	YES	ASL
	7439-97-6	Mercury	0.55	6.3	mg/kg	WB-37	4/4	*-*	6.3		5.48119	-	-	YES	ASL
	7440-02-0	Nickel	3.5	55	mg/kg	UG-10	3/3	*-*	55		692.107	-	-	NO	BSL
	7440-22-4	Silver	2.4	8.1	mg/kg	WB-40	2/2	*-*	8.1		173.027	-	-	NO	BSL
	7440-38-2	Arsenic	5.2	24 (J)	mg/kg	WB-40	4/4	*-*	24	3	0.39	-	-	YES	ASL
	7440-39-3	Barium	200 (J)	450 (J)	mg/kg	WB-40	2/2	*-*	450	8	2347.19	-	-	NO	BSL
	7440-43-9	Cadmium	1.5	18	mg/kg	UG-10	5/5	*-*	18		1.2	-	-	YES	ASL
	7440-47-3	Chromium	5.4	180	mg/kg	WB-40	5/5	*-*	180	6	210.6753498	-	-	NO	BSL
	7440-50-8	Copper	37	450 (J)	mg/kg	WB-40	5/5	*-*	450	5	1280.4	-	-	NO	BSL
	7440-66-6	Zinc	125	1900 (J)	mg/kg	WB-40	5/5	*-*	1900	41	10381.6	-	-	NO	BSL

TABLE 2.7

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Reach 7 Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	76-44-8	Heptachlor	160	190	ug/kg	UG-10	2/4	2.8-26	0.19		0.053618	-	-	YES	ASL
	7782-49-2	Selenium	2.7	3.8	mg/kg	WB-40	2/2	*-*	3.8		173.027	-	-	NO	BSL
	8001-35-2	Toxaphene	1140	2050	ug/kg	UG-10	2/4	14-130	2.05		0.38608	-	-	YES	ASL
	83-32-9	Acenaphthene	5300	340000	ug/kg	SD-98-17S/0-2'	4/4	*-*	340		947.306	-	-	NO	BSL
	84-74-2	Di-n-butylphthalate	1800	1800	ug/kg	WB-37	1/2	400-400	1.8		1827.22	-	-	NO	BSL
	85-01-8	Phenanthrene	2550	440000	ug/kg	SD-98-17S/0-2'	6/6	*-*	440		111.3	-	-	YES	ASL
	86-73-7	Fluorene	4900	160000	ug/kg	SD-98-17S/0-2'	4/4	*-*	160		631.537	-	-	NO	BSL
	86-74-8	Carbazole	1500	1500	ug/kg	WB-37	1/2	470-470	1.5		21.3176	-	-	NO	BSL
	91-20-3	Naphthalene	4610	820000	ug/kg	SD-98-17S/0-2'	6/6	*-*	820		315.559	-	-	YES	ASL
	91-57-6	2-Methylnaphthalene	10000	630000	ug/kg	SD-98-17S/0-2'	4/4	*-*	630		365.444	-	-	YES	ASL
	DDT_SUM	Total DDT	3.8	2800	ug/kg	UG-10	3/3	*-*	2.8		1.98123	-	-	YES	ASL
	HCCH-SUM	Hexachlorocyclohexane-all isomers	260	260	ug/kg	UG-10	1/1	*-*	0.26		0.315754425	-	-	NO	BSL

Footnote Instructions:
Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:
U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High

(1) The data set includes the site characterization study as well as historical sediment sampling results.
(2) The maximum detected concentration is the concentration used for screening.
(3) The Background Value listed is the maximum detected surface sediment result from Lake Mary.
(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for soil; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were utilized.
(5) Rationale Codes:

Selection Reason:
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.8

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Roxanna Marsh Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Surface Sediment	1024-57-3	Heptachlor epoxide	6.7 J	15 JP	ug/Kg	RM-19	2/25	17-1200	0.015		0.046852	-	-	NO	BSL
	1031-07-8	Endosulfan sulfate	3.7 JP	41 J	ug/Kg	RM-18	15/21	33-2400	0.041		109.633	-	-	NO	BSL
	11096-82-5	Aroclor 1260	120 J	2100 J	ug/Kg	RM-19	18/25	33-13000	2.1		0.176214	-	-	YES	ASL
	11097-69-1	Aroclor 1254	32	13000 (j)	ug/Kg	RM-19	21/25	330-3300	13		0.176214	-	-	YES	ASL
	120-12-7	Anthracene	260	26000	ug/Kg	RM-17	6/25	290-1900	26		4736.53	-	-	NO	BSL
	12672-29-6	Aroclor 1248	210 (j)	6900	ug/Kg	RM-01	20/25	33-3300	6.9		0.176214	-	-	YES	ASL
	129-00-0	Pyrene	620	580000 (j)	ug/kg	RM-17	23/25	660-660	580		548.166	-	-	YES	ASL
	191-24-2	Benzo(ghi)perylene	3200	89000 (j)	ug/Kg	RM-17	21/21	*-*	89		0.0505	-	-	YES	ASL
	193-39-5	Indeno(1,2,3-cd)pyrene	2400	74000	ug/Kg	RM-17	21/25	330-660	74		0.504662	-	-	YES	ASL
	205-99-2	Benzo(b)fluoranthene	980	84000	ug/Kg	RM-19	21/21	*-*	84		0.504662	-	-	YES	ASL
	206-44-0	Fluoranthene	530	100000	ug/Kg	RM-17	21/25	460-660	100		631.537	-	-	NO	BSL
	207-08-9	Benzo(k)fluoranthene	1000	14000	ug/Kg	RM-05	6/25	330-5700	14		5.04662	-	-	YES	ASL
	208-96-8	Acenaphthylene	300	4200	ug/Kg	RM-20	4/25	330-6100	4.2		112	-	-	NO	BSL
	218-01-9	Chrysene	400	370000	ug/kg	RM-17	22/25	660-660	370		50.4662	-	-	YES	ASL
	309-00-2	Aldrin	17 JP	17 JP	ug/Kg	RM-19	1/21	17-1200	0.017		0.024914	-	-	NO	BSL
	319-85-7	beta-BHC	0.99 JP	47 JP	ug/Kg	RM-05	13/21	22-1200	0.047		0.345598	-	-	NO	BSL
	319-86-8	delta-BHC	23 J	23 J	ug/Kg	RM-19	1/21	17-1200	0.023		0.315754425	-	-	NO	BSL
	50-29-3	4,4-DDT	14 JP	390 J	ug/Kg	RM-17	11/25	33-340	0.39		1.98123	-	-	NO	BSL
	50-32-8	Benzo(a)pyrene	570	50000	ug/Kg	RM-17	21/25	330-660	50		0.050466	-	-	YES	ASL
	5103-71-9	alpha-Chlordane	1.2 J	120 J	ug/Kg	RM-12	13/25	17-12000	0.12		1.73857	-	-	NO	BSL
	5103-74-2	gamma-Chlordane	2.1 J	130 J	ug/Kg	RM-12	13/25	17-11000	0.13		1.73857	-	-	NO	BSL
	53494-70-5	Endrin ketone	6.85 J-JP	110 J	ug/Kg	RM-05	4/21	33-2400	0.11		5.48166	-	-	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	2500	73000	ug/Kg	RM-17	11/25	330-2900	73		0.050466	-	-	YES	ASL
	56-55-3	Benzo(a)anthracene	460	160000	ug/Kg	RM-17	21/25	330-660	160		0.504662	-	-	YES	ASL
	57-12-5	Cyanide	0.68	1.1	mg/kg	01RA02SE00	2/4	0.5-0.5	1.1		365.457	-	-	NO	BSL
	58-89-9	gamma-BHC (Lindane)	1.2 JP	11 JP	ug/Kg	RM-05	4/25	17-1200	0.011		0.478521	-	-	NO	BSL
	60-57-1	Dieldrin	3.2 JP	36 JP	ug/Kg	RM-12	6/25	33-2400	0.036		0.026647	-	-	YES	ASL
	72-20-8	Endrin	92 (j)	92 (j)	ug/kg	RM-19	1/25	33-2400	0.092		5.48166	-	-	NO	BSL
	72-43-5	Methoxychlor	23 J	1000 JP	ug/Kg	RM-17	4/21	170-11000	1		91.361	-	-	NO	BSL
	72-54-8	4,4-DDD	10 J	790	ug/Kg	RM-05	18/25	34-2400	0.79		2.798	-	-	NO	BSL
	72-55-9	4,4'-DDE	5 J	93 J	ug/Kg	RM-05	13/25	34-2400	0.093		1.98123	-	-	NO	BSL
	7439-89-6	Iron	1730	12800	mg/kg	01RA01SE00	4/4	*-*	12800	4,700	2346.318462	-	-	YES	ASL
	7439-92-1	Lead	13.7	8800 (j)	mg/Kg	RM-17	25/25	*-*	8800	11	40	-	-	YES	ASL
	7439-97-6	Mercury	0.14	7.8 (j)	mg/Kg	RM-12	24/25	0.1-0.1	7.8		5.48119	-	-	YES	ASL
	7440-02-0	Nickel	4.4	40.4	mg/kg	01RA01SE00	4/4	*-*	40.4		692.107	-	-	NO	BSL
	7440-22-4	Silver	1.4 B	50	mg/Kg	RM-18	23/25	1-1	50		173.027	-	-	NO	BSL

TABLE 2.8

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Sediment
Exposure Medium: Roxanna Marsh Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
	7440-31-5	Tin	39.2	152	mg/kg	01RA01SE00	3/4	10-10	152		4692.416726	-	-	NO	BSL
	7440-36-0	Antimony	6.7	6.7	mg/kg	01RA01SE00	1/4	6-6	6.7		13.8421	-	-	NO	BSL
	7440-38-2	Arsenic	0.96	150	mg/Kg	RM-18	25/25	*-*	150	3	0.39	-	-	YES	ASL
	7440-39-3	Barium	52	680	mg/kg	RM-01	24/25	20-20	680	8	2347.19	-	-	NO	BSL
	7440-43-9	Cadmium	1.6 B	72	mg/kg	RM-18	24/25	0.5-0.5	72		1.2	-	-	YES	ASL
	7440-47-3	Chromium	2.6	1300	mg/Kg	RM-18	25/25	*-*	1300	6	210.6753498	-	-	YES	ASL
	7440-50-8	Copper	9.3	212	mg/kg	01RB01SE00	4/4	*-*	212	5	1280.4	-	-	NO	BSL
	7440-66-6	Zinc	72.2	737	mg/kg	01RA01SE00	4/4	*-*	737	41	10381.6	-	-	NO	BSL
	7782-49-2	Selenium	0.97	43	mg/Kg	RM-18	25/25	*-*	43		173.027	-	-	NO	BSL
	83-32-9	Acenaphthene	3100	4700	ug/Kg	RM-19	2/25	260-6900	4.7		947.306	-	-	NO	BSL
	85-01-8	Phenanthrene	720	6200	ug/Kg	RM-19	5/24	330-7800	6.2		111.3	-	-	NO	BSL
	86-73-7	Fluorene	3100	21000	ug/Kg	RM-19	5/25	280-3300	21		631.537	-	-	NO	BSL
	959-98-8	Endosulfan I	6.2 JP	32 JP	ug/Kg	RM-19	4/21	17-1200	0.032		109.633	-	-	NO	BSL
	DDT_SUM	Total DDT	17 J	883 J	ug/Kg	RM-05	21/25	34-340	0.883		1.98123	-	-	NO	BSL

Footnote Instructions:

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High

(1) The data set includes the site characterization study as well as historical sediment sampling results.

(2) The maximum detected concentration is the concentration used for screening.

(3) The Background Value listed is the maximum detected surface sediment result from Lake Mary.

(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for soil; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were utilized

(5) Rationale Codes:

Selection Reason:
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.9
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Reach 1 Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/L) (2)	Background Value (mg/L) (3)	Screening Toxicity Value (mg/L) (4)	Potential ARAR/TBC Value (mg/L)	Potential ARAR/TBC Source (5)	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Surface Water	206-44-0	Fluoranthene	0.67 J	0.67 J	ug/l	WS-1	1/1	*-*	0.00067		0.146	0.0094	GLWQC	NO	BSL
	33213-65-9_D	Endosulfan II (Dissolved)	0.011 P (J)	0.011 P (J)	ug/l	WS-1	1/1	*-*	0.000011		0.0219	0.085	GLWQC	NO	BSL
	7439-92-1	Lead	2.67	2.67	ug/l	WS-1	1/1	*-*	0.00267		0.0015			YES	ASL
	7439-92-1_D	Lead (Dissolved)	0.603	0.603	ug/l	WS-1	1/1	*-*	0.000603		0.0015			NO	BSL
	7440-22-4	Silver	0.02 B	0.02 B	ug/l	WS-1	1/1	*-*	0.00002		0.01825	0.13	GLWQC	NO	BSL
	7440-22-4_D	Silver (Dissolved)	0.02 B	0.02 B	ug/l	WS-1	1/1	*-*	0.00002		0.01825	0.13	GLWQC	NO	BSL
	7440-38-2	Arsenic	5.8	5.8	ug/l	WS-1	1/1	*-*	0.0058		0.00005678	0.01	GLWQC	YES	ASL
	7440-38-2_D	Arsenic (Dissolved)	5.5	5.5	ug/l	WS-1	1/1	*-*	0.0055		0.00005678	0.01	GLWQC	YES	ASL
	7440-39-3	Barium	9.01	9.01	ug/l	WS-1	1/1	*-*	0.00901		0.2555			NO	BSL
	7440-39-3_D	Barium (Dissolved)	8.94	8.94	ug/l	WS-1	1/1	*-*	0.00894		0.2555			NO	BSL
	7440-43-9	Cadmium	0.09	0.09	ug/l	WS-1	1/1	*-*	0.00009		0.001825	0.014	GLWQC	NO	BSL
	7440-43-9_D	Cadmium (Dissolved)	0.09	0.09	ug/l	WS-1	1/1	*-*	0.00009		0.001825	0.014	GLWQC	NO	BSL
	7440-47-3	Chromium	1.2	1.2	ug/l	WS-1	1/1	*-*	0.0012		0.01095	0.23	GLWQC	NO	BSL
	7440-47-3_D	Chromium (Dissolved)	0.6	0.6	ug/l	WS-1	1/1	*-*	0.0006		0.01095	0.23	GLWQC	NO	BSL
	7440-50-8	Copper	2.8	2.8	ug/l	WS-1	1/1	*-*	0.0028		0.13505	0.28	GLWQC	NO	BSL
	7440-50-8_D	Copper (Dissolved)	2.5	2.5	ug/l	WS-1	1/1	*-*	0.0025		0.13505	0.28	GLWQC	NO	BSL
	7440-66-6	Zinc	49.1	49.1	ug/l	WS-1	1/1	*-*	0.0491		1.095	9	GLWQC	NO	BSL
	7440-66-6_D	Zinc (Dissolved)	45.3	45.3	ug/l	WS-1	1/1	*-*	0.0453		1.095	9	GLWQC	NO	BSL

Footnote Instructions:
Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:
- U - Undetected
- B - Blank Contaminant
- J - Positive Result is Estimated
- UJ - Quantitation Limit is Estimated
- L - Positive Result is Biased Low
- UL - Quantitation Limit is Biased Low
- K - Positive Result is Biased High
- P - The relative percent difference between the two columns for detected concentrations was greater than 40%

(1) The data set includes the site characterization study
(2) The maximum detected concentration is the concentration used for screening
(3) There is no background data for surface water.
(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for groundwater; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were utilize
(5) Great Lakes Water Quality Criteria ARAR/TBC values used. Last updated December 2001. ARAR for Chromium IV was used for Chromium (Total Dissolved) and Chromium (Total)
(6) Rationale Codes:

Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)

Deletion Reason:
- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.10
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Reach 4 Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/L) (2)	Background Value (mg/L) (3)	Screening Toxicity Value (mg/L) (4)	Potential ARAR/TBC Value (mg/L)	Potential ARAR/TBC Source (5)	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Surface Water	7439-92-1	Lead	5.03	5.03	ug/L	WS-2	1/1	*-*	0.00503		0.0015			YES	ASL
	7439-92-1_D	Lead (Dissolved)	0.319	0.319	ug/L	WS-2	1/1	*-*	0.000319		0.0015			NO	BSL
	7440-38-2	Arsenic	3.9	3.9	ug/L	WS-2	1/1	*-*	0.0039		0.00005678	0.01	GLWQC	YES	ASL
	7440-38-2_D	Arsenic (Dissolved)	2.7	2.7	ug/L	WS-2	1/1	*-*	0.0027		0.00005678	0.01	GLWQC	YES	ASL
	7440-39-3	Barium	13.9	13.9	ug/L	WS-2	1/1	*-*	0.0139		0.2555			NO	BSL
	7440-39-3_D	Barium (Dissolved)	7.94	7.94	ug/L	WS-2	1/1	*-*	0.00794		0.2555			NO	BSL
	7440-43-9	Cadmium	0.14	0.14	ug/L	WS-2	1/1	*-*	0.00014		0.001825	0.014	GLWQC	NO	BSL
	7440-43-9_D	Cadmium (Dissolved)	0.05	0.05	ug/L	WS-2	1/1	*-*	0.00005		0.001825	0.014	GLWQC	NO	BSL
	7440-47-3	Chromium	3.08	3.08	ug/L	WS-2	1/1	*-*	0.00308		0.01095	0.23	GLWQC	NO	BSL
	7440-47-3_D	Chromium (Dissolved)	1.67	1.67	ug/L	WS-2	1/1	*-*	0.00167		0.01095	0.23	GLWQC	NO	BSL
	7440-50-8	Copper	7.76	7.76	ug/L	WS-2	1/1	*-*	0.00776		0.13505	0.28	GLWQC	NO	BSL
	7440-50-8_D	Copper (Dissolved)	2.01	2.01	ug/L	WS-2	1/1	*-*	0.00201		0.13505	0.28	GLWQC	NO	BSL
	7440-66-6	Zinc	32.2	32.2	ug/L	WS-2	1/1	*-*	0.0322		1.095	9	GLWQC	NO	BSL
	7440-66-6_D	Zinc (Dissolved)	16.9	16.9	ug/L	WS-2	1/1	*-*	0.0169		1.095	9	GLWQC	NO	BSL

Footnote Instructions:
Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.
Qualifier Definitions:
U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High
(1) The data set includes the site characterization study.
(2) The maximum detected concentration is the concentration used for screening.
(3) There is no background data for surface water.
(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for groundwater; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were util
(5) Great Lakes Water Quality Criteria ARAR/TBC values used. Last updated December 2001. ARAR for Chromium IV was used for Chromium (Total Dissolved) and Chromium (Total
(6) Rationale Codes:
Selection Reason
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)
Deletion Reason
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.11
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Reach 6 Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/L) (2)	Background Value (mg/L) (3)	Screening Toxicity Value (mg/L) (4)	Potential ARAR/TBC Value (mg/L)	Potential ARAR/TBC Source (5)	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Surface Water	124-48-1	Chlorodibromomethane	0.9	1.5	ug/L	SW-98-07	4/4	1.0-1.0	0.0015		0	0.004	GLWQC	YES	ASL
	7439-92-1	Lead (Total)	0.0058	0.011 J	mg/L	SW-98-05	4/4	*-*	0.011		0.0015			YES	ASL
	7440-02-0	Nickel (Total)	0.0063	0.0073 J	mg/L	SW-98-05	4/4	*-*	0.0073		0.073	0.46	GLWQC	NO	BSL
	7440-38-2	Arsenic (Total)	0.0036	0.0044	mg/L	SW-98-05	3/4	0.005-0.005	0.0044		0.00005678	0.01	GLWQC	YES	ASL
	7440-50-8	Copper (Total)	0.0088	0.0115J	mg/L	SW-98-05	4/4	*-*	0.0115		0.13505	0.28	GLWQC	NO	BSL
	7440-66-6	Zinc (Total)	0.064	0.079 J	mg/L	SW-98-05	4/4	*-*	0.079		1.095	9	GLWQC	NO	BSL
	75-25-2	Bromoform	2.3	4.4	ug/L	SW-98-08	4/4	1.0-1.0	0.0044		0.011	0.042	GLWQC	NO	BSL
	91-20-3	Naphthalene	1.15	1.15	ug/L	SW-98-05	1/4	1.0-1.0	0.00115		0.00082758	0.49	GLWQC	YES	ASL

Footnote Instructions: U - Undetected L - Positive Result is Biased Low
Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.
Qualifier Definitions: B - Blank Contaminant UL - Quantitation Limit is Biased Low
J - Positive Result is Estimated K - Positive Result is Biased High
UJ - Quantitation Limit is Estimated

(1) The data set includes data from the NIPSCO site investigation.
(2) The maximum detected concentration is the concentration used for screening.
(3) There is no background data for surface water.
(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for groundwater; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were utilized.
(5) Great Lakes Water Quality Criteria ARAR/TBC values used. Last updated December 2001.
(6) Rationale Codes:

Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)

Deletion Reason:
- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.12
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Reach 5 Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Date and Time of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/L) (2)	Background Value (mg/L) (3)	Screening Toxicity Value (mg/L) (4)	Potential ARAR/TBC Value (mg/L)	Potential ARAR/TBC Source (5)	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Surface Water	57-12-5_CA	Cyanide (Chlorine Amenable)	0.005	0.005	mg/L	02/25/2002 3:40:00 PM	1/2	0.005-0.005	0.005		0.073	0.6	GLWQC	NO	BSL
	57-12-5_T	Cyanide (Total)	0.005	0.013	mg/L	12/18/2002 2:40:00 PM	2/19	0.005-0.005	0.013		0.073	0.6	GLWQC	NO	BSL
	7429-90-5	Aluminum (Total)	50.2	3390	ug/L	12/18/2002 2:40:00 PM	16/19	50-50	3.39		3649.86678	0.97	GLWQC	YES	ASL
	7429-90-5_D	Aluminum (Dissolved)	45.7	45.7	ug/L	12/18/2002 2:40:00 PM	1/19	30-30	0.0457		3649.86678	0.97	GLWQC	NO	BSL
	7439-89-6	Iron (Total)	228	4560	ug/L	12/18/2002 2:40:00 PM	19/19	*-*	4.56		1094.98801			NO	BSL
	7439-89-6_D	Iron (Dissolved)	28.1	296	ug/L	12/18/2002 2:40:00 PM	19/19	*-*	0.296		1094.98801			NO	BSL
	7439-92-1	Lead (Total)	2.02 Pr	69.8	ug/L	12/18/2002 2:40:00 PM	19/19	*-*	0.0698		0.0015			YES	ASL
	7439-92-1_D	Lead (Dissolved)	1.01	2.15	ug/L	12/18/2002 2:40:00 PM	2/19	1-1	0.00215		0.0015			YES	ASL
	7439-96-5	Manganese (Total)	16.6	193	ug/L	12/18/2002 2:40:00 PM	19/19	*-*	0.193		87.59992326			NO	BSL
	7439-96-5_D	Manganese (Dissolved)	15.26	160 Pr	ug/L	03/19/2003 2:30:00 PM	19/19	*-*	0.16		87.59992326			NO	BSL
	7440-02-0	Nickel (Total)	3.88 Pr	8.8 Pr	ug/L	06/11/2003 5:50:00 PM	19/19	*-*	0.0088		0.073	0.46	GLWQC	NO	BSL
	7440-02-0_D	Nickel (Dissolved)	2.77	6.65	ug/L	07/24/2002 6:00:00 PM	19/19	*-*	0.00665		0.073	0.46	GLWQC	NO	BSL
	7440-22-4	Silver (Total)	1.19	1.19	ug/L	12/18/2002 2:40:00 PM	1/19	1-1	0.00119		0.01825	0.13	GLWQC	NO	BSL
	7440-38-2	Arsenic (Total)	2.4 Pr	5.4	ug/L	09/23/2002 3:10:00 PM	19/19	*-*	0.0054		0.00005678	0.01	GLWQC	YES	ASL
	7440-38-2_D	Arsenic (Dissolved)	1.4	4.17	ug/L	09/23/2002 3:10:00 PM	19/19	*-*	0.00417		0.00005678	0.01	GLWQC	YES	ASL
	7440-39-3	Barium (Total)	15.7 Pr	88.4	ug/L	12/18/2002 2:40:00 PM	19/19	*-*	0.0884		0.2555			NO	BSL
	7440-39-3_D	Barium (Dissolved)	8.93	32.9	ug/L	12/18/2002 2:40:00 PM	19/19	*-*	0.0329		0.2555			NO	BSL
	7440-43-9	Cadmium (Total)	1.68	1.68	ug/L	12/18/2002 2:40:00 PM	1/19	1.1	0.00168		0.001825	0.014	GLWQC	NO	BSL
	7440-47-3	Chromium (Total)	1.26 Pr	19.8	ug/L	12/18/2002 2:40:00 PM	18/19	1.2-1.2	0.0198		0.01095	0.23	GLWQC	YES	ASL
	7440-47-3_TD	Chromium (Dissolved)	1.2	3.76 Pr	ug/L	06/11/2003 5:50:00 PM	16/19	1.2-1.2	0.00376		0.01095	0.23	GLWQC	NO	BSL
	7440-50-8	Copper (Total)	2.15 Pr	77.1	ug/L	12/18/2002 2:40:00 PM	19/19	*-*	0.0771		0.13505	0.28	GLWQC	NO	BSL
	7440-50-8_D	Copper (Dissolved)	1.01	4.44	ug/L	12/18/2002 2:40:00 PM	17/19	1-1	0.00444		0.13505	0.28	GLWQC	NO	BSL
	7440-66-6	Zinc (Total)	18.4	370	ug/L	12/18/2002 2:40:00 PM	19/19	*-*	0.37		1.095	9	GLWQC	NO	BSL
	7440-66-6_D	Zinc (Dissolved)	4.29	56.428	ug/L	03/27/2002 5:00:00 PM	19/19	*-*	0.056428		1.095	9	GLWQC	NO	BSL
	7782-49-2	Selenium (Total)	1.2	1.97	ug/L	05/13/2002 6:20:00 PM	3/19	1.2-2.0	0.00197		0.01825	0.14	GLWQC	NO	BSL
	7782-49-2_D	Selenium (Dissolved)	1.28	1.68 Pr	ug/L	06/11/2003 5:50:00 PM	10/19	1.2-2.0	0.00168		0.01825	0.14	GLWQC	NO	BSL

Footnote Instructions:
Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:
U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High
Pr - Preliminary

(1) The data set includes monthly monitoring data from the Hammond Sanitary District.
(2) The maximum detected concentration is the concentration used for screening.
(3) There is no background data for surface water.
(4) The Screening Toxicity Value is one-tenth the IDEM Residential Closure Criteria for groundwater; Where IDEM values were unavailable, USEPA Region 9 Residential PRGs were utilized.
(5) Great Lakes Water Quality Criteria ARAR/TBC values used. Last updated December 2001. ARAR for Chromium IV was used for Chromium (Total Dissolved) and Chromium (Total).
(6) Rationale Codes:

Selection Reason:
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

TABLE 2.13

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 1 Carp Fillet

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Carp Fillet	120-12-7	Anthracene	0.007	0.007	mg/kg	TK7160	1/1	*-*	0.007	--	--	-	-	YES	ASL
	129-00-0	Pyrene	0.006	0.006	mg/kg	TK7160	1/1	*-*	0.006	--	--	-	-	YES	ASL
	206-44-0	Fluoranthene	0.004	0.004	mg/kg	TK7160	1/1	*-*	0.004	--	--	-	-	YES	ASL
	208-96-8	Acenaphthylene	0.005	0.005	mg/kg	TK7160	1/1	*-*	0.005	--	--	-	-	YES	ASL
	39765-80-5	Trans nonachlor	0.035	0.035	mg/kg	TK7160	1/1	*-*	0.035	--	--	-	-	YES	ASL
	5103-71-9	Chlordane - alpha	0.024	0.024	mg/kg	TK7160	1/1	*-*	0.024	--	--	-	-	YES	ASL
	5103-74-2	Chlordane - gamma	0.018 J-	0.018 J-	mg/kg	TK7160	1/1	*-*	0.018	--	--	-	-	YES	ASL
	53-19-0	o,p'-DDD	0.047	0.047	mg/kg	TK7160	1/1	*-*	0.047	--	--	-	-	YES	ASL
	72-54-8	p,p'-DDD	0.197	0.197	mg/kg	TK7160	1/1	*-*	0.197	--	--	-	-	YES	ASL
	72-55-9	p,p'-DDE	0.15	0.15	mg/kg	TK7160	1/1	*-*	0.15	--	--	-	-	YES	ASL
	7439-89-6	Iron	32.864	32.864	mg/kg	TK7160	1/1	*-*	32.864	--	--	-	-	YES	ASL
	7440-09-7	Potassium	15023.474	15023.474	mg/kg	TK7160	1/1	*-*	15023.474	--	--	-	-	NO	NUT
	7440-47-3	Chromium	0.516	0.516	mg/kg	TK7160	1/1	*-*	0.516	--	--	-	-	YES	ASL
	7440-50-8	Copper	3.192	3.192	mg/kg	TK7160	1/1	*-*	3.192	--	--	-	-	YES	ASL
	7440-66-6	Zinc	122.066	122.066	mg/kg	TK7160	1/1	*-*	122.066	--	--	-	-	YES	ASL
	7782-49-2	Selenium	7.981	7.981	mg/kg	TK7160	1/1	*-*	7.981	--	--	-	-	YES	ASL
	83-32-9	Acenaphthene	0.013	0.013	mg/kg	TK7160	1/1	*-*	0.013	--	--	-	-	YES	ASL
	85-01-8	Phenanthrene	0.007	0.007	mg/kg	TK7160	1/1	*-*	0.007	--	--	-	-	YES	ASL
	86-73-7	Fluorene	0.023	0.023	mg/kg	TK7160	1/1	*-*	0.023	--	--	-	-	YES	ASL
	90-12-0	1-Methylnaphthalene	0.007	0.007	mg/kg	TK7160	1/1	*-*	0.007	--	--	-	-	YES	ASL
	91-57-6	2-Methylnaphthalene	0.008	0.008	mg/kg	TK7160	1/1	*-*	0.008	--	--	-	-	YES	ASL

Footnote Instructions:

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High
J- - Value estimated with a low bias

(1) The data set includes fillet fish tissue sample results collected by IDEM and USFWS.
(2) The maximum detected concentration is the concentration used for screening.
(3) There are no background data for fish tissue.
(4) There are no Screening Toxicity Values for fish tissue.
(5) Rationale Codes:

Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

Table 2.13 (continued)
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Reach 1 Carp FILLET	12674-11-2	Aroclor 1016	-	-	ug/kg	-	0/1	230-230	-	-	-	-	-	YES	ASL
	11104-28-2	Aroclor 1221	-	-	ug/kg	-	0/1	230-230	-	-	-	-	-	YES	ASL
	11141-16-5	Aroclor 1232	-	-	ug/kg	-	0/1	230-230	-	-	-	-	-	YES	ASL
	53469-21-9	Aroclor 1242	-	-	ug/kg	-	0/1	230-230	-	-	-	-	-	YES	ASL
	12672-29-6	Aroclor 1248	2300	2300	ug/kg	TK7160	1/1	*-*	2300	-	-	-	-	YES	ASL
	11097-69-1	Aroclor 1254	-	-	ug/kg	-	0/1	230-230	-	-	-	-	-	YES	ASL
	11096-82-5	Aroclor 1260	1200	1200	ug/kg	TK7160	1/1	*-*	1200	-	-	-	-	YES	ASL
	32598-14-4	PCB 105 (BZ)	22000	22000	ng/kg	TK7160	1/1	*-*	22000	-	-	-	-	YES	ASL
	74472-37-0	PCB 114 (BZ)	1500	1500	ng/kg	TK7160	1/1	*-*	1500	-	-	-	-	YES	ASL
	31508-00-6	PCB 118 (BZ)	46000	46000	ng/kg	TK7160	1/1	*-*	46000	-	-	-	-	YES	ASL
	65510-44-3	PCB 123 (BZ)	1200	1200	ng/kg	TK7160	1/1	*-*	1200	-	-	-	-	YES	ASL
	57465-28-8	PCB 126 (BZ)	90	90	ng/kg	TK7160	1/1	*-*	90	-	-	-	-	YES	ASL
	74472-42-7	PCB 158 (BZ)	3700	3700	ng/kg	TK7160	1/1	*-*	3700	-	-	-	-	YES	ASL
	52663-72-6	PCB 167 (BZ)	1500	1500	ng/kg	TK7160	1/1	*-*	1500	-	-	-	-	YES	ASL
	32774-16-6	PCB 169 (BZ)	-	-	ng/kg	-	0/1	28-28	-	-	-	-	-	YES	ASL
	35065-30-6	PCB 170 (BZ)	8900	8900	ng/kg	TK7160	1/1	*-*	8900	-	-	-	-	YES	ASL
	74472-48-3	PCB 184 (BZ)	5.8	5.8 KD	ng/kg	TK7160	1/1	*-*	5.8 KD	-	-	-	-	YES	ASL
	52663-68-0	PCB 187 (BZ)	17000	17000	ng/kg	TK7160	1/1	*-*	17000	-	-	-	-	YES	ASL
	39635-31-9	PCB 189 (BZ)	330	330	ng/kg	TK7160	1/1	*-*	330	-	-	-	-	YES	ASL
	52663-78-2	PCB 195 (BZ)	1800	1800	ng/kg	TK7160	1/1	*-*	1800	-	-	-	-	YES	ASL
	40186-72-9	PCB 206 (BZ)	1800	1800	ng/kg	TK7160	1/1	*-*	1800	-	-	-	-	YES	ASL
	2051-24-3	PCB 209 (BZ)	570	570	ng/kg	TK7160	1/1	*-*	570	-	-	-	-	YES	ASL
	38444-90-5	PCB 37 (BZ)	690	690 KD	ng/kg	TK7160	1/1	*-*	690 KD	-	-	-	-	YES	ASL
	35693-99-3	PCB 52 (BZ)	97000	97000	ng/kg	TK7160	1/1	*-*	97000	-	-	-	-	YES	ASL
	32598-10-0	PCB 66 (BZ)	60000	60000	ng/kg	TK7160	1/1	*-*	60000	-	-	-	-	YES	ASL
	32598-13-3	PCB 77 (BZ)	690	690	ng/kg	TK7160	1/1	*-*	690	-	-	-	-	YES	ASL
	34883-43-7	PCB 8 (BZ)	3000	3000	ng/kg	TK7160	1/1	*-*	3000	-	-	-	-	YES	ASL
	70362-50-4	PCB 81 (BZ)	100	100	ng/kg	TK7160	1/1	*-*	100	-	-	-	-	YES	ASL
	#	PCB_086_087_108_119_125	42000	42000 C	ng/kg	TK7160	1/1	*-*	42000 C	-	-	-	-	YES	ASL
	#	PCB018_030	27000	27000 C	ng/kg	TK7160	1/1	*-*	27000 C	-	-	-	-	YES	ASL
	#	PCB020_028	39000	39000 C	ng/kg	TK7160	1/1	*-*	39000 C	-	-	-	-	YES	ASL
	#	PCB044_047_065	88000	88000 C	ng/kg	TK7160	1/1	*-*	88000 C	-	-	-	-	YES	ASL
	#	PCB049_069	62000	62000 C	ng/kg	TK7160	1/1	*-*	62000 C	-	-	-	-	YES	ASL
	#	PCB061_070_074_076	65000	65000 C	ng/kg	TK7160	1/1	*-*	65000 C	-	-	-	-	YES	ASL
	#	PCB090_101_113	62000	62000 C	ng/kg	TK7160	1/1	*-*	62000 C	-	-	-	-	YES	ASL
	#	PCB128_166	5400	5400 C	ng/kg	TK7160	1/1	*-*	5400 C	-	-	-	-	YES	ASL
	#	PCB129_138_160_163	42000	42000 C	ng/kg	TK7160	1/1	*-*	42000 C	-	-	-	-	YES	ASL
	#	PCB135_151_154	12000	12000 C	ng/kg	TK7160	1/1	*-*	12000 C	-	-	-	-	YES	ASL
	#	PCB153_168	39000	39000 C	ng/kg	TK7160	1/1	*-*	39000 C	-	-	-	-	YES	ASL
	#	PCB156_157	4300	4300 C	ng/kg	TK7160	1/1	*-*	4300 C	-	-	-	-	YES	ASL
	#	PCB180_193	23000	23000 C	ng/kg	TK7160	1/1	*-*	23000 C	-	-	-	-	YES	ASL
	#	PCB183_185	7400	7400 C	ng/kg	TK7160	1/1	*-*	7400 C	-	-	-	-	YES	ASL
	#	PCB201	600	600	ng/kg	TK7160	1/1	*-*	600	-	-	-	-	YES	ASL
	#	PCB_CONJ_SUM	790000	790000	ng/kg	TK7160	1/1	*-*	790000	-	-	-	-	YES	ASL
	#	Total PCBs (calculated)	3500	3500	ug/kg	TK7160	1/1	*-*	3500	-	-	-	-	YES	ASL

TABLE 2.14

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 1 Chinook Fillet

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Chinook Fillet	120-12-7	Anthracene	0.004	0.004	mg/kg	TK7162	1/1	*-*	0.004	--	--	-	-	YES	ASL
	206-44-0	Fluoranthene	0.005	0.005	mg/kg	TK7162	1/1	*-*	0.005	--	--	-	-	YES	ASL
	208-96-8	Acenaphthylene	0.004	0.004	mg/kg	TK7162	1/1	*-*	0.004	--	--	-	-	YES	ASL
	39765-80-5	Trans nonachlor	0.25	0.25	mg/kg	TK7162	1/1	*-*	0.25	--	--	-	-	YES	ASL
	50-29-3	p,p'-DDT	0.171	0.171	mg/kg	TK7162	1/1	*-*	0.171	--	--	-	-	YES	ASL
	5103-71-9	Chlordane - alpha	0.056	0.056	mg/kg	TK7162	1/1	*-*	0.056	--	--	-	-	YES	ASL
	5103-73-1	cis-Nonachlor	0.157	0.157	mg/kg	TK7162	1/1	*-*	0.157	--	--	-	-	YES	ASL
	5103-74-2	Chlordane - gamma	0.041 J-	0.041 J-	mg/kg	TK7162	1/1	*-*	'0.041	--	--	-	-	YES	ASL
	60-57-1	Dieldrin	0.027	0.027	mg/kg	TK7162	1/1	*-*	0.027	--	--	-	-	YES	ASL
	72-54-8	p,p'-DDD	0.134	0.134	mg/kg	TK7162	1/1	*-*	0.134	--	--	-	-	YES	ASL
	72-55-9	p,p'-DDE	2.824	2.824	mg/kg	TK7162	1/1	*-*	2.824	--	--	-	-	YES	ASL
	7439-89-6	Iron	34.259	34.259	mg/kg	TK7162	1/1	*-*	34.259	--	--	-	-	YES	ASL
	7439-97-6	Mercury	1.111	1.111	mg/kg	TK7162	1/1	*-*	1.111	--	--	-	-	YES	ASL
	7440-09-7	Potassium	15740.741	15740.741	mg/kg	TK7162	1/1	*-*	15740.741	--	--	-	-	NO	NUT
	7440-47-3	Chromium	0.602	0.602	mg/kg	TK7162	1/1	*-*	0.602	--	--	-	-	YES	ASL
	7440-50-8	Copper	3.519	3.519	mg/kg	TK7162	1/1	*-*	3.519	--	--	-	-	YES	ASL
	7440-66-6	Zinc	25.463	25.463	mg/kg	TK7162	1/1	*-*	25.463	--	--	-	-	YES	ASL
	7782-49-2	Selenium	3.102	3.102	mg/kg	TK7162	1/1	*-*	3.102	--	--	-	-	YES	ASL
	83-32-9	Acenaphthene	0.008	0.008	mg/kg	TK7162	1/1	*-*	0.008	--	--	-	-	YES	ASL
	85-01-8	Phenanthrene	0.017	0.017	mg/kg	TK7162	1/1	*-*	0.017	--	--	-	-	YES	ASL
	86-73-7	Fluorene	0.024	0.024	mg/kg	TK7162	1/1	*-*	0.024	--	--	-	-	YES	ASL
	90-12-0	1-Methylnaphthalene	0.005	0.005	mg/kg	TK7162	1/1	*-*	0.005	--	--	-	-	YES	ASL
	91-57-6	2-Methylnaphthalene	0.004	0.004	mg/kg	TK7162	1/1	*-*	0.004	--	--	-	-	YES	ASL

Footnote Instructions:

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High
J- - Value estimated with a low bias

(1) The data set includes fillet fish tissue sample results collected by IDEM and USFWS.
(2) The maximum detected concentration is the concentration used for screening.
(3) There are no background data for fish tissue.
(4) There are no Screening Toxicity Values for fish tissue.
(5) Rationale Codes:

Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

Table 2.14 (continued)
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Reach 1 Chinook FILLET	12674-11-2	Aroclor 1016	-	-	ug/kg	-	0/1	690-690	-	-	-	-	-	YES	ASL
	11104-28-2	Aroclor 1221	-	-	ug/kg	-	0/1	690-690	-	-	-	-	-	YES	ASL
	11141-16-5	Aroclor 1232	-	-	ug/kg	-	0/1	690-690	-	-	-	-	-	YES	ASL
	53469-21-9	Aroclor 1242	-	-	ug/kg	-	0/1	690-690	-	-	-	-	-	YES	ASL
	12672-29-6	Aroclor 1248	1500	1500	ug/kg	TK7162	1/1	*-*	1500	-	-	-	-	YES	ASL
	11097-69-1	Aroclor 1254	-	-	ug/kg	-	0/1	690-690	-	-	-	-	-	YES	ASL
	11096-82-5	Aroclor 1260	3100	3100	ug/kg	TK7162	1/1	*-*	3100	-	-	-	-	YES	ASL
	32598-14-4	PCB 105 (BZ)	34000	34000	ng/kg	TK7162	1/1	*-*	34000	-	-	-	-	YES	ASL
	74472-37-0	PCB 114 (BZ)	2700	2700	ng/kg	TK7162	1/1	*-*	2700	-	-	-	-	YES	ASL
	31508-00-6	PCB 118 (BZ)	60000	60000	ng/kg	TK7162	1/1	*-*	60000	-	-	-	-	YES	ASL
	65510-44-3	PCB 123 (BZ)	2000	2000	ng/kg	TK7162	1/1	*-*	2000	-	-	-	-	YES	ASL
	57465-28-8	PCB 126 (BZ)	390	390	ng/kg	TK7162	1/1	*-*	390	-	-	-	-	YES	ASL
	74472-42-7	PCB 158 (BZ)	9900	9900	ng/kg	TK7162	1/1	*-*	9900	-	-	-	-	YES	ASL
	52663-72-6	PCB 167 (BZ)	6000	6000	ng/kg	TK7162	1/1	*-*	6000	-	-	-	-	YES	ASL
	32774-16-6	PCB 169 (BZ)	-	-	ng/kg	-	0/1	96-96	-	-	-	-	-	YES	ASL
	35065-30-6	PCB 170 (BZ)	26000	26000	ng/kg	TK7162	1/1	*-*	26000	-	-	-	-	YES	ASL
	74472-48-3	PCB 184 (BZ)	150	150	ng/kg	TK7162	1/1	*-*	150	-	-	-	-	YES	ASL
	52663-68-0	PCB 187 (BZ)	61000	61000	ng/kg	TK7162	1/1	*-*	61000	-	-	-	-	YES	ASL
	39635-31-9	PCB 189 (BZ)	1100	1100	ng/kg	TK7162	1/1	*-*	1100	-	-	-	-	YES	ASL
	52663-78-2	PCB 195 (BZ)	3700	3700	ng/kg	TK7162	1/1	*-*	3700	-	-	-	-	YES	ASL
	40186-72-9	PCB 206 (BZ)	4400	4400	ng/kg	TK7162	1/1	*-*	4400	-	-	-	-	YES	ASL
	2051-24-3	PCB 209 (BZ)	1600	1600	ng/kg	TK7162	1/1	*-*	1600	-	-	-	-	YES	ASL
	38444-90-5	PCB 37 (BZ)	620	620	ng/kg	TK7162	1/1	*-*	620	-	-	-	-	YES	ASL
	35693-99-3	PCB 52 (BZ)	45000	45000	ng/kg	TK7162	1/1	*-*	45000	-	-	-	-	YES	ASL
	32598-10-0	PCB 66 (BZ)	54000	54000	ng/kg	TK7162	1/1	*-*	54000	-	-	-	-	YES	ASL
	32598-13-3	PCB 77 (BZ)	1300	1300	ng/kg	TK7162	1/1	*-*	1300	-	-	-	-	YES	ASL
	34883-43-7	PCB 8 (BZ)	3200	3200	ng/kg	TK7162	1/1	*-*	3200	-	-	-	-	YES	ASL
	70362-50-4	PCB 81 (BZ)	170	170	ng/kg	TK7162	1/1	*-*	170	-	-	-	-	YES	ASL
	#	PCB_086_087_108_119_125	44000	44000 C	ng/kg	TK7162	1/1	*-*	44000 C	-	-	-	-	YES	ASL
	#	PCB018_030	14000	14000 C	ng/kg	TK7162	1/1	*-*	14000 C	-	-	-	-	YES	ASL
	#	PCB020_028	17000	17000 C	ng/kg	TK7162	1/1	*-*	17000 C	-	-	-	-	YES	ASL
	#	PCB044_047_065	39000	39000 C	ng/kg	TK7162	1/1	*-*	39000 C	-	-	-	-	YES	ASL
	#	PCB049_069	26000	26000 C	ng/kg	TK7162	1/1	*-*	26000 C	-	-	-	-	YES	ASL
	#	PCB061_070_074_076	60000	60000 C	ng/kg	TK7162	1/1	*-*	60000 C	-	-	-	-	YES	ASL
	#	PCB090_101_113	72000	72000 C	ng/kg	TK7162	1/1	*-*	72000 C	-	-	-	-	YES	ASL
	#	PCB128_166	24000	24000 C	ng/kg	TK7162	1/1	*-*	24000 C	-	-	-	-	YES	ASL
	#	PCB129_138_160_163	180000	180000 C	ng/kg	TK7162	1/1	*-*	180000 C	-	-	-	-	YES	ASL
	#	PCB135_151_154	32000	32000 C	ng/kg	TK7162	1/1	*-*	32000 C	-	-	-	-	YES	ASL
	#	PCB153_168	180000	180000 C	ng/kg	TK7162	1/1	*-*	180000 C	-	-	-	-	YES	ASL
	#	PCB156_157	12000	12000 C	ng/kg	TK7162	1/1	*-*	12000 C	-	-	-	-	YES	ASL
	#	PCB180_193	59000	59000 C	ng/kg	TK7162	1/1	*-*	59000 C	-	-	-	-	YES	ASL
	#	PCB183_185	23000	23000 C	ng/kg	TK7162	1/1	*-*	23000 C	-	-	-	-	YES	ASL
	#	PCB201	2700	2700	ng/kg	TK7162	1/1	*-*	2700	-	-	-	-	YES	ASL
	#	PCB_CONJ_SUM	1100000	1100000	ng/kg	TK7162	1/1	*-*	1100000	-	-	-	-	YES	ASL
	#	Total PCBs (calculated)	4600	4600	ug/kg	TK7162	1/1	*-*	4600	-	-	-	-	YES	ASL

TABLE 2.15

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 1 Goldfish Fille

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Goldfish Fillet	117-81-7	Bis(2-ethylhexyl) phthalate	5.612	5.612	mg/kg	TK7159	1/1	*-*	5.612	--	--	-	-	YES	ASL
	39765-80-5	Trans nonachlor	0.037	0.037	mg/kg	TK7159	1/1	*-*	0.037	--	--	-	-	YES	ASL
	5103-71-9	Chlordane - alpha	0.032	0.032	mg/kg	TK7159	1/1	*-*	0.032	--	--	-	-	YES	ASL
	5103-74-2	Chlordane - gamma	0.019 J-	0.019 J-	mg/kg	TK7159	1/1	*-*	0.019	--	--	-	-	YES	ASL
	53-19-0	o,p'-DDD	0.031	0.031	mg/kg	TK7159	1/1	*-*	0.031	--	--	-	-	YES	ASL
	72-54-8	p,p'-DDD	0.153	0.153	mg/kg	TK7159	1/1	*-*	0.153	--	--	-	-	YES	ASL
	72-55-9	p,p'-DDE	0.179	0.179	mg/kg	TK7159	1/1	*-*	0.179	--	--	-	-	YES	ASL
	7439-89-6	Iron	56.122	56.122	mg/kg	TK7159	1/1	*-*	56.122	--	--	-	-	YES	ASL
	7439-92-1	Lead	0.612	0.612	mg/kg	TK7159	1/1	*-*	0.612	--	--	-	-	YES	ASL
	7440-09-7	Potassium	15306.122	15306.122	mg/kg	TK7159	1/1	*-*	15306.122	--	--	-	-	NO	NUT
	7440-47-3	Chromium	0.51	0.51	mg/kg	TK7159	1/1	*-*	0.51	--	--	-	-	YES	ASL
	7440-50-8	Copper	2.551	2.551	mg/kg	TK7159	1/1	*-*	2.551	--	--	-	-	YES	ASL
	7440-66-6	Zinc	132.653	132.653	mg/kg	TK7159	1/1	*-*	132.653	--	--	-	-	YES	ASL
	7440-70-2	Calcium	4642.857 J	4642.857 J	mg/kg	TK7159	1/1	*-*	4642.857	--	--	-	-	NO	NUT
	7782-49-2	Selenium	5.612	5.612	mg/kg	TK7159	1/1	*-*	5.612	--	--	-	-	YES	ASL
	86-73-7	Fluorene	0.007	0.007	mg/kg	TK7159	1/1	*-*	0.007	--	--	-	-	YES	ASL
	90-12-0	1-Methylnaphthalene	0.006	0.006	mg/kg	TK7159	1/1	*-*	0.006	--	--	-	-	YES	ASL
	91-20-3	Naphthalene	0.006	0.006	mg/kg	TK7159	1/1	*-*	0.006	--	--	-	-	YES	ASL
	91-57-6	2-Methylnaphthalene	0.007	0.007	mg/kg	TK7159	1/1	*-*	0.007	--	--	-	-	YES	ASL

Footnote Instructions:

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High
J- - Value estimated with a low bias

(1) The data set includes fillet fish tissue sample results collected by IDEM and USFWS.
(2) The maximum detected concentration is the concentration used for screening.
(3) There are no background data for fish tissue.
(4) There are no Screening Toxicity Values for fish tissue.
(5) Rationale Codes:

Selection Reason:
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

Table 2.15 (continued)
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Goldfish	12674-11-2	Aroclor 1016	-	-	ug/kg	-	0/1	260-260	-	-	-	-	-	YES	ASL
	11104-28-2	Aroclor 1221	-	-	ug/kg	-	0/1	260-260	-	-	-	-	-	YES	ASL
	11141-16-5	Aroclor 1232	-	-	ug/kg	-	0/1	260-260	-	-	-	-	-	YES	ASL
	53469-21-9	Aroclor 1242	-	-	ug/kg	-	0/1	260-260	-	-	-	-	-	YES	ASL
	12672-29-6	Aroclor 1248	1300	1300	ug/kg	TK7159	1/1	*-*	1300	-	-	-	-	YES	ASL
	11097-69-1	Aroclor 1254	-	-	ug/kg	-	0/1	260-260	-	-	-	-	-	YES	ASL
	11096-82-5	Aroclor 1260	1200	1200	ug/kg	TK7159	1/1	*-*	1200	-	-	-	-	YES	ASL
	32598-14-4	PCB 105 (BZ)	38000	38000	ng/kg	TK7159	1/1	*-*	38000	-	-	-	-	YES	ASL
	74472-37-0	PCB 114 (BZ)	2600	2600	ng/kg	TK7159	1/1	*-*	2600	-	-	-	-	YES	ASL
	31508-00-6	PCB 118 (BZ)	59000	59000	ng/kg	TK7159	1/1	*-*	59000	-	-	-	-	YES	ASL
	65510-44-3	PCB 123 (BZ)	1700	1700	ng/kg	TK7159	1/1	*-*	1700	-	-	-	-	YES	ASL
	57465-28-8	PCB 126 (BZ)	57	57 KD	ng/kg	TK7159	1/1	*-*	57 KD	-	-	-	-	YES	ASL
	74472-42-7	PCB 158 (BZ)	5500	5500	ng/kg	TK7159	1/1	*-*	5500	-	-	-	-	YES	ASL
	52663-72-6	PCB 167 (BZ)	1600	1600	ng/kg	TK7159	1/1	*-*	1600	-	-	-	-	YES	ASL
	32774-16-6	PCB 169 (BZ)	-	-	ng/kg	-	0/1	30-30	-	-	-	-	-	YES	ASL
	35065-30-6	PCB 170 (BZ)	11000	11000	ng/kg	TK7159	1/1	*-*	11000	-	-	-	-	YES	ASL
	74472-48-3	PCB 184 (BZ)	4	4	ng/kg	TK7159	1/1	*-*	4	-	-	-	-	YES	ASL
	52663-68-0	PCB 187 (BZ)	18000	18000	ng/kg	TK7159	1/1	*-*	18000	-	-	-	-	YES	ASL
	39635-31-9	PCB 189 (BZ)	400	400	ng/kg	TK7159	1/1	*-*	400	-	-	-	-	YES	ASL
	52663-78-2	PCB 195 (BZ)	2000	2000	ng/kg	TK7159	1/1	*-*	2000	-	-	-	-	YES	ASL
	40186-72-9	PCB 206 (BZ)	2400	2400	ng/kg	TK7159	1/1	*-*	2400	-	-	-	-	YES	ASL
	2051-24-3	PCB 209 (BZ)	810	810	ng/kg	TK7159	1/1	*-*	810	-	-	-	-	YES	ASL
	38444-90-5	PCB 37 (BZ)	770	770	ng/kg	TK7159	1/1	*-*	770	-	-	-	-	YES	ASL
	35693-99-3	PCB 52 (BZ)	130000	130000	ng/kg	TK7159	1/1	*-*	130000	-	-	-	-	YES	ASL
	32598-10-0	PCB 66 (BZ)	72000	72000	ng/kg	TK7159	1/1	*-*	72000	-	-	-	-	YES	ASL
	32598-13-3	PCB 77 (BZ)	170	170	ng/kg	TK7159	1/1	*-*	170	-	-	-	-	YES	ASL
	34883-43-7	PCB 8 (BZ)	1500	1500	ng/kg	TK7159	1/1	*-*	1500	-	-	-	-	YES	ASL
	70362-50-4	PCB 81 (BZ)	50	50 KD	ng/kg	TK7159	1/1	*-*	50 KD	-	-	-	-	YES	ASL
	#	PCB_086_087_108_119_125	47000	47000 C	ng/kg	TK7159	1/1	*-*	47000 C	-	-	-	-	YES	ASL
	#	PCB018_030	7800	7800 C	ng/kg	TK7159	1/1	*-*	7800 C	-	-	-	-	YES	ASL
	#	PCB020_028	8000	8000 C	ng/kg	TK7159	1/1	*-*	8000 C	-	-	-	-	YES	ASL
	#	PCB044_047_065	100000	100000 C	ng/kg	TK7159	1/1	*-*	100000 C	-	-	-	-	YES	ASL
	#	PCB049_069	90000	90000 C	ng/kg	TK7159	1/1	*-*	90000 C	-	-	-	-	YES	ASL
	#	PCB061_070_074_076	68000	68000 C	ng/kg	TK7159	1/1	*-*	68000 C	-	-	-	-	YES	ASL
	#	PCB090_101_113	90000	90000 C	ng/kg	TK7159	1/1	*-*	90000 C	-	-	-	-	YES	ASL
	#	PCB128_166	8100	8100 C	ng/kg	TK7159	1/1	*-*	8100 C	-	-	-	-	YES	ASL
	#	PCB129_138_160_163	61000	61000 C	ng/kg	TK7159	1/1	*-*	61000 C	-	-	-	-	YES	ASL
	#	PCB135_151_154	15000	15000 C	ng/kg	TK7159	1/1	*-*	15000 C	-	-	-	-	YES	ASL
	#	PCB153_168	54000	54000 C	ng/kg	TK7159	1/1	*-*	54000 C	-	-	-	-	YES	ASL
	#	PCB156_157	6200	6200 C	ng/kg	TK7159	1/1	*-*	6200 C	-	-	-	-	YES	ASL
	#	PCB180_193	28000	28000 C	ng/kg	TK7159	1/1	*-*	28000 C	-	-	-	-	YES	ASL
	#	PCB183_185	8900	8900 C	ng/kg	TK7159	1/1	*-*	8900 C	-	-	-	-	YES	ASL
	#	PCB201	730	730	ng/kg	TK7159	1/1	*-*	730	-	-	-	-	YES	ASL
	#	PCB_CONJ_SUM	940000	940000	ng/kg	TK7159	1/1	*-*	940000	-	-	-	-	YES	ASL
	#	Total PCBs (calculated)	2500	2500	ug/kg	TK7159	1/1	*-*	2500	-	-	-	-	YES	ASL

TABLE 2.16

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 1 Steelhead Fillet

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Steelhead Fillet	120-12-7	Anthracene	0.004	0.004	mg/kg	TK7172	1/1	*-*	0.004	--	--	-	-	YES	ASL
	206-44-0	Fluoranthene	0.004	0.004	mg/kg	TK7172	1/1	*-*	0.004	--	--	-	-	YES	ASL
	39765-80-5	Trans nonachlor	0.169	0.169	mg/kg	TK7172	1/1	*-*	0.169	--	--	-	-	YES	ASL
	50-29-3	p,p'-DDT	0.128	0.128	mg/kg	TK7172	1/1	*-*	0.128	--	--	-	-	YES	ASL
	5103-71-9	Chlordane - alpha	0.033	0.033	mg/kg	TK7172	1/1	*-*	0.033	--	--	-	-	YES	ASL
	5103-73-1	cis-Nonachlor	0.123	0.123	mg/kg	TK7172	1/1	*-*	0.123	--	--	-	-	YES	ASL
	5103-74-2	Chlordane - gamma	0.02 J-	0.02 J-	mg/kg	TK7172	1/1	*-*	0.02	--	--	-	-	YES	ASL
	72-54-8	p,p'-DDD	0.082	0.082	mg/kg	TK7172	1/1	*-*	0.082	--	--	-	-	YES	ASL
	72-55-9	p,p'-DDE	2.359	2.359	mg/kg	TK7172	1/1	*-*	2.359	--	--	-	-	YES	ASL
	7439-89-6	Iron	71.795	71.795	mg/kg	TK7172	1/1	*-*	71.795	--	--	-	-	YES	ASL
	7439-92-1	Lead	0.487	0.487	mg/kg	TK7172	1/1	*-*	0.487	--	--	-	-	YES	ASL
	7439-97-6	Mercury	1.897	1.897	mg/kg	TK7172	1/1	*-*	1.897	--	--	-	-	YES	ASL
	7440-09-7	Potassium	16410.256	16410.256	mg/kg	TK7172	1/1	*-*	16410.256	--	--	-	-	NO	NUT
	7440-23-5	Sodium	2615.385	2615.385	mg/kg	TK7172	1/1	*-*	2615.385	--	--	-	-	NO	NUT
	7440-47-3	Chromium	0.769	0.769	mg/kg	TK7172	1/1	*-*	0.769	--	--	-	-	YES	ASL
	7440-50-8	Copper	6.154	6.154	mg/kg	TK7172	1/1	*-*	6.154	--	--	-	-	YES	ASL
	7440-66-6	Zinc	35.385	35.385	mg/kg	TK7172	1/1	*-*	35.385	--	--	-	-	YES	ASL
	7440-70-2	Calcium	5641.026 J	5641.026 J	mg/kg	TK7172	1/1	*-*	5641.026	--	--	-	-	NO	NUT
	7782-49-2	Selenium	3.179	3.179	mg/kg	TK7172	1/1	*-*	3.179	--	--	-	-	YES	ASL
	83-32-9	Acenaphthene	0.006	0.006	mg/kg	TK7172	1/1	*-*	0.006	--	--	-	-	YES	ASL
	85-01-8	Phenanthrene	0.013	0.013	mg/kg	TK7172	1/1	*-*	0.013	--	--	-	-	YES	ASL
	86-73-7	Fluorene	0.014	0.014	mg/kg	TK7172	1/1	*-*	0.014	--	--	-	-	YES	ASL
	90-12-0	1-Methylnaphthalene	0.004	0.004	mg/kg	TK7172	1/1	*-*	0.004	--	--	-	-	YES	ASL

Footnote Instructions:
Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:
- U - Undetected
- B - Blank Contaminant
- J - Positive Result is Estimated
- UJ - Quantitation Limit is Estimated
- L - Positive Result is Biased Low
- UL - Quantitation Limit is Biased Low
- K - Positive Result is Biased High
- J- - Value estimated with a low bias

(1) The data set includes fillet fish tissue sample results collected by IDEM and USFWS.
(2) The maximum detected concentration is the concentration used for screening.
(3) There are no background data for fish tissue.
(4) There are no Screening Toxicity Values for fish tissue.
(5) Rationale Codes:

Selection Reason:
- Infrequent Detection but Associated Historically (HIST)
- Frequent Detection (FD)
- Toxicity Information Available (TX)
- Above Screening Levels (ASL)

Deletion Reason:
- Infrequent Detection (IFD)
- Background Levels (BKG)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)
- Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

Table 2.16 (continued)
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Steelhead	12674-11-2	Aroclor 1016	-	-	ug/kg	-	0/1	770-770	-	-	-	-	-	YES	ASL
	11104-28-2	Aroclor 1221	-	-	ug/kg	-	0/1	770-770	-	-	-	-	-	YES	ASL
	11141-16-5	Aroclor 1232	-	-	ug/kg	-	0/1	770-770	-	-	-	-	-	YES	ASL
	53469-21-9	Aroclor 1242	-	-	ug/kg	-	0/1	770-770	-	-	-	-	-	YES	ASL
	12672-29-6	Aroclor 1248	1400	1400	ug/kg	TK7172	1/1	*-*	1400	-	-	-	-	YES	ASL
	11097-69-1	Aroclor 1254	-	-	ug/kg	-	0/1	770-770	-	-	-	-	-	YES	ASL
	11096-82-5	Aroclor 1260	3700	3700	ug/kg	TK7172	1/1	*-*	3700	-	-	-	-	YES	ASL
	32598-14-4	PCB 105 (BZ)	23000	23000	ng/kg	TK7172	1/1	*-*	23000	-	-	-	-	YES	ASL
	74472-37-0	PCB 114 (BZ)	1800	1800	ng/kg	TK7172	1/1	*-*	1800	-	-	-	-	YES	ASL
	31508-00-6	PCB 118 (BZ)	47000	47000	ng/kg	TK7172	1/1	*-*	47000	-	-	-	-	YES	ASL
	65510-44-3	PCB 123 (BZ)	1500	1500	ng/kg	TK7172	1/1	*-*	1500	-	-	-	-	YES	ASL
	57465-28-8	PCB 126 (BZ)	380	380	ng/kg	TK7172	1/1	*-*	380	-	-	-	-	YES	ASL
	74472-42-7	PCB 158 (BZ)	8000	8000	ng/kg	TK7172	1/1	*-*	8000	-	-	-	-	YES	ASL
	52663-72-6	PCB 167 (BZ)	5500	5500	ng/kg	TK7172	1/1	*-*	5500	-	-	-	-	YES	ASL
	32774-16-6	PCB 169 (BZ)	-	-	ng/kg	-	0/1	180-180	-	-	-	-	-	YES	ASL
	35065-30-6	PCB 170 (BZ)	24000	24000	ng/kg	TK7172	1/1	*-*	24000	-	-	-	-	YES	ASL
	74472-48-3	PCB 184 (BZ)	130	130	ng/kg	TK7172	1/1	*-*	130	-	-	-	-	YES	ASL
	52663-68-0	PCB 187 (BZ)	51000	51000	ng/kg	TK7172	1/1	*-*	51000	-	-	-	-	YES	ASL
	39635-31-9	PCB 189 (BZ)	1200	1200	ng/kg	TK7172	1/1	*-*	1200	-	-	-	-	YES	ASL
	52663-78-2	PCB 195 (BZ)	3800	3800	ng/kg	TK7172	1/1	*-*	3800	-	-	-	-	YES	ASL
	40186-72-9	PCB 206 (BZ)	4000	4000	ng/kg	TK7172	1/1	*-*	4000	-	-	-	-	YES	ASL
	2051-24-3	PCB 209 (BZ)	1600	1600	ng/kg	TK7172	1/1	*-*	1600	-	-	-	-	YES	ASL
	38444-90-5	PCB 37 (BZ)	480	480	ng/kg	TK7172	1/1	*-*	480	-	-	-	-	YES	ASL
	35693-99-3	PCB 52 (BZ)	28000	28000	ng/kg	TK7172	1/1	*-*	28000	-	-	-	-	YES	ASL
	32598-10-0	PCB 66 (BZ)	25000	25000	ng/kg	TK7172	1/1	*-*	25000	-	-	-	-	YES	ASL
	32598-13-3	PCB 77 (BZ)	480	480	ng/kg	TK7172	1/1	*-*	480	-	-	-	-	YES	ASL
	34883-43-7	PCB 8 (BZ)	2600	2600	ng/kg	TK7172	1/1	*-*	2600	-	-	-	-	YES	ASL
	70362-50-4	PCB 81 (BZ)	120	120 KD	ng/kg	TK7172	1/1	*-*	120 KD	-	-	-	-	YES	ASL
	#	PCB_086_087_108_119_125	26000	26000	ng/kg	TK7172	1/1	*-*	26000	-	-	-	-	YES	ASL
	#	PCB018_030	11000	11000	ng/kg	TK7172	1/1	*-*	11000	-	-	-	-	YES	ASL
	#	PCB020_028	12000	12000	ng/kg	TK7172	1/1	*-*	12000	-	-	-	-	YES	ASL
	#	PCB044_047_065	23000	23000	ng/kg	TK7172	1/1	*-*	23000	-	-	-	-	YES	ASL
	#	PCB049_069	15000	15000	ng/kg	TK7172	1/1	*-*	15000	-	-	-	-	YES	ASL
	#	PCB061_070_074_076	34000	34000	ng/kg	TK7172	1/1	*-*	34000	-	-	-	-	YES	ASL
	#	PCB090_101_113	49000	49000	ng/kg	TK7172	1/1	*-*	49000	-	-	-	-	YES	ASL
	#	PCB128_166	19000	19000	ng/kg	TK7172	1/1	*-*	19000	-	-	-	-	YES	ASL
	#	PCB129_138_160_163	150000	150000	ng/kg	TK7172	1/1	*-*	150000	-	-	-	-	YES	ASL
	#	PCB135_151_154	21000	21000	ng/kg	TK7172	1/1	*-*	21000	-	-	-	-	YES	ASL
	#	PCB153_168	160000	160000	ng/kg	TK7172	1/1	*-*	160000	-	-	-	-	YES	ASL
	#	PCB156_157	11000	11000	ng/kg	TK7172	1/1	*-*	11000	-	-	-	-	YES	ASL
	#	PCB180_193	77000	77000	ng/kg	TK7172	1/1	*-*	77000	-	-	-	-	YES	ASL
	#	PCB183_185	21000	21000	ng/kg	TK7172	1/1	*-*	21000	-	-	-	-	YES	ASL
	#	PCB201	2600	2600	ng/kg	TK7172	1/1	*-*	2600	-	-	-	-	YES	ASL
	#	PCB_CONJ_SUM	860000	860000	ng/kg	TK7172	1/1	*-*	860000	-	-	-	-	YES	ASL
	#	Total PCBs (calculated)	5100	5100	ug/kg	TK7172	1/1	*-*	5100	-	-	-	-	YES	ASL

TABLE 2.17

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 2 Chinook Fillet

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Chinook Fillet	120-12-7	Anthracene	0.004	0.004	mg/kg	TK7164	1/2	0.003-0.003	0.004	--	--	-	-	YES	ASL
	206-44-0	Fluoranthene	0.005	0.005	mg/kg	TK7164	1/2	0.003-0.003	0.005	--	--	-	-	YES	ASL
	39765-80-5	Trans nonachlor	0.116	0.194	mg/kg	TK7163	2/2	*-*	0.194	--	--	-	-	YES	ASL
	50-29-3	p,p'-DDT	0.072	0.131	mg/kg	TK7163	2/2	*-*	0.131	--	--	-	-	YES	ASL
	5103-71-9	Chlordane - alpha	0.053	0.057	mg/kg	TK7164	2/2	*-*	0.057	--	--	-	-	YES	ASL
	5103-73-1	cis-Nonachlor	0.07	0.117	mg/kg	TK7163	2/2	*-*	0.117	--	--	-	-	YES	ASL
	5103-74-2	Chlordane - gamma	0.03 J	0.033 J--J	mg/kg	TK7164	2/2	*-*	0.033	--	--	-	-	NO	BKG
	53-19-0	o,p'-DDD	0.05	0.05	mg/kg	TK7164	1/2	0.024-0.024	0.05	--	--	-	-	YES	ASL
	60-57-1	Dieldrin	0.02	0.02	mg/kg	TK7164	1/2	0.024-0.024	0.02	--	--	-	-	YES	ASL
	72-54-8	p,p'-DDD	0.102	0.204	mg/kg	TK7164	2/2	*-*	0.204	--	--	-	-	YES	ASL
	72-55-9	p,p'-DDE	1.364	2.087	mg/kg	TK7163	2/2	*-*	2.087	--	--	-	-	YES	ASL
	7429-90-5	Aluminum	61.268	61.268	mg/kg	TK7164	1/2	23.786-23.786	61.268	--	--	-	-	YES	ASL
	7439-89-6	Iron	43.689	236.497	mg/kg	TK7164	2/2	*-*	236.497	--	--	-	-	YES	ASL
	7439-92-1	Lead	3.278	3.278	mg/kg	TK7164	1/2	0.33-0.33	3.278	--	--	-	-	YES	ASL
	7439-95-4	Magnesium	1671.916	1671.916	mg/kg	TK7164	1/2	2378.641-2378.641	1671.916	--	--	-	-	NO	NUT
	7439-96-5	Manganese	5.786	5.786	mg/kg	TK7164	1/2	7.282-7.282	5.786	--	--	-	-	YES	ASL
	7439-97-6	Mercury	1.101	1.117	mg/kg	TK7163	2/2	*-*	1.117	--	--	-	-	YES	ASL
	7440-09-7	Potassium	12807.356	17475.728	mg/kg	TK7163	2/2	*-*	17475.728	--	--	-	-	NO	NUT
	7440-23-5	Sodium	2555.375	2555.375	mg/kg	TK7164	1/2	2378.641-2378.641	2555.375	--	--	-	-	NO	NUT
	7440-47-3	Chromium	0.68	1.509	mg/kg	TK7164	2/2	*-*	1.509	--	--	-	-	YES	ASL
	7440-50-8	Copper	4.854	10.61	mg/kg	TK7164	2/2	*-*	10.61	--	--	-	-	YES	ASL
	7440-66-6	Zinc	33.01	179.787	mg/kg	TK7164	2/2	*-*	179.787	--	--	-	-	YES	ASL
	7440-70-2	Calcium	5339.806 J	32129.242 J-J	mg/kg	TK7164	2/2	*-*	32129.242	--	--	-	-	NO	NUT
	7782-49-2	Selenium	3.322	3.835	mg/kg	TK7163	2/2	*-*	3.835	--	--	-	-	YES	ASL
	83-32-9	Acenaphthene	0.007	0.012	mg/kg	TK7163	2/2	*-*	0.012	--	--	-	-	YES	ASL
	85-01-8	Phenanthrene	0.005	0.015	mg/kg	TK7164	2/2	*-*	0.015	--	--	-	-	YES	ASL
	86-73-7	Fluorene	0.008	0.016	mg/kg	TK7164	2/2	*-*	0.016	--	--	-	-	YES	ASL
	90-12-0	1-Methylnaphthalene	0.004	0.004	mg/kg	TK7164	1/2	0.003-0.003	0.004	--	--	-	-	YES	ASL

Footnote Instructions:

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High
J- - Value estimated with a low bias

(1) The data set includes fillet fish tissue sample results collected by IDEM and USFWS.
(2) The maximum detected concentration is the concentration used for screening.
(3) There are no background data for fish tissue.
(4) There are no Screening Toxicity Values for fish tissue.
(5) Rationale Codes:

Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

Table 2.17 (continued)
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Chinook FILLET	12674-11-2	Aroclor 1016	-	-	ug/kg	-	0/2	560-730	-	-	-	-	-	YES	ASL
	11104-28-2	Aroclor 1221	-	-	ug/kg	-	0/2	560-730	-	-	-	-	-	YES	ASL
	11141-16-5	Aroclor 1232	-	-	ug/kg	-	0/2	560-730	-	-	-	-	-	YES	ASL
	53469-21-9	Aroclor 1242	-	-	ug/kg	-	0/2	560-730	-	-	-	-	-	YES	ASL
	12672-29-6	Aroclor 1248	1100	3000	ug/kg	TK7164	2/2	*-*	3000	-	-	-	-	YES	ASL
	11097-69-1	Aroclor 1254	-	-	ug/kg	-	0/2	560-730	-	-	-	-	-	YES	ASL
	11096-82-5	Aroclor 1260	790	2600	ug/kg	TK7163	2/2	*-*	2600	-	-	-	-	YES	ASL
	32598-14-4	PCB 105 (BZ)	18000	23000	ng/kg	TK7163	2/2	*-*	23000	-	-	-	-	YES	ASL
	74472-37-0	PCB 114 (BZ)	1200	1900	ng/kg	TK7163	2/2	*-*	1900	-	-	-	-	YES	ASL
	31508-00-6	PCB 118 (BZ)	45000	51000	ng/kg	TK7163	2/2	*-*	51000	-	-	-	-	YES	ASL
	65510-44-3	PCB 123 (BZ)	910	1800	ng/kg	TK7163	2/2	*-*	1800	-	-	-	-	YES	ASL
	57465-28-8	PCB 126 (BZ)	86	330	ng/kg	TK7163	2/2	*-*	330	-	-	-	-	YES	ASL
	74472-42-7	PCB 158 (BZ)	4700	6700	ng/kg	TK7163	2/2	*-*	6700	-	-	-	-	YES	ASL
	52663-72-6	PCB 167 (BZ)	1600	4500	ng/kg	TK7163	2/2	*-*	4500	-	-	-	-	YES	ASL
	32774-16-6	PCB 169 (BZ)	-	-	ng/kg	-	0/2	32-120	-	-	-	-	-	YES	ASL
	35065-30-6	PCB 170 (BZ)	7700	20000	ng/kg	TK7163	2/2	*-*	20000	-	-	-	-	YES	ASL
	74472-48-3	PCB 184 (BZ)	11	100	ng/kg	TK7163	2/2	*-*	100	-	-	-	-	YES	ASL
	52663-68-0	PCB 187 (BZ)	15000	41000	ng/kg	TK7163	2/2	*-*	41000	-	-	-	-	YES	ASL
	39635-31-9	PCB 189 (BZ)	260	850	ng/kg	TK7163	2/2	*-*	850	-	-	-	-	YES	ASL
	52663-78-2	PCB 195 (BZ)	1200	3300	ng/kg	TK7163	2/2	*-*	3300	-	-	-	-	YES	ASL
	40186-72-9	PCB 206 (BZ)	1400	3800	ng/kg	TK7163	2/2	*-*	3800	-	-	-	-	YES	ASL
	2051-24-3	PCB 209 (BZ)	800	1400	ng/kg	TK7163	2/2	*-*	1400	-	-	-	-	YES	ASL
	38444-90-5	PCB 37 (BZ)	420	970	ng/kg	TK7164	2/2	*-*	970	-	-	-	-	YES	ASL
	35693-99-3	PCB 52 (BZ)	24000	150000	ng/kg	TK7164	2/2	*-*	150000	-	-	-	-	YES	ASL
	32598-10-0	PCB 66 (BZ)	32000	60000	ng/kg	TK7164	2/2	*-*	60000	-	-	-	-	YES	ASL
	32598-13-3	PCB 77 (BZ)	790	1900	ng/kg	TK7164	2/2	*-*	1900	-	-	-	-	YES	ASL
	34883-43-7	PCB 8 (BZ)	570	2000	ng/kg	TK7164	2/2	*-*	2000	-	-	-	-	YES	ASL
	70362-50-4	PCB 81 (BZ)	130	140	ng/kg	TK7164	2/2	*-*	140	-	-	-	-	YES	ASL
	#	PCB_086_087_108_119_125	30000	45000	ng/kg	TK7164	2/2	*-*	45000	-	-	-	-	YES	ASL
	#	PCB018_030	10000	25000	ng/kg	TK7164	2/2	*-*	25000	-	-	-	-	YES	ASL
	#	PCB020_028	9000	50000	ng/kg	TK7164	2/2	*-*	50000	-	-	-	-	YES	ASL
	#	PCB044_047_065	21000	100000	ng/kg	TK7164	2/2	*-*	100000	-	-	-	-	YES	ASL
	#	PCB049_069	14000	70000	ng/kg	TK7164	2/2	*-*	70000	-	-	-	-	YES	ASL
	#	PCB061_070_074_076	47000	110000	ng/kg	TK7164	2/2	*-*	110000	-	-	-	-	YES	ASL
	#	PCB090_101_113	71000	79000	ng/kg	TK7164	2/2	*-*	79000	-	-	-	-	YES	ASL
	#	PCB128_166	6500	18000	ng/kg	TK7163	2/2	*-*	18000	-	-	-	-	YES	ASL
	#	PCB129_138_160_163	52000	140000	ng/kg	TK7163	2/2	*-*	140000	-	-	-	-	YES	ASL
	#	PCB135_151_154	16000	19000	ng/kg	TK7163	2/2	*-*	19000	-	-	-	-	YES	ASL
	#	PCB153_168	49000	150000	ng/kg	TK7163	2/2	*-*	150000	-	-	-	-	YES	ASL
	#	PCB156_157	4500	9300	ng/kg	TK7163	2/2	*-*	9300	-	-	-	-	YES	ASL
	#	PCB180_193	21000	57000	ng/kg	TK7163	2/2	*-*	57000	-	-	-	-	YES	ASL
	#	PCB183_185	7000	16000	ng/kg	TK7163	2/2	*-*	16000	-	-	-	-	YES	ASL
	#	PCB201	550	2000	ng/kg	TK7163	2/2	*-*	2000	-	-	-	-	YES	ASL
	#	PCB_CONJ_SUM	830000	950000	ng/kg	TK7164	2/2	*-*	950000	-	-	-	-	YES	ASL
	#	Total PCBs (calculated)	3700	3800	ug/kg	TK7164	2/2	*-*	3800	-	-	-	-	YES	ASL

TABLE 2.18

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 2 Goldfish Fille

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Goldfish Fillet	120-12-7	Anthracene	0.007	0.007	mg/kg	TK7161	1/1	*-*	0.007	--	--	-	-	YES	ASL
	39765-80-5	Trans nonachlor	0.035	0.035	mg/kg	TK7161	1/1	*-*	0.035	--	--	-	-	YES	ASL
	5103-71-9	Chlordane - alpha	0.03	0.03	mg/kg	TK7161	1/1	*-*	0.03	--	--	-	-	YES	ASL
	5103-74-2	Chlordane - gamma	0.024 J-	0.024 J-	mg/kg	TK7161	1/1	*-*	0.024	--	--	-	-	YES	ASL
	53-19-0	o,p'-DDD	0.106	0.106	mg/kg	TK7161	1/1	*-*	0.106	--	--	-	-	YES	ASL
	58-89-9	Lindane	0.013	0.013	mg/kg	TK7161	1/1	*-*	0.013	--	--	-	-	YES	ASL
	60-57-1	Dieldrin	0.018	0.018	mg/kg	TK7161	1/1	*-*	0.018	--	--	-	-	YES	ASL
	72-54-8	p,p'-DDD	0.528	0.528	mg/kg	TK7161	1/1	*-*	0.528	--	--	-	-	YES	ASL
	72-55-9	p,p'-DDE	0.141	0.141	mg/kg	TK7161	1/1	*-*	0.141	--	--	-	-	YES	ASL
	7439-89-6	Iron	35.211	35.211	mg/kg	TK7161	1/1	*-*	35.211	--	--	-	-	YES	ASL
	7440-09-7	Potassium	9859.155	9859.155	mg/kg	TK7161	1/1	*-*	9859.155	--	--	-	-	NO	NUT
	7440-47-3	Chromium	0.387	0.387	mg/kg	TK7161	1/1	*-*	0.387	--	--	-	-	YES	ASL
	7440-50-8	Copper	2.007	2.007	mg/kg	TK7161	1/1	*-*	2.007	--	--	-	-	YES	ASL
	7440-66-6	Zinc	105.634	105.634	mg/kg	TK7161	1/1	*-*	105.634	--	--	-	-	YES	ASL
	7440-70-2	Calcium	2218.31 J	2218.31 J	mg/kg	TK7161	1/1	*-*	2218.31	--	--	-	-	NO	NUT
	7782-49-2	Selenium	4.225	4.225	mg/kg	TK7161	1/1	*-*	4.225	--	--	-	-	YES	ASL
	83-32-9	Acenaphthene	0.005	0.005	mg/kg	TK7161	1/1	*-*	0.005	--	--	-	-	YES	ASL
	86-73-7	Fluorene	0.018	0.018	mg/kg	TK7161	1/1	*-*	0.018	--	--	-	-	YES	ASL
	90-12-0	1-Methylnaphthalene	0.008	0.008	mg/kg	TK7161	1/1	*-*	0.008	--	--	-	-	YES	ASL
	91-57-6	2-Methylnaphthalene	0.011	0.011	mg/kg	TK7161	1/1	*-*	0.011	--	--	-	-	YES	ASL

Footnote Instructions:
Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:
U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High
J- - Value estimated with a low bias

(1) The data set includes fillet fish tissue sample results collected by IDEM and USFWS.
(2) The maximum detected concentration is the concentration used for screening.
(3) There are no background data for fish tissue.
(4) There are no Screening Toxicity Values for fish tissue.
(5) Rationale Codes:

Selection Reason:
Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason:
Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

Table 2.18 (continued)
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Reach 2															
Goldfish FILLET	12674-11-2	Aroclor 1016	-	-	ug/kg	-	0/1	180-180	-	-	-	-	-	YES	ASL
	11104-28-2	Aroclor 1221	-	-	ug/kg	-	0/1	180-180	-	-	-	-	-	YES	ASL
	11141-16-5	Aroclor 1232	-	-	ug/kg	-	0/1	180-180	-	-	-	-	-	YES	ASL
	53469-21-9	Aroclor 1242	-	-	ug/kg	-	0/1	180-180	-	-	-	-	-	YES	ASL
	12672-29-6	Aroclor 1248	880	880	ug/kg	TK7161	1/1	*-*	880	-	-	-	-	YES	ASL
	11097-69-1	Aroclor 1254	-	-	ug/kg	-	0/1	180-180	-	-	-	-	-	YES	ASL
	11096-82-5	Aroclor 1260	920	920	ug/kg	TK7161	1/1	*-*	920	-	-	-	-	YES	ASL
	32598-14-4	PCB 105 (BZ)	24000	24000	ng/kg	TK7161	1/1	*-*	24000	-	-	-	-	YES	ASL
	74472-37-0	PCB 114 (BZ)	1800	1800	ng/kg	TK7161	1/1	*-*	1800	-	-	-	-	YES	ASL
	31508-00-6	PCB 118 (BZ)	42000	42000	ng/kg	TK7161	1/1	*-*	42000	-	-	-	-	YES	ASL
	65510-44-3	PCB 123 (BZ)	1200	1200	ng/kg	TK7161	1/1	*-*	1200	-	-	-	-	YES	ASL
	57465-28-8	PCB 126 (BZ)	95	95	ng/kg	TK7161	1/1	*-*	95	-	-	-	-	YES	ASL
	74472-42-7	PCB 158 (BZ)	5700	5700	ng/kg	TK7161	1/1	*-*	5700	-	-	-	-	YES	ASL
	52663-72-6	PCB 167 (BZ)	1900	1900	ng/kg	TK7161	1/1	*-*	1900	-	-	-	-	YES	ASL
	32774-16-6	PCB 169 (BZ)	-	-	ng/kg	-	0/1	53-53	-	-	-	-	-	YES	ASL
	35065-30-6	PCB 170 (BZ)	12000	12000	ng/kg	TK7161	1/1	*-*	12000	-	-	-	-	YES	ASL
	74472-48-3	PCB 184 (BZ)	8.1	8.1	ng/kg	TK7161	1/1	*-*	8.1	-	-	-	-	YES	ASL
	52663-68-0	PCB 187 (BZ)	20000	20000	ng/kg	TK7161	1/1	*-*	20000	-	-	-	-	YES	ASL
	39635-31-9	PCB 189 (BZ)	420	420	ng/kg	TK7161	1/1	*-*	420	-	-	-	-	YES	ASL
	52663-78-2	PCB 195 (BZ)	2300	2300	ng/kg	TK7161	1/1	*-*	2300	-	-	-	-	YES	ASL
	40186-72-9	PCB 206 (BZ)	2900	2900	ng/kg	TK7161	1/1	*-*	2900	-	-	-	-	YES	ASL
	2051-24-3	PCB 209 (BZ)	1500	1500	ng/kg	TK7161	1/1	*-*	1500	-	-	-	-	YES	ASL
	38444-90-5	PCB 37 (BZ)	560	560	ng/kg	TK7161	1/1	*-*	560	-	-	-	-	YES	ASL
	35693-99-3	PCB 52 (BZ)	150000	150000	ng/kg	TK7161	1/1	*-*	150000	-	-	-	-	YES	ASL
	32598-10-0	PCB 66 (BZ)	63000	63000	ng/kg	TK7161	1/1	*-*	63000	-	-	-	-	YES	ASL
	32598-13-3	PCB 77 (BZ)	160	160	ng/kg	TK7161	1/1	*-*	160	-	-	-	-	YES	ASL
	34883-43-7	PCB 8 (BZ)	900	900	ng/kg	TK7161	1/1	*-*	900	-	-	-	-	YES	ASL
	70362-50-4	PCB 81 (BZ)	63	63 KD	ng/kg	TK7161	1/1	*-*	63 KD	-	-	-	-	YES	ASL
	#	PCB_086_087_108_119_125	49000	49000	ng/kg	TK7161	1/1	*-*	49000	-	-	-	-	YES	ASL
	#	PCB018_030	13000	13000 C	ng/kg	TK7161	1/1	*-*	13000 C	-	-	-	-	YES	ASL
	#	PCB020_028	9300	9300 C	ng/kg	TK7161	1/1	*-*	9300 C	-	-	-	-	YES	ASL
	#	PCB044_047_065	110000	110000 C	ng/kg	TK7161	1/1	*-*	110000 C	-	-	-	-	YES	ASL
	#	PCB049_069	83000	83000 C	ng/kg	TK7161	1/1	*-*	83000 C	-	-	-	-	YES	ASL
	#	PCB061_070_074_076	61000	61000 C	ng/kg	TK7161	1/1	*-*	61000 C	-	-	-	-	YES	ASL
	#	PCB090_101_113	88000	88000 C	ng/kg	TK7161	1/1	*-*	88000 C	-	-	-	-	YES	ASL
	#	PCB128_166	7700	7700 C	ng/kg	TK7161	1/1	*-*	7700 C	-	-	-	-	YES	ASL
	#	PCB129_138_160_163	74000	74000 C	ng/kg	TK7161	1/1	*-*	74000 C	-	-	-	-	YES	ASL
	#	PCB135_151_154	16000	16000 C	ng/kg	TK7161	1/1	*-*	16000 C	-	-	-	-	YES	ASL
	#	PCB153_168	71000	71000 C	ng/kg	TK7161	1/1	*-*	71000 C	-	-	-	-	YES	ASL
	#	PCB156_157	6300	6300 C	ng/kg	TK7161	1/1	*-*	6300 C	-	-	-	-	YES	ASL
	#	PCB180_193	31000	31000 C	ng/kg	TK7161	1/1	*-*	31000 C	-	-	-	-	YES	ASL
	#	PCB183_185	9400	9400 C	ng/kg	TK7161	1/1	*-*	9400 C	-	-	-	-	YES	ASL
	#	PCB201	860	860	ng/kg	TK7161	1/1	*-*	860	-	-	-	-	YES	ASL
	#	PCB_CONJ_SUM	960000	960000	ng/kg	TK7161	1/1	*-*	960000	-	-	-	-	YES	ASL
	#	Total PCBs (calculated)	1800	1800	ug/kg	TK7161	1/1	*-*	1800	-	-	-	-	YES	ASL

TABLE 2.19
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 6 Carp Fillet

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Carp Fillet	120-12-7	Anthracene	0.062	0.062	mg/kg	TK7166	1/1	*-*	0.062	--	--	-	-	YES	ASL
	129-00-0	Pyrene	0.35	0.35	mg/kg	TK7166	1/1	*-*	0.35	--	--	-	-	YES	ASL
	205-99-2	Benzo(b)fluoranthene	0.004	0.004	mg/kg	TK7166	1/1	*-*	0.004	--	--	-	-	YES	ASL
	206-44-0	Fluoranthene	0.212	0.212	mg/kg	TK7166	1/1	*-*	0.212	--	--	-	-	YES	ASL
	208-96-8	Acenaphthylene	0.042	0.042	mg/kg	TK7166	1/1	*-*	0.042	--	--	-	-	YES	ASL
	218-01-9	Chrysene	0.009	0.009	mg/kg	TK7166	1/1	*-*	0.009	--	--	-	-	YES	ASL
	39765-80-5	Trans nonachlor	0.075	0.075	mg/kg	TK7166	1/2	0.073-0.073	0.075	--	--	-	-	YES	ASL
	5103-71-9	Chlordane - alpha	0.049	0.147	mg/kg	TK7166	2/2	*-*	0.147	--	--	-	-	YES	ASL
	5103-73-1	cis-Nonachlor	0.035	0.035	mg/kg	TK7166	1/2	0.073-0.073	0.035	--	--	-	-	YES	ASL
	5103-74-2	Chlordane - gamma	0.117 J-	0.117 J-	mg/kg	TK7166	1/2	0.035-0.035	0.117	--	--	-	-	YES	ASL
	53-19-0	o,p'-DDD	0.112	0.135	mg/kg	TK7167	2/2	*-*	0.135	--	--	-	-	YES	ASL
	56-55-3	Benz(a)anthracene	0.006	0.006	mg/kg	TK7166	1/1	*-*	0.006	--	--	-	-	YES	ASL
	60-57-1	Dieldrin	0.07	0.07	mg/kg	TK7166	1/2	0.073-0.073	0.07	--	--	-	-	YES	ASL
	72-54-8	p,p'-DDD	0.49	0.512	mg/kg	TK7167	2/2	*-*	0.512	--	--	-	-	YES	ASL
	72-55-9	p,p'-DDE	0.124	0.373	mg/kg	TK7166	2/2	*-*	0.373	--	--	-	-	YES	ASL
	7429-90-5	Aluminum	25.337	25.337	mg/kg	TK7167	1/2	10.956-10.956	25.337	--	--	-	-	YES	ASL
	7439-89-6	Iron	14.219	221.024	mg/kg	TK7167	2/2	*-*	221.024	--	--	-	-	YES	ASL
	7439-92-1	Lead	2.695	2.695	mg/kg	TK7167	1/2	0.154-0.154	2.695	--	--	-	-	YES	ASL
	7440-09-7	Potassium	6293.706	7008.086	mg/kg	TK7167	2/2	*-*	7008.086	--	--	-	-	NO	NUT
	7440-23-5	Sodium	2210.243	2210.243	mg/kg	TK7167	1/2	1095.571-1095.57	2210.243	--	--	-	-	NO	NUT
	7440-47-3	Chromium	0.35	1.186	mg/kg	TK7167	2/2	*-*	1.186	--	--	-	-	YES	ASL
	7440-50-8	Copper	1.002	5.391	mg/kg	TK7167	2/2	*-*	5.391	--	--	-	-	YES	ASL
	7440-66-6	Zinc	34.965	215.633	mg/kg	TK7167	2/2	*-*	215.633	--	--	-	-	YES	ASL
	7440-70-2	Calcium	35040.431 J	35040.431 J	mg/kg	TK7167	1/2	1095.571-1095.57	35040.431	--	--	-	-	NO	NUT
	7782-49-2	Selenium	1.329	2.695	mg/kg	TK7167	2/2	*-*	2.695	--	--	-	-	YES	ASL
	83-32-9	Acenaphthene	1.585	1.585	mg/kg	TK7166	1/1	*-*	1.585	--	--	-	-	YES	ASL
	85-01-8	Phenanthrene	0.42	0.42	mg/kg	TK7166	1/1	*-*	0.42	--	--	-	-	YES	ASL
	86-73-7	Fluorene	0.466	0.466	mg/kg	TK7166	1/1	*-*	0.466	--	--	-	-	YES	ASL
	90-12-0	1-Methylnaphthalene	0.72	0.72	mg/kg	TK7166	1/1	*-*	0.72	--	--	-	-	YES	ASL
	91-20-3	Naphthalene	1.119	1.119	mg/kg	TK7166	1/1	*-*	1.119	--	--	-	-	YES	ASL
	91-57-6	2-Methylnaphthalene	1.002	1.002	mg/kg	TK7166	1/1	*-*	1.002	--	--	-	-	YES	ASL

Footnote Instructions:
Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:
U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High
J- - Value estimated with a low bias

(1) The data set includes fillet fish tissue sample results collected by IDEM and USFWS.
(2) The maximum detected concentration is the concentration used for screening.
(3) There are no background data for fish tissue.
(4) There are no Screening Toxicity Values for fish tissue.
(5) Rationale Codes:

Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

Table 2.19 (continued)
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Reach 6 Carp FILLET	12674-11-2	Aroclor 1016	-	-	ug/kg	-	0/2	730-1200	-	-	-	-	-	YES	ASL
	11104-28-2	Aroclor 1221	-	-	ug/kg	-	0/2	730-1200	-	-	-	-	-	YES	ASL
	11141-16-5	Aroclor 1232	-	-	ug/kg	-	0/2	730-1200	-	-	-	-	-	YES	ASL
	53469-21-9	Aroclor 1242	-	-	ug/kg	-	0/2	730-1200	-	-	-	-	-	YES	ASL
	12672-29-6	Aroclor 1248	2000	5600	ug/kg	TK7166	2/2	*-*	5600	-	-	-	-	YES	ASL
	11097-69-1	Aroclor 1254	-	-	ug/kg	-	0/2	730-1200	-	-	-	-	-	YES	ASL
	11096-82-5	Aroclor 1260	2000	2000	ug/kg	TK7166	1/2	730-730	2000	-	-	-	-	YES	ASL
	32598-14-4	PCB 105 (BZ)	18000	57000	ng/kg	TK7166	2/2	*-*	57000	-	-	-	-	YES	ASL
	74472-37-0	PCB 114 (BZ)	1200	4000	ng/kg	TK7166	2/2	*-*	4000	-	-	-	-	YES	ASL
	31508-00-6	PCB 118 (BZ)	38000	140000	ng/kg	TK7166	2/2	*-*	140000	-	-	-	-	YES	ASL
	65510-44-3	PCB 123 (BZ)	910	2900	ng/kg	TK7166	2/2	*-*	2900	-	-	-	-	YES	ASL
	57465-28-8	PCB 126 (BZ)	82	230 KD	ng/kg	TK7166	2/2	*-*	230 KD	-	-	-	-	YES	ASL
	74472-42-7	PCB 158 (BZ)	3900	20000	ng/kg	TK7166	2/2	*-*	20000	-	-	-	-	YES	ASL
	52663-72-6	PCB 167 (BZ)	1400	6200	ng/kg	TK7166	2/2	*-*	6200	-	-	-	-	YES	ASL
	32774-16-6	PCB 169 (BZ)	-	-	ng/kg	-	0/2	36-140	-	-	-	-	-	YES	ASL
	35065-30-6	PCB 170 (BZ)	5700	39000	ng/kg	TK7166	2/2	*-*	39000	-	-	-	-	YES	ASL
	74472-48-3	PCB 184 (BZ)	5.3	35	ng/kg	TK7166	2/2	*-*	35	-	-	-	-	YES	ASL
	52663-68-0	PCB 187 (BZ)	11000	80000	ng/kg	TK7166	2/2	*-*	80000	-	-	-	-	YES	ASL
	39635-31-9	PCB 189 (BZ)	230	1200	ng/kg	TK7166	2/2	*-*	1200	-	-	-	-	YES	ASL
	52663-78-2	PCB 195 (BZ)	960	6600	ng/kg	TK7166	2/2	*-*	6600	-	-	-	-	YES	ASL
	40186-72-9	PCB 206 (BZ)	1200	5300	ng/kg	TK7166	2/2	*-*	5300	-	-	-	-	YES	ASL
	2051-24-3	PCB 209 (BZ)	760	3100	ng/kg	TK7166	2/2	*-*	3100	-	-	-	-	YES	ASL
	38444-90-5	PCB 37 (BZ)	1300	2700	ng/kg	TK7166	2/2	*-*	2700	-	-	-	-	YES	ASL
	35693-99-3	PCB 52 (BZ)	110000	510000	ng/kg	TK7166	2/2	*-*	510000	-	-	-	-	YES	ASL
	32598-10-0	PCB 66 (BZ)	48000	160000	ng/kg	TK7166	2/2	*-*	160000	-	-	-	-	YES	ASL
	32598-13-3	PCB 77 (BZ)	1900	2600	ng/kg	TK7166	2/2	*-*	2600	-	-	-	-	YES	ASL
	34883-43-7	PCB 8 (BZ)	3500	11000	ng/kg	TK7166	2/2	*-*	11000	-	-	-	-	YES	ASL
	70362-50-4	PCB 81 (BZ)	120	370 KD	ng/kg	TK7166	2/2	*-*	370 KD	-	-	-	-	YES	ASL
	#	PCB_086_087_108_119_125	37000	160000	ng/kg	TK7166	2/2	*-*	160000	-	-	-	-	YES	ASL
	#	PCB018_030	28000	140000	ng/kg	TK7166	2/2	*-*	140000	-	-	-	-	YES	ASL
	#	PCB020_028	46000	120000	ng/kg	TK7166	2/2	*-*	120000	-	-	-	-	YES	ASL
	#	PCB044_047_065	80000	390000	ng/kg	TK7166	2/2	*-*	390000	-	-	-	-	YES	ASL
	#	PCB049_069	56000	270000	ng/kg	TK7166	2/2	*-*	270000	-	-	-	-	YES	ASL
	#	PCB061_070_074_076	87000	250000	ng/kg	TK7166	2/2	*-*	250000	-	-	-	-	YES	ASL
	#	PCB090_101_113	62000	290000	ng/kg	TK7166	2/2	*-*	290000	-	-	-	-	YES	ASL
	#	PCB128_166	5300	28000	ng/kg	TK7166	2/2	*-*	28000	-	-	-	-	YES	ASL
	#	PCB129_138_160_163	40000	210000	ng/kg	TK7166	2/2	*-*	210000	-	-	-	-	YES	ASL
	#	PCB135_151_154	12000	80000	ng/kg	TK7166	2/2	*-*	80000	-	-	-	-	YES	ASL
	#	PCB153_168	36000	210000	ng/kg	TK7166	2/2	*-*	210000	-	-	-	-	YES	ASL
	#	PCB156_157	4400	18000	ng/kg	TK7166	2/2	*-*	18000	-	-	-	-	YES	ASL
	#	PCB180_193	15000	100000	ng/kg	TK7166	2/2	*-*	100000	-	-	-	-	YES	ASL
	#	PCB183_185	4900	36000	ng/kg	TK7166	2/2	*-*	36000	-	-	-	-	YES	ASL
	#	PCB201	390	2500	ng/kg	TK7166	2/2	*-*	2500	-	-	-	-	YES	ASL
	#	PCB_CONJ_SUM	760000	3300000	ng/kg	TK7166	2/2	*-*	3300000	-	-	-	-	YES	ASL
	#	Total PCBs (calculated)	2000	7600	ug/kg	TK7166	2/2	*-*	7600	-	-	-	-	YES	ASL

TABLE 2.20

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 7 Carp Fille

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Carp Fillet	129-00-0	Pyrene	0.865	0.865	mg/kg	TK7170	1/1	*-*	0.865	--	--	-	-	YES	ASL
	206-44-0	Fluoranthene	0.414	0.414	mg/kg	TK7170	1/1	*-*	0.414	--	--	-	-	YES	ASL
	39765-80-5	Trans nonachlor	0.056	0.056	mg/kg	TK7170	1/1	*-*	0.056	--	--	-	-	YES	ASL
	5103-71-9	Chlordane - alpha	0.083	0.083	mg/kg	TK7170	1/1	*-*	0.083	--	--	-	-	YES	ASL
	5103-73-1	cis-Nonachlor	0.024	0.024	mg/kg	TK7170	1/1	*-*	0.024	--	--	-	-	YES	ASL
	5103-74-2	Chlordane - gamma	0.128 J	0.128 J	mg/kg	TK7170	1/1	*-*	0.128	--	--	-	-	YES	ASL
	53-19-0	o,p'-DDD	0.105	0.105	mg/kg	TK7170	1/1	*-*	0.105	--	--	-	-	YES	ASL
	60-57-1	Dieldrin	0.031	0.031	mg/kg	TK7170	1/1	*-*	0.031	--	--	-	-	YES	ASL
	65-85-0	Benzoic acid	6.391	6.391	mg/kg	TK7170	1/1	*-*	6.391	--	--	-	-	YES	ASL
	72-54-8	p,p'-DDD	0.376	0.376	mg/kg	TK7170	1/1	*-*	0.376	--	--	-	-	YES	ASL
	72-55-9	p,p'-DDE	0.233	0.233	mg/kg	TK7170	1/1	*-*	0.233	--	--	-	-	YES	ASL
	7429-90-5	Aluminum	33.835	33.835	mg/kg	TK7170	1/1	*-*	33.835	--	--	-	-	YES	ASL
	7439-89-6	Iron	270.677	270.677	mg/kg	TK7170	1/1	*-*	270.677	--	--	-	-	YES	ASL
	7439-92-1	Lead	4.511	4.511	mg/kg	TK7170	1/1	*-*	4.511	--	--	-	-	YES	ASL
	7440-09-7	Potassium	9398.496	9398.496	mg/kg	TK7170	1/1	*-*	9398.496	--	--	-	-	NO	NUT
	7440-23-5	Sodium	2969.925	2969.925	mg/kg	TK7170	1/1	*-*	2969.925	--	--	-	-	NO	NUT
	7440-47-3	Chromium	1.654	1.654	mg/kg	TK7170	1/1	*-*	1.654	--	--	-	-	YES	ASL
	7440-50-8	Copper	10.902	10.902	mg/kg	TK7170	1/1	*-*	10.902	--	--	-	-	YES	ASL
	7440-66-6	Zinc	270.677	270.677	mg/kg	TK7170	1/1	*-*	270.677	--	--	-	-	YES	ASL
	7440-70-2	Calcium	45112.782 J	45112.782 J	mg/kg	TK7170	1/1	*-*	45112.782	--	--	-	-	NO	NUT
	7782-49-2	Selenium	2.895	2.895	mg/kg	TK7170	1/1	*-*	2.895	--	--	-	-	YES	ASL
	83-32-9	Acenaphthene	1.729	1.729	mg/kg	TK7170	1/1	*-*	1.729	--	--	-	-	YES	ASL
	85-01-8	Phenanthrene	0.789	0.789	mg/kg	TK7170	1/1	*-*	0.789	--	--	-	-	YES	ASL
	86-73-7	Fluorene	0.639	0.639	mg/kg	TK7170	1/1	*-*	0.639	--	--	-	-	YES	ASL
	91-20-3	Naphthalene	0.564	0.564	mg/kg	TK7170	1/1	*-*	0.564	--	--	-	-	YES	ASL
	91-57-6	2-Methylnaphthalene	0.602	0.602	mg/kg	TK7170	1/1	*-*	0.602	--	--	-	-	YES	ASL

Footnote Instructions:

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High

(1) The data set includes fillet fish tissue sample results collected by IDEM and USFWS.
(2) The maximum detected concentration is the concentration used for screening.
(3) There are no background data for fish tissue.
(4) There are no Screening Toxicity Values for fish tissue.
(5) Rationale Codes:

Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

Table 2.20 (continued)
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Reach 7 Carp FILLET	12674-11-2	Aroclor 1016	-	-	ug/kg	-	0/1	560-560	-	-	-	-	-	YES	ASL
	11104-28-2	Aroclor 1221	-	-	ug/kg	-	0/1	560-560	-	-	-	-	-	YES	ASL
	11141-16-5	Aroclor 1232	-	-	ug/kg	-	0/1	560-560	-	-	-	-	-	YES	ASL
	53469-21-9	Aroclor 1242	-	-	ug/kg	-	0/1	560-560	-	-	-	-	-	YES	ASL
	12672-29-6	Aroclor 1248	3300	3300	ug/kg	TK7170	1/1	*-*	3300	-	-	-	-	YES	ASL
	11097-69-1	Aroclor 1254	-	-	ug/kg	-	0/1	560-560	-	-	-	-	-	YES	ASL
	11096-82-5	Aroclor 1260	940	940	ug/kg	TK7170	1/1	*-*	940	-	-	-	-	YES	ASL
	32598-14-4	PCB 105 (BZ)	26000	26000	ng/kg	TK7170	1/1	*-*	26000	-	-	-	-	YES	ASL
	74472-37-0	PCB 114 (BZ)	1800	1800	ng/kg	TK7170	1/1	*-*	1800	-	-	-	-	YES	ASL
	31508-00-6	PCB 118 (BZ)	65000	65000	ng/kg	TK7170	1/1	*-*	65000	-	-	-	-	YES	ASL
	65510-44-3	PCB 123 (BZ)	1200	1200	ng/kg	TK7170	1/1	*-*	1200	-	-	-	-	YES	ASL
	57465-28-8	PCB 126 (BZ)	130	130	ng/kg	TK7170	1/1	*-*	130	-	-	-	-	YES	ASL
	74472-42-7	PCB 158 (BZ)	7100	7100	ng/kg	TK7170	1/1	*-*	7100	-	-	-	-	YES	ASL
	52663-72-6	PCB 167 (BZ)	2500	2500	ng/kg	TK7170	1/1	*-*	2500	-	-	-	-	YES	ASL
	32774-16-6	PCB 169 (BZ)	-	-	ng/kg	-	0/1	40-40	-	-	-	-	-	YES	ASL
	35065-30-6	PCB 170 (BZ)	9800	9800	ng/kg	TK7170	1/1	*-*	9800	-	-	-	-	YES	ASL
	74472-48-3	PCB 184 (BZ)	7.8	7.8	ng/kg	TK7170	1/1	*-*	7.8	-	-	-	-	YES	ASL
	52663-68-0	PCB 187 (BZ)	20000	20000	ng/kg	TK7170	1/1	*-*	20000	-	-	-	-	YES	ASL
	39635-31-9	PCB 189 (BZ)	340	340	ng/kg	TK7170	1/1	*-*	340	-	-	-	-	YES	ASL
	52663-78-2	PCB 195 (BZ)	1500	1500	ng/kg	TK7170	1/1	*-*	1500	-	-	-	-	YES	ASL
	40186-72-9	PCB 206 (BZ)	2000	2000	ng/kg	TK7170	1/1	*-*	2000	-	-	-	-	YES	ASL
	2051-24-3	PCB 209 (BZ)	1200	1200	ng/kg	TK7170	1/1	*-*	1200	-	-	-	-	YES	ASL
	38444-90-5	PCB 37 (BZ)	1200	1200	ng/kg	TK7170	1/1	*-*	1200	-	-	-	-	YES	ASL
	35693-99-3	PCB 52 (BZ)	240000	240000	ng/kg	TK7170	1/1	*-*	240000	-	-	-	-	YES	ASL
	32598-10-0	PCB 66 (BZ)	90000	90000	ng/kg	TK7170	1/1	*-*	90000	-	-	-	-	YES	ASL
	32598-13-3	PCB 77 (BZ)	2700	2700	ng/kg	TK7170	1/1	*-*	2700	-	-	-	-	YES	ASL
	34883-43-7	PCB 8 (BZ)	3800	3800	ng/kg	TK7170	1/1	*-*	3800	-	-	-	-	YES	ASL
	70362-50-4	PCB 81 (BZ)	170	170 KD	ng/kg	TK7170	1/1	*-*	170 KD	-	-	-	-	YES	ASL
	#	PCB_086_087_108_119_125	66000	66000	ng/kg	TK7170	1/1	*-*	66000	-	-	-	-	YES	ASL
	#	PCB018_030	45000	45000	ng/kg	TK7170	1/1	*-*	45000	-	-	-	-	YES	ASL
	#	PCB020_028	70000	70000	ng/kg	TK7170	1/1	*-*	70000	-	-	-	-	YES	ASL
	#	PCB044_047_065	150000	150000	ng/kg	TK7170	1/1	*-*	150000	-	-	-	-	YES	ASL
	#	PCB049_069	110000	110000	ng/kg	TK7170	1/1	*-*	110000	-	-	-	-	YES	ASL
	#	PCB061_070_074_076	180000	180000	ng/kg	TK7170	1/1	*-*	180000	-	-	-	-	YES	ASL
	#	PCB090_101_113	130000	130000	ng/kg	TK7170	1/1	*-*	130000	-	-	-	-	YES	ASL
	#	PCB128_166	8600	8600	ng/kg	TK7170	1/1	*-*	8600	-	-	-	-	YES	ASL
	#	PCB129_138_160_163	73000	73000	ng/kg	TK7170	1/1	*-*	73000	-	-	-	-	YES	ASL
	#	PCB135_151_154	24000	24000	ng/kg	TK7170	1/1	*-*	24000	-	-	-	-	YES	ASL
	#	PCB153_168	73000	73000	ng/kg	TK7170	1/1	*-*	73000	-	-	-	-	YES	ASL
	#	PCB156_157	6900	6900	ng/kg	TK7170	1/1	*-*	6900	-	-	-	-	YES	ASL
	#	PCB180_193	30000	30000	ng/kg	TK7170	1/1	*-*	30000	-	-	-	-	YES	ASL
	#	PCB183_185	10000	10000	ng/kg	TK7170	1/1	*-*	10000	-	-	-	-	YES	ASL
	#	PCB201	700	700	ng/kg	TK7170	1/1	*-*	700	-	-	-	-	YES	ASL
	#	PCB_CONJ_SUM	1400000	1400000	ng/kg	TK7170	1/1	*-*	1400000	-	-	-	-	YES	ASL
	#	Total PCBs (calculated)	4240	4240	ug/kg	TK7170	1/1	*-*	4240	-	-	-	-	YES	ASL

TABLE 2.21

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 7 Goldfish Fille

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (mg/kg) (2)	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Goldfish Fillet	120-12-7	Anthracene	0.239	0.239	mg/kg	TK7169	1/1	*-*	0.239	--	--	-	-	YES	ASL
	129-00-0	Pyrene	0.55	0.55	mg/kg	TK7169	1/1	*-*	0.55	--	--	-	-	YES	ASL
	132-64-9	Dibenzofuran	0.282	0.282	mg/kg	TK7169	1/1	*-*	0.282	--	--	-	-	YES	ASL
	206-44-0	Fluoranthene	0.356	0.356	mg/kg	TK7169	1/1	*-*	0.356	--	--	-	-	YES	ASL
	208-96-8	Acenaphthylene	0.23	0.23	mg/kg	TK7169	1/1	*-*	0.23	--	--	-	-	YES	ASL
	218-01-9	Chrysene	0.008	0.008	mg/kg	TK7169	1/1	*-*	0.008	--	--	-	-	YES	ASL
	39765-80-5	Trans nonachlor	0.129	0.129	mg/kg	TK7169	1/1	*-*	0.129	--	--	-	-	YES	ASL
	5103-71-9	Chlordane - alpha	0.298	0.298	mg/kg	TK7169	1/1	*-*	0.298	--	--	-	-	YES	ASL
	5103-73-1	cis-Nonachlor	0.065	0.065	mg/kg	TK7169	1/1	*-*	0.065	--	--	-	-	YES	ASL
	5103-74-2	Chlordane - gamma	0.223 J-	0.223 J-	mg/kg	TK7169	1/1	*-*	0.223	--	--	-	-	YES	ASL
	53-19-0	o,p'-DDD	0.175	0.175	mg/kg	TK7169	1/1	*-*	0.175	--	--	-	-	YES	ASL
	56-55-3	Benz(a)anthracene	0.007	0.007	mg/kg	TK7169	1/1	*-*	0.007	--	--	-	-	YES	ASL
	60-57-1	Dieldrin	0.074	0.074	mg/kg	TK7169	1/1	*-*	0.074	--	--	-	-	YES	ASL
	72-54-8	p,p'-DDD	1.1	1.1	mg/kg	TK7169	1/1	*-*	1.1	--	--	-	-	YES	ASL
	72-55-9	p,p'-DDE	0.68	0.68	mg/kg	TK7169	1/1	*-*	0.68	--	--	-	-	YES	ASL
	7439-89-6	Iron	22.33	22.33	mg/kg	TK7169	1/1	*-*	22.33	--	--	-	-	YES	ASL
	7440-09-7	Potassium	9061.489	9061.489	mg/kg	TK7169	1/1	*-*	9061.489	--	--	-	-	NO	NUT
	7440-47-3	Chromium	0.388	0.388	mg/kg	TK7169	1/1	*-*	0.388	--	--	-	-	YES	ASL
	7440-50-8	Copper	3.883	3.883	mg/kg	TK7169	1/1	*-*	3.883	--	--	-	-	YES	ASL
	7440-66-6	Zinc	84.142	84.142	mg/kg	TK7169	1/1	*-*	84.142	--	--	-	-	YES	ASL
	7782-49-2	Selenium	2.977	2.977	mg/kg	TK7169	1/1	*-*	2.977	--	--	-	-	YES	ASL
	83-32-9	Acenaphthene	3.236	3.236	mg/kg	TK7169	1/1	*-*	3.236	--	--	-	-	YES	ASL
	85-01-8	Phenanthrene	0.68	0.68	mg/kg	TK7169	1/1	*-*	0.68	--	--	-	-	YES	ASL
	86-73-7	Fluorene	1.036	1.036	mg/kg	TK7169	1/1	*-*	1.036	--	--	-	-	YES	ASL
	90-12-0	1-Methylnaphthalene	0.58	0.58	mg/kg	TK7169	1/1	*-*	0.58	--	--	-	-	YES	ASL
	91-20-3	Naphthalene	0.906	0.906	mg/kg	TK7169	1/1	*-*	0.906	--	--	-	-	YES	ASL
	91-57-6	2-Methylnaphthalene	0.906	0.906	mg/kg	TK7169	1/1	*-*	0.906	--	--	-	-	YES	ASL

Footnote Instructions:

Multiple qualifiers shown are a combination of those flagged by the lab and those added by the data validation process.

Qualifier Definitions:

U - Undetected
B - Blank Contaminant
J - Positive Result is Estimated
UJ - Quantitation Limit is Estimated
L - Positive Result is Biased Low
UL - Quantitation Limit is Biased Low
K - Positive Result is Biased High
J- - Value estimated with a low bias

(1) The data set includes fillet fish tissue sample results collected by IDEM and USFWS.
(2) The maximum detected concentration is the concentration used for screening.
(3) There are no background data for fish tissue.
(4) There are no Screening Toxicity Values for fish tissue.
(5) Rationale Codes:

Selection Reason: Infrequent Detection but Associated Historically (HIST)
Frequent Detection (FD)
Toxicity Information Available (TX)
Above Screening Levels (ASL)

Deletion Reason: Infrequent Detection (IFD)
Background Levels (BKG)
No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Levels- Maximum detected concentrations must be below both Soil Cleanup Levels and potential ARAR/TBC values (BSL)

Table 2.21 (continued)
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
West Branch of the Grand Calumet River, Lake County, Indiana

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (mg/kg) (3)	Screening Toxicity Value (mg/kg) (4)	Potential ARAR/TBC Value (mg/kg)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Reach 7															
Goldfish FILLET	12674-11-2	Aroclor 1016	-	-	ug/kg	-	0/1	1600-1600	-	-	-	-	-	YES	ASL
	11104-28-2	Aroclor 1221	-	-	ug/kg	-	0/1	1600-1600	-	-	-	-	-	YES	ASL
	11141-16-5	Aroclor 1232	-	-	ug/kg	-	0/1	1600-1600	-	-	-	-	-	YES	ASL
	53469-21-9	Aroclor 1242	-	-	ug/kg	-	0/1	1600-1600	-	-	-	-	-	YES	ASL
	12672-29-6	Aroclor 1248	7100	7100	ug/kg	TK7169	1/1	*-*	7100	-	-	-	-	YES	ASL
	11097-69-1	Aroclor 1254	-	-	ug/kg	-	0/1	1600-1600	-	-	-	-	-	YES	ASL
	11096-82-5	Aroclor 1260	4900	4900	ug/kg	TK7169	1/1	*-*	4900	-	-	-	-	YES	ASL
	32598-14-4	PCB 105 (BZ)	89000	89000	ng/kg	TK7169	1/1	*-*	89000	-	-	-	-	YES	ASL
	74472-37-0	PCB 114 (BZ)	6400	6400	ng/kg	TK7169	1/1	*-*	6400	-	-	-	-	YES	ASL
	31508-00-6	PCB 118 (BZ)	220000	220000	ng/kg	TK7169	1/1	*-*	220000	-	-	-	-	YES	ASL
	65510-44-3	PCB 123 (BZ)	4600	4600	ng/kg	TK7169	1/1	*-*	4600	-	-	-	-	YES	ASL
	57465-28-8	PCB 126 (BZ)	330	330 KD	ng/kg	TK7169	1/1	*-*	330 KD	-	-	-	-	YES	ASL
	74472-42-7	PCB 158 (BZ)	31000	31000	ng/kg	TK7169	1/1	*-*	31000	-	-	-	-	YES	ASL
	52663-72-6	PCB 167 (BZ)	9400	9400	ng/kg	TK7169	1/1	*-*	9400	-	-	-	-	YES	ASL
	32774-16-6	PCB 169 (BZ)	-	-	ng/kg	-	0/1	180-180	-	-	-	-	-	YES	ASL
	35065-30-6	PCB 170 (BZ)	65000	65000	ng/kg	TK7169	1/1	*-*	65000	-	-	-	-	YES	ASL
	74472-48-3	PCB 184 (BZ)	48	48 KD	ng/kg	TK7169	1/1	*-*	48 KD	-	-	-	-	YES	ASL
	52663-68-0	PCB 187 (BZ)	130000	130000	ng/kg	TK7169	1/1	*-*	130000	-	-	-	-	YES	ASL
	39635-31-9	PCB 189 (BZ)	1900	1900	ng/kg	TK7169	1/1	*-*	1900	-	-	-	-	YES	ASL
	52663-78-2	PCB 195 (BZ)	11000	11000	ng/kg	TK7169	1/1	*-*	11000	-	-	-	-	YES	ASL
	40186-72-9	PCB 206 (BZ)	13000	13000	ng/kg	TK7169	1/1	*-*	13000	-	-	-	-	YES	ASL
	2051-24-3	PCB 209 (BZ)	8500	8500	ng/kg	TK7169	1/1	*-*	8500	-	-	-	-	YES	ASL
	38444-90-5	PCB 37 (BZ)	3300	3300	ng/kg	TK7169	1/1	*-*	3300	-	-	-	-	YES	ASL
	35693-99-3	PCB 52 (BZ)	660000	660000	ng/kg	TK7169	1/1	*-*	660000	-	-	-	-	YES	ASL
	32598-10-0	PCB 66 (BZ)	250000	250000	ng/kg	TK7169	1/1	*-*	250000	-	-	-	-	YES	ASL
	32598-13-3	PCB 77 (BZ)	2400	2400	ng/kg	TK7169	1/1	*-*	2400	-	-	-	-	YES	ASL
	34883-43-7	PCB 8 (BZ)	8500	8500	ng/kg	TK7169	1/1	*-*	8500	-	-	-	-	YES	ASL
	70362-50-4	PCB 81 (BZ)	400	400 KD	ng/kg	TK7169	1/1	*-*	400 KD	-	-	-	-	YES	ASL
	#	PCB_086_087_108_119_12	220000	220000	ng/kg	TK7169	1/1	*-*	220000	-	-	-	-	YES	ASL
	#	PCB018_030	110000	110000	ng/kg	TK7169	1/1	*-*	110000	-	-	-	-	YES	ASL
	#	PCB020_028	150000	150000	ng/kg	TK7169	1/1	*-*	150000	-	-	-	-	YES	ASL
	#	PCB044_047_065	450000	450000	ng/kg	TK7169	1/1	*-*	450000	-	-	-	-	YES	ASL
	#	PCB049_069	330000	330000	ng/kg	TK7169	1/1	*-*	330000	-	-	-	-	YES	ASL
	#	PCB061_070_074_076	400000	400000	ng/kg	TK7169	1/1	*-*	400000	-	-	-	-	YES	ASL
	#	PCB090_101_113	430000	430000	ng/kg	TK7169	1/1	*-*	430000	-	-	-	-	YES	ASL
	#	PCB128_166	41000	41000	ng/kg	TK7169	1/1	*-*	41000	-	-	-	-	YES	ASL
	#	PCB129_138_160_163	340000	340000	ng/kg	TK7169	1/1	*-*	340000	-	-	-	-	YES	ASL
	#	PCB135_151_154	100000	100000	ng/kg	TK7169	1/1	*-*	100000	-	-	-	-	YES	ASL
	#	PCB153_168	340000	340000	ng/kg	TK7169	1/1	*-*	340000	-	-	-	-	YES	ASL
	#	PCB156_157	28000	28000	ng/kg	TK7169	1/1	*-*	28000	-	-	-	-	YES	ASL
	#	PCB180_193	180000	180000	ng/kg	TK7169	1/1	*-*	180000	-	-	-	-	YES	ASL
	#	PCB183_185	58000	58000	ng/kg	TK7169	1/1	*-*	58000	-	-	-	-	YES	ASL
	#	PCB201	4300	4300	ng/kg	TK7169	1/1	*-*	4300	-	-	-	-	YES	ASL
	#	PCB_CONJ_SUM	4700000	4700000	ng/kg	TK7169	1/1	*-*	4700000	-	-	-	-	YES	ASL
	#	Total PCBs (calculated)	12000	12000	ug/kg	TK7169	1/1	*-*	12000	-	-	-	-	YES	ASL

TABLE 3.1
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Reach 1 Surface Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 1 Surface Sediment	bis(2-Ethylhexyl)phthalate	mg/kg	21.79	-	81	81	mg/kg	Max	(11)
	Benzo(a)anthracene	mg/kg	45.60	590	280	280	mg/kg	Max	(3)
	Benzo(a)pyrene	mg/kg	22.19	183	110	110	mg/kg	Max	(3)
	Benzo(b)fluoranthene	mg/kg	36.89	-	99	99	mg/kg	Max	(11)
	Benzo(ghi)perylene	mg/kg	29.76	-	89	89	mg/kg	Max	(11)
	Benzo(k)fluoranthene	mg/kg	13.26	52	42	42	mg/kg	Max	(3)
	Carbazole	mg/kg	39.07	-	47	47	mg/kg	Max	(11)
	Chrysene	mg/kg	93.03	1248	600	600	mg/kg	Max	(3)
	Dibenz(a,h)anthracene	mg/kg	11.65	85	41	41	mg/kg	Max	(3)
	Indeno(1,2,3-cd)pyrene	mg/kg	14.93	114	50	50	mg/kg	Max	(3)
	Naphthalene	mg/kg	95	896	1300	896	mg/kg	95% UCL-T	(2)
	Phenanthrene	mg/kg	226	3195	1900	1900	mg/kg	Max	(3)
	Pyrene	mg/kg	104	1504	720	720	mg/kg	Max	(3)
	Dieldrin	mg/kg	0.22	1.34	0.12	0.12	mg/kg	Max	(3)
	Aluminum	mg/kg	12,867	-	25,100	25,100	mg/kg	Max	(11)
	Antimony	mg/kg	19.24	-	72	72	mg/kg	Max	(11)
	Arsenic	mg/kg	57.26	165	210	165	mg/kg	95% UCL-T	(2)
	Cadmium	mg/kg	20.51	52	62	52	mg/kg	97.5% UCL-C	(6)
	Chromium	mg/kg	448	622	1,300	622	mg/kg	95% UCL-N	(1)
	Iron	mg/kg	34,913	-	85,000	85,000	mg/kg	Max	(11)
	Lead	mg/kg	1412	4195	6,800	4195	mg/kg	97.5% UCL-C	(6)
	Manganese	mg/kg	630	-	907	907	mg/kg	Max	(11)
	Nickel	mg/kg	237	-	1,140	1,140	mg/kg	Max	(11)
	Zinc	mg/kg	2132	3305	6000 J	3,305	mg/kg	95% UCL-N	(1)
	Aroclor 1242	mg/kg	1.58	20.05	6.80	6.80	mg/kg	Max	(3)
	Aroclor 1248	mg/kg	1.69	8.48	7.94	7.94	mg/kg	Max	(10)
	Aroclor 1260	mg/kg	0.92	1.32	2.20	1.32	mg/kg	95% UCL-N	(1)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.2
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Reach 2 Surface Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 2 Surface Sediment	Benzo(a)anthracene	mg/kg	58	172	420	172	mg/kg	95% UCL-T	(2)
	Benzo(a)pyrene	mg/kg	46	120	206	120	mg/kg	95% UCL-T	(2)
	Benzo(b)fluoranthene	mg/kg	20.20	-	34	34	mg/kg	Max	(11)
	Benzo(ghi)perylene	mg/kg	17.15	-	29	29	mg/kg	Max	(11)
	Benzo(k)fluoranthene	mg/kg	6.39	11.16	14	11.16	mg/kg	95% UCL-T	(2)
	Carbazole	mg/kg	11.02	-	33 J	33	mg/kg	Max	(11)
	Chrysene	mg/kg	104	326	730	326	mg/kg	95% UCL-T	(2)
	Dibenz(a,h)anthracene	mg/kg	6.62	15.77	26	15.77	mg/kg	95% UCL-T	(2)
	Indeno(1,2,3-cd)pyrene	mg/kg	7.67	17.59	26	17.59	mg/kg	95% UCL-T	(2)
	Phenanthrene	mg/kg	123	372	1,070	372	mg/kg	95% UCL-T	(2)
	Pyrene	mg/kg	95	254	700	254	mg/kg	95% UCL-T	(2)
	Total Chlordane	mg/kg	1.10	-	2.35	2.35	mg/kg	Max	(11)
	4,4'-DDE	mg/kg	2.30	-	8.84	8.84	mg/kg	Max	(11)
	Total DDT	mg/kg	2.89	-	10.30	10.30	mg/kg	Max	(11)
	Dieldrin	mg/kg	1.68	-	4.25	4.25	mg/kg	Max	(11)
	gamma-BHC (Lindane)	mg/kg	0.98	-	3.16	3.16	mg/kg	Max	(11)
	Heptachlor	mg/kg	1.57	-	4.61	4.61	mg/kg	Max	(11)
	Hexachlorocyclohexane-all isomers	mg/kg	3.16	-	3.16	3.16	mg/kg	Max	(11)
	Toxaphene	mg/kg	2.31	-	6.35		mg/kg	Max	(11)
	Aluminum	mg/kg	6,907	10,507	11,000	10,507	mg/kg	95%UCL-C	(5)
	Antimony	mg/kg	29	47	99	47	mg/kg	95% UCL-T	(2)
	Arsenic	mg/kg	58	185	180	180	mg/kg	Max	(3)
	Cadmium	mg/kg	30	74	89	74	mg/kg	95% UCL-T	(2)
	Chromium	mg/kg	335	620	1200	620	mg/kg	95% UCL-T	(2)
	Iron	mg/kg	81,426	186,911	260,000	186,911	mg/kg	95% UCL-T	(2)
	Lead	mg/kg	1,889	3,201	12,000	3,201	mg/kg	95% UCL-T	(2)
	Manganese	mg/kg	890	1,113	1,700	1,113	mg/kg	95% UCL-N	(1)
	Mercury	mg/kg	5.53	-	7.20	7.20	mg/kg	Max	(11)
	Zinc	mg/kg	3,812	8,436	11,000	8,436	mg/kg	95% UCL-T	(2)
	2,3,7,8-Dibenzo-p-dioxin	mg/kg	3.00E-06	-	6.00E-06	6.00E-06	mg/kg	Max	(11)
	Aroclor 1248	mg/kg	3.76	-	10.40	10.40	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)
95% UCL of Normal Data (95% UCL-N)
95% UCL of Log-transformed Data (95% UCL-T)
95% Chebyshev UCL (95% UCL-C)
97.5% Chebyshev UCL (97.5% UCL-C)
99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.3
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Reach 3 Surface Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 3 Surface Sediment	Benzo(a)anthracene	mg/kg	14.45	-	27	27	mg/kg	Max	(11)
	Benzo(a)pyrene	mg/kg	7.98	-	16 J	16	mg/kg	Max	(11)
	Benzo(b)fluoranthene	mg/kg	6.35	-	12 J	12	mg/kg	Max	(11)
	Benzo(ghi)perylene	mg/kg	3.78	-	6.7 J	6.7	mg/kg	Max	(11)
	Benzo(k)fluoranthene	mg/kg	5.58	-	11 J	11	mg/kg	Max	(11)
	Chrysene	mg/kg	30	-	68	68	mg/kg	Max	(11)
	Dibenz(a,h)anthracene	mg/kg	1.72	-	4 J	4	mg/kg	Max	(11)
	Indeno(1,2,3-cd)pyrene	mg/kg	2.73	-	4.9 J	4.9	mg/kg	Max	(11)
	Phenanthrene	mg/kg	47	-	120	120	mg/kg	Max	(11)
	Dieldrin	mg/kg	0.018	-	0.028 J	0.028	mg/kg	Max	(11)
	Arsenic	mg/kg	58	-	110	110	mg/kg	Max	(11)
	Cadmium	mg/kg	28	-	36	36	mg/kg	Max	(11)
	Chromium	mg/kg	277	-	410	410	mg/kg	Max	(11)
	Lead	mg/kg	2,188	-	5,200	5,200	mg/kg	Max	(11)
	Mercury	mg/kg	10.15	-	15	15	mg/kg	Max	(11)
	Aroclor 1248	mg/kg	0.52	-	1.2 J	1.2	mg/kg	Max	(11)
	Aroclor 1260	mg/kg	0.24	-	0.55 J	0.55	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.4
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Reach 4 Surface Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 4 Surface Sediment	Acenaphthene	mg/kg	342	-	1,300	1,300	mg/kg	Max	(11)
	Benzo(a)anthracene	mg/kg	63	-	170	170	mg/kg	Max	(11)
	Benzo(a)pyrene	mg/kg	35	-	98	98	mg/kg	Max	(11)
	Benzo(b)fluoranthene	mg/kg	15	-	17	17	mg/kg	Max	(11)
	Benzo(ghi)perylene	mg/kg	8.55	-	9.10	9.10	mg/kg	Max	(11)
	Benzo(k)fluoranthene	mg/kg	12.98	-	27	27	mg/kg	Max	(11)
	Chrysene	mg/kg	75	-	190	190	mg/kg	Max	(11)
	Dibenz(a,h)anthracene	mg/kg	6.81	-	4.50	4.50	mg/kg	Max	(11)
	Indeno(1,2,3-cd)pyrene	mg/kg	16.15	-	43	43	mg/kg	Max	(11)
	2-Methylnaphthalene	mg/kg	497	-	2,000	2,000	mg/kg	Max	(11)
	Naphthalene	mg/kg	682	-	2,900	2,900	mg/kg	Max	(11)
	Phenanthrene	mg/kg	386	-	1,400	1,400	mg/kg	Max	(11)
	Antimony	mg/kg	95	-	280	280	mg/kg	Max	(11)
	Arsenic	mg/kg	24	-	40 (J)	40	mg/kg	Max	(11)
	Cadmium	mg/kg	11.13	-	23	23	mg/kg	Max	(11)
	Chromium	mg/kg	137	-	250	250	mg/kg	Max	(11)
	Iron	mg/kg	38,500	-	64,000	64,000	mg/kg	Max	(11)
	Lead	mg/kg	643	-	1,000 (J)	1,000	mg/kg	Max	(11)
	Manganese	mg/kg	515	-	890		mg/kg	Max	(11)
	Mercury	mg/kg	8.70	-	12	12	mg/kg	Max	(11)
	Aroclor 1248	mg/kg	0.20	-	0.40	0.40	mg/kg	Max	(11)
	Aroclor 1260	mg/kg	0.15	-	0.29	0.29	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

	Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
	95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
	95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.5
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Reach 5 Surface Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 5 Surface Sediment	Benzo(a)anthracene	mg/kg	9.52	-	20	20	mg/kg	Max	(11)
	Benzo(a)pyrene	mg/kg	12.62	-	7.2	7.2	mg/kg	Max	(11)
	Benzo(b)fluoranthene	mg/kg	4.05	-	4.6	4.6	mg/kg	Max	(11)
	Benzo(ghi)perylene	mg/kg	1.80	-	2.2 J	2.2	mg/kg	Max	(11)
	Dibenz(a,h)anthracene	mg/kg	11.23	-	0.62	0.62	mg/kg	Max	(11)
	Indeno(1,2,3-cd)pyrene	mg/kg	11.62	-	1.8 J	1.8	mg/kg	Max	(11)
	Aluminum	mg/kg	9,900	-	9,900	9,900	mg/kg	Max	(11)
	Antimony	mg/kg	212	-	212	212	mg/kg	Max	(11)
	Arsenic	mg/kg	10.66	-	20.5	20.50	mg/kg	Max	(11)
	Cadmium	mg/kg	4.67	-	10.3	10.30	mg/kg	Max	(11)
	Iron	mg/kg	33,000	-	33,000	33,000	mg/kg	Max	(11)
	Lead	mg/kg	374	-	600	600	mg/kg	Max	(11)
	Manganese	mg/kg	2,860	-	2,860	2,860	mg/kg	Max	(11)
	Aroclor 1248	mg/kg	0.46	-	0.68	0.68	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.6
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Reach 6 Surface Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 6 Surface Sediment	Benzene	mg/kg	14.62	61	44	44	mg/kg	Max	(10)
	Acenaphthene	mg/kg	276	2,340	1,400	1,400	mg/kg	Max	(3)
	Benzo(a)anthracene	mg/kg	66	197	330	197	mg/kg	95% UCL-T	(2)
	Benzo(a)pyrene	mg/kg	44	128	160	128	mg/kg	95% UCL-T	(2)
	Benzo(k)fluoranthene	mg/kg	34	121	22	22	mg/kg	Max	(9)
	Chrysene	mg/kg	71	195	320	195	mg/kg	95% UCL-T	(2)
	Dibenz(a,h)anthracene	mg/kg	39	-	7.20	7.20	mg/kg	Max	(11)
	Indeno(1,2,3-cd)pyrene	mg/kg	40	138	23	23	mg/kg	Max	(9)
	2-Methylnaphthalene	mg/kg	439	4,547	3,400	3,400	mg/kg	Max	(3)
	Naphthalene	mg/kg	608	5,939	3,800	3,800	mg/kg	Max	(3)
	Phenanthrene	mg/kg	376	3,382	1,900	1,900	mg/kg	Max	(3)
	Pyrene	mg/kg	183	638	830	638	mg/kg	95% UCL-T	(2)
	Aluminum	mg/kg	10,125	-	13,000	13,000	mg/kg	Max	(11)
	Antimony	mg/kg	42	-	69	69	mg/kg	Max	(11)
	Arsenic	mg/kg	23	40	96	40	mg/kg	95% UCL-T	(2)
	Cadmium	mg/kg	12.76	34	75	34	mg/kg	95% UCL-T	(2)
	Chromium	mg/kg	94	228	340	228	mg/kg	95% UCL-T	(2)
	Iron	mg/kg	75,750	-	160,000	160,000	mg/kg	Max	(11)
	Lead	mg/kg	573	1,523	3,400	1,523	mg/kg	95% UCL-C	(5)
	Manganese	mg/kg	575	-	980	980	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.7
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Reach 7 Surface Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 7 Surface Sediment	Benzene	mg/kg	13	-	25	25	mg/kg	Max	(11)
	Benzo(a)anthracene	mg/kg	21	-	66	66	mg/kg	Max	(11)
	Benzo(a)pyrene	mg/kg	36	-	110	110	mg/kg	Max	(11)
	Benzo(b)fluoranthene	mg/kg	6.45	-	7.5	7.5	mg/kg	Max	(11)
	Benzo(ghi)perylene	mg/kg	5.45	-	6.5	6.5	mg/kg	Max	(11)
	Benzo(k)fluoranthene	mg/kg	5.96	-	14	14	mg/kg	Max	(11)
	Chrysene	mg/kg	24	-	68	68	mg/kg	Max	(11)
	Dibenz(a,h)anthracene	mg/kg	9.6125	-	2.2	2.2	mg/kg	Max	(11)
	Indeno(1,2,3-cd)pyrene	mg/kg	10.8125	-	4.7	4.7	mg/kg	Max	(11)
	2-Methylnaphthalene	mg/kg	193	-	630	630	mg/kg	Max	(11)
	Naphthalene	mg/kg	160	-	820	820	mg/kg	Max	(11)
	Phenanthrene	mg/kg	103	-	440	440	mg/kg	Max	(11)
	Total Chlordane	mg/kg	0.881788	-	2.14	2.14	mg/kg	Max	(11)
	4,4'-DDE	mg/kg	2.3887	-	6.8	6.8	mg/kg	Max	(11)
	Total DDT	mg/kg	0.948267	-	2.8	2.8	mg/kg	Max	(11)
	Dieldrin	mg/kg	0.996375	-	2.83	2.83	mg/kg	Max	(11)
	Heptachlor	mg/kg	0.0911	-	0.19	0.19	mg/kg	Max	(11)
	Toxaphene	mg/kg	0.8155	-	2.05	2.05	mg/kg	Max	(11)
	Arsenic	mg/kg	14.675	-	24 J	24	mg/kg	Max	(11)
	Cadmium	mg/kg	8.62	-	18	18	mg/kg	Max	(11)
	Lead	mg/kg	635	-	1,306	1,306	mg/kg	Max	(11)
	Manganese	mg/kg	614	-	614	614	mg/kg	Max	(11)
	Mercury	mg/kg	3.612	-	6.30	6.30	mg/kg	Max	(11)
	Aroclor 1248	mg/kg	5.518362	-	13.65	13.65	mg/kg	Max	(11)
	Aroclor 1260	mg/kg	0.181875	-	0.36	0.36	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.8
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Roxanna Marsh Surface Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Roxanna Marsh Surface Sediment	Benzo(a)anthracene	mg/kg	21	77	160	77	mg/kg	97.5% UCL-C	(6)
	Benzo(a)pyrene	mg/kg	9.79	27	50	27	mg/kg	95% UCL-T	(2)
	Benzo(b)fluoranthene	mg/kg	20	45	84	45	mg/kg	95% UCL-T	(2)
	Benzo(ghi)perylene	mg/kg	22	36	89 (j)	36	mg/kg	95% UCL-T	(2)
	Benzo(k)fluoranthene	mg/kg	2.80	5.18	14	5.18	mg/kg	95% UCL-T	(2)
	Chrysene	mg/kg	49	258	370	258	mg/kg	99% UCL-C	(7)
	Dibenz(a,h)anthracene	mg/kg	9.37	30	73	30	mg/kg	97.5% UCL-C	(6)
	Indeno(1,2,3-cd)pyrene	mg/kg	14.46	35	74	35	mg/kg	97.5% UCL-C	(6)
	Pyrene	mg/kg	69	376	580 (j)	376	mg/kg	99% UCL-C	(7)
	Dieldrin	mg/kg	0.14	0.53	0.036 JP	0.036	mg/kg	Max	(9)
	Arsenic	mg/kg	43	100	150	100	mg/kg	95% UCL-T	(2)
	Cadmium	mg/kg	22	63	72	63	mg/kg	95% UCL-T	(2)
	Chromium	mg/kg	311	696	1,300	696	mg/kg	97.5% UCL-C	(6)
	Iron	mg/kg	8,825	-	12,800	12,800	mg/kg	Max	(11)
	Lead	mg/kg	1,374	3,443	8,800 (j)	3,443	mg/kg	95% UCL-T	(2)
	Mercury	mg/kg	2.781	5.6	7.8 (j)	5.6	mg/kg	97.5% UCL-C	(6)
	Aroclor 1260	mg/kg	1.05	2.37	2.1 J	2.1	mg/kg	Max	(3)
	Aroclor 1254	mg/kg	1.90	4.27	13 (j)	4.27	mg/kg	95% UCL-T	(2)
	Aroclor 1248	mg/kg	1.51	3.23	6.90	3.23	mg/kg	97.5% UCL-C	(6)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":
Maximum Detected Value (Max)
95% UCL of Normal Data (95% UCL-N)
95% UCL of Log-transformed Data (95% UCL-T)
95% Chebyshev UCL (95% UCL-C)
97.5% Chebyshev UCL (97.5% UCL-C)
99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.9
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Surface Water	Chlorodibromomethane	mg/L	0.0012	-	0.0015	0.0015	mg/L	Max	(11)
	Napthalene	mg/L	0.00066	-	0.00115	0.00115	mg/L	Max	(11)
	Aluminum (Total)	mg/L	0.30	1.38	3.39	1.38	mg/L	97.5% UCL-C	(6)
	Arsenic (Total)	mg/L	0.0037	0.004	0.0058	0.004	mg/L	95% UCL-N	(1)
	Chromium (Total)	mg/L	0.0037	0.0051	0.0198	0.0051	mg/L	95% UCL-T	(2)
	Lead (Total)	mg/L	0.0097	0.013	0.0698	0.013	mg/L	95% UCL-T	(2)

Notes:
- = Not enough detected samples to calculate a 95% UCL.
This table includes surface water data from Reach 1, Reach 4, Reach 6, and the Hammond Sanitary Outfall.

Codes used for the "EPC Statistic":
Maximum Detected Value (Max)
95% UCL of Normal Data (95% UCL-N)
95% UCL of Log-transformed Data (95% UCL-T)
95% Chebyshev UCL (95% UCL-C)
97.5% Chebyshev UCL (97.5% UCL-C)
99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.10
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Reach 1 Carp Fillet

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 1 Carp Fillet	Acenaphthene	mg/kg	0.013	-	0.013	0.013	mg/kg	Max	(11)
	Acenaphthylene	mg/kg	0.005	-	0.005	0.005	mg/kg	Max	(11)
	Anthracene	mg/kg	0.007	-	0.007	0.007	mg/kg	Max	(11)
	Fluoranthene	mg/kg	0.004	-	0.004	0.004	mg/kg	Max	(11)
	Fluorene	mg/kg	0.023	-	0.023	0.023	mg/kg	Max	(11)
	1-Methylnaphthalene	mg/kg	0.007	-	0.007	0.007	mg/kg	Max	(11)
	2-Methylnaphthalene	mg/kg	0.008	-	0.008	0.008	mg/kg	Max	(11)
	Phenanthrene	mg/kg	0.007	-	0.007	0.007	mg/kg	Max	(11)
	Pyrene	mg/kg	0.006	-	0.006	0.006	mg/kg	Max	(11)
	Chlordane - alpha	mg/kg	0.024	-	0.024	0.024	mg/kg	Max	(11)
	Chlordane - gamma	mg/kg	0.018	-	0.018 J-	0.018	mg/kg	Max	(11)
	o,p'-DDD	mg/kg	0.047	-	0.047	0.047	mg/kg	Max	(11)
	p,p'-DDD	mg/kg	0.20	-	0.20	0.20	mg/kg	Max	(11)
	p,p'-DDE	mg/kg	0.15	-	0.15	0.15	mg/kg	Max	(11)
	Trans nonachlor	mg/kg	0.035	-	0.035	0.035	mg/kg	Max	(11)
	Chromium	mg/kg	0.52	-	0.52	0.52	mg/kg	Max	(11)
	Copper	mg/kg	3.19	-	3.19	3.19	mg/kg	Max	(11)
	Iron	mg/kg	33	-	33	33	mg/kg	Max	(11)
	Selenium	mg/kg	7.98	-	7.98	7.98	mg/kg	Max	(11)
	Zinc	mg/kg	122	-	122	122	mg/kg	Max	(11)
	Dioxin TEQ	mg/kg	0.000020	-	2.03E-05	2.03E-05	mg/kg	Max	(11)
	Nondioxin-like PCBs	mg/kg	0.678	-	0.68	0.68	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentratio so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentrat so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.11
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 1 Chinook Fillet

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 1 Chinook Fillet	Acenaphthene	mg/kg	0.008	-	0.008	0.008	mg/kg	Max	(11)
	Acenaphthylene	mg/kg	0.004	-	0.004	0.004	mg/kg	Max	(11)
	Anthracene	mg/kg	0.004	-	0.004	0.004	mg/kg	Max	(11)
	Fluoranthene	mg/kg	0.005	-	0.005	0.005	mg/kg	Max	(11)
	Fluorene	mg/kg	0.024	-	0.024	0.024	mg/kg	Max	(11)
	1-Methylnaphthalene	mg/kg	0.005	-	0.005	0.005	mg/kg	Max	(11)
	2-Methylnaphthalene	mg/kg	0.004	-	0.004	0.004	mg/kg	Max	(11)
	Phenanthrene	mg/kg	0.017	-	0.017	0.017	mg/kg	Max	(11)
	Chlordane - alpha	mg/kg	0.056	-	0.056	0.056	mg/kg	Max	(11)
	Chlordane - gamma	mg/kg	0.041	-	0.041 J-	0.041	mg/kg	Max	(11)
	p,p'-DDD	mg/kg	0.134	-	0.13	0.13	mg/kg	Max	(11)
	p,p'-DDE	mg/kg	2.82	-	2.82	2.82	mg/kg	Max	(11)
	p,p'-DDT	mg/kg	0.171	-	0.17	0.17	mg/kg	Max	(11)
	Dieldrin	mg/kg	0.027	-	0.027	0.027	mg/kg	Max	(11)
	cis-Nonachlor	mg/kg	0.16	-	0.16	0.16	mg/kg	Max	(11)
	Trans nonachlor	mg/kg	0.25	-	0.25	0.25	mg/kg	Max	(11)
	Chromium	mg/kg	0.60	-	0.60	0.60	mg/kg	Max	(11)
	Copper	mg/kg	3.52	-	3.52	3.52	mg/kg	Max	(11)
	Iron	mg/kg	34	-	34	34	mg/kg	Max	(11)
	Mercury	mg/kg	1.11	-	1.11	1.11	mg/kg	Max	(11)
	Selenium	mg/kg	3.10	-	3.10	3.10	mg/kg	Max	(11)
	Zinc	mg/kg	25	-	25	25	mg/kg	Max	(11)
	Dioxin TEQ	mg/kg	0.000060	-	5.98E-05	5.98E-05	mg/kg	Max	(11)
	Nondioxin-like PCBs	mg/kg	0.897	-	0.90	0.90	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.12
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 1 Goldfish Fillet

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 1 Goldfish Fillet	Bis(2-ethylhexyl) phthalate	mg/kg	5.61	-	5.61	5.61	mg/kg	Max	(11)
	Fluorene	mg/kg	0.007	-	0.007	0.007	mg/kg	Max	(11)
	1-Methylnaphthalene	mg/kg	0.006	-	0.006	0.006	mg/kg	Max	(11)
	2-Methylnaphthalene	mg/kg	0.007	-	0.007	0.007	mg/kg	Max	(11)
	Naphthalene	mg/kg	0.006	-	0.006	0.006	mg/kg	Max	(11)
	Chlordane - alpha	mg/kg	0.032	-	0.032	0.032	mg/kg	Max	(11)
	Chlordane - gamma	mg/kg	0.019	-	0.019 J-	0.019	mg/kg	Max	(11)
	o,p'-DDD	mg/kg	0.031	-	0.031	0.031	mg/kg	Max	(11)
	p,p'-DDD	mg/kg	0.15	-	0.15	0.15	mg/kg	Max	(11)
	p,p'-DDE	mg/kg	0.18	-	0.18	0.18	mg/kg	Max	(11)
	Trans nonachlor	mg/kg	0.037	-	0.037	0.037	mg/kg	Max	(11)
	Chromium	mg/kg	0.51	-	0.51	0.51	mg/kg	Max	(11)
	Copper	mg/kg	2.55	-	2.55	2.55	mg/kg	Max	(11)
	Iron	mg/kg	56	-	56	56	mg/kg	Max	(11)
	Lead	mg/kg	0.61	-	0.61	0.61	mg/kg	Max	(11)
	Selenium	mg/kg	5.61	-	5.61	5.61	mg/kg	Max	(11)
	Zinc	mg/kg	133	-	133	133	mg/kg	Max	(11)
	Dioxin TEQ	mg/kg	0.000021	-	2.15E-05	2.15E-05	mg/kg	Max	(11)
	Nondioxin-like PCBs	mg/kg	0.790	-	0.79	0.79	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.13
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 1 Steelhead Fillet

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 1 Steelhead Fillet	Acenaphthene	mg/kg	0.006	-	0.006	0.006	mg/kg	Max	(11)
	Anthracene	mg/kg	0.004	-	0.004	0.004	mg/kg	Max	(11)
	Fluoranthene	mg/kg	0.004	-	0.004	0.004	mg/kg	Max	(11)
	Fluorene	mg/kg	0.014	-	0.014	0.014	mg/kg	Max	(11)
	1-Methylnaphthalene	mg/kg	0.004	-	0.004	0.004	mg/kg	Max	(11)
	Phenanthrene	mg/kg	0.013	-	0.013	0.013	mg/kg	Max	(11)
	Chlordane - alpha	mg/kg	0.033	-	0.033	0.033	mg/kg	Max	(11)
	Chlordane - gamma	mg/kg	0.02	-	0.02 J-	0.02	mg/kg	Max	(11)
	p,p'-DDD	mg/kg	0.082	-	0.082	0.082	mg/kg	Max	(11)
	p,p'-DDE	mg/kg	2.36	-	2.36	2.36	mg/kg	Max	(11)
	p,p'-DDT	mg/kg	0.13	-	0.13	0.13	mg/kg	Max	(11)
	cis-Nonachlor	mg/kg	0.12	-	0.12	0.12	mg/kg	Max	(11)
	Trans nonachlor	mg/kg	0.169	-	0.169	0.169	mg/kg	Max	(11)
	Chromium	mg/kg	0.769	-	0.77	0.77	mg/kg	Max	(11)
	Copper	mg/kg	6.15	-	6.15	6.15	mg/kg	Max	(11)
	Iron	mg/kg	72	-	72	72	mg/kg	Max	(11)
	Lead	mg/kg	0.49	-	0.49	0.49	mg/kg	Max	(11)
	Mercury	mg/kg	1.90	-	1.90	1.90	mg/kg	Max	(11)
	Selenium	mg/kg	3.18	-	3.18	3.18	mg/kg	Max	(11)
	Zinc	mg/kg	35	-	35	35	mg/kg	Max	(11)
	Dioxin TEQ	mg/kg	0.000055	-	5.50E-05	5.50E-05	mg/kg	Max	(11)
	Nondioxin-like PCBs	mg/kg	0.671	-	0.67	0.67	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.14
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 2 Chinook Fillet

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 2 Chinook Fillet	Acenaphthene	mg/kg	0.009	-	0.012	0.012	mg/kg	Max	(11)
	Anthracene	mg/kg	0.003	-	0.004	0.004	mg/kg	Max	(11)
	Fluoranthene	mg/kg	0.003	-	0.005	0.005	mg/kg	Max	(11)
	Fluorene	mg/kg	0.012	-	0.016	0.016	mg/kg	Max	(11)
	1-Methylnaphthalene	mg/kg	0.003	-	0.004	0.004	mg/kg	Max	(11)
	Phenanthrene	mg/kg	0.01	-	0.015	0.015	mg/kg	Max	(11)
	Chlordane - alpha	mg/kg	0.055	-	0.057	0.057	mg/kg	Max	(11)
	o,p'-DDD	mg/kg	0.031	-	0.05	0.05	mg/kg	Max	(11)
	p,p'-DDD	mg/kg	0.15	-	0.20	0.20	mg/kg	Max	(11)
	p,p'-DDE	mg/kg	1.73	-	2.09	2.09	mg/kg	Max	(11)
	p,p'-DDT	mg/kg	0.10	-	0.13	0.13	mg/kg	Max	(11)
	Dieldrin	mg/kg	0.016	-	0.02	0.02	mg/kg	Max	(11)
	cis-Nonachlor	mg/kg	0.093	-	0.12	0.12	mg/kg	Max	(11)
	Trans nonachlor	mg/kg	0.16	-	0.19	0.19	mg/kg	Max	(11)
	Aluminum	mg/kg	37	-	61	61	mg/kg	Max	(11)
	Chromium	mg/kg	1.09	-	1.51	1.51	mg/kg	Max	(11)
	Copper	mg/kg	7.73	-	10.61	10.61	mg/kg	Max	(11)
	Iron	mg/kg	140	-	236	236	mg/kg	Max	(11)
	Lead	mg/kg	1.72	-	3.28	3.28	mg/kg	Max	(11)
	Manganese	mg/kg	4.71	-	5.79	5.79	mg/kg	Max	(11)
	Mercury	mg/kg	1.11	-	1.12	1.12	mg/kg	Max	(11)
	Selenium	mg/kg	3.58	-	3.84	3.84	mg/kg	Max	(11)
	Zinc	mg/kg	106.40	-	180	180	mg/kg	Max	(11)
	Dioxin TEQ	mg/kg	0.000049	-	4.95E-05	4.95E-05	mg/kg	Max	(11)
	Nondioxin-like PCBs	mg/kg	0.845		0.84	0.84	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.15
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 2 Goldfish Fillet

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 2 Goldfish Fillet	Acenaphthene	mg/kg	0.005	-	0.005	0.005	mg/kg	Max	(11)
	Anthracene	mg/kg	0.007	-	0.007	0.007	mg/kg	Max	(11)
	Fluorene	mg/kg	0.018	-	0.018	0.018	mg/kg	Max	(11)
	1-Methylnaphthalene	mg/kg	0.008	-	0.008	0.008	mg/kg	Max	(11)
	2-Methylnaphthalene	mg/kg	0.011	-	0.011	0.011	mg/kg	Max	(11)
	Chlordane - alpha	mg/kg	0.03	-	0.03	0.03	mg/kg	Max	(11)
	Chlordane - gamma	mg/kg	0.024	-	0.024 J-	0.024	mg/kg	Max	(11)
	o,p'-DDD	mg/kg	0.106	-	0.11	0.11	mg/kg	Max	(11)
	p,p'-DDD	mg/kg	0.528	-	0.53	0.53	mg/kg	Max	(11)
	p,p'-DDE	mg/kg	0.141	-	0.14	0.14	mg/kg	Max	(11)
	Dieldrin	mg/kg	0.018	-	0.018	0.018	mg/kg	Max	(11)
	gamma-BHC (Lindane)	mg/kg	0.013	-	0.013	0.013	mg/kg	Max	(11)
	Trans nonachlor	mg/kg	0.035	-	0.035	0.035	mg/kg	Max	(11)
	Iron	mg/kg	35	-	35	35	mg/kg	Max	(11)
	Chromium	mg/kg	0.39	-	0.39	0.39	mg/kg	Max	(11)
	Copper	mg/kg	2.01	-	2.01	2.01	mg/kg	Max	(11)
	Selenium	mg/kg	4.23	-	4.23	4.23	mg/kg	Max	(11)
	Zinc	mg/kg	106	-	106	106	mg/kg	Max	(11)
	Dioxin TEQ	mg/kg	0.000022	-	2.20E-05	2.20E-05	mg/kg	Max	(11)
	Nondioxin-like PCBs	mg/kg	0.842	-	0.84	0.84	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.16
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 6 Carp Fillet

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 6 Carp Fillet	Acenaphthene	mg/kg	1.59	-	1.59	1.59	mg/kg	Max	(11)
	Acenaphthylene	mg/kg	0.042	-	0.042	0.042	mg/kg	Max	(11)
	Anthracene	mg/kg	0.062	-	0.062	0.062	mg/kg	Max	(11)
	Benz(a)anthracene	mg/kg	0.006	-	0.006	0.006	mg/kg	Max	(11)
	Benzo(b)fluoranthene	mg/kg	0.004	-	0.004	0.004	mg/kg	Max	(11)
	Chrysene	mg/kg	0.009	-	0.009	0.009	mg/kg	Max	(11)
	Fluoranthene	mg/kg	0.21	-	0.21	0.21	mg/kg	Max	(11)
	Fluorene	mg/kg	0.47	-	0.47	0.47	mg/kg	Max	(11)
	1-Methylnaphthalene	mg/kg	0.72	-	0.72	0.72	mg/kg	Max	(11)
	2-Methylnaphthalene	mg/kg	1.00	-	1.0	1.0	mg/kg	Max	(11)
	Naphthalene	mg/kg	1.12	-	1.12	1.12	mg/kg	Max	(11)
	Phenanthrene	mg/kg	0.42	-	0.42	0.42	mg/kg	Max	(11)
	Pyrene	mg/kg	0.35	-	0.35	0.35	mg/kg	Max	(11)
	Chlordane - alpha	mg/kg	0.098	-	0.15	0.15	mg/kg	Max	(11)
	Chlordane - gamma	mg/kg	0.067	-	0.117 J-	0.12	mg/kg	Max	(11)
	o,p'-DDD	mg/kg	0.12	-	0.14	0.14	mg/kg	Max	(11)
	p,p'-DDD	mg/kg	0.50	-	0.51	0.51	mg/kg	Max	(11)
	p,p'-DDE	mg/kg	0.25	-	0.37	0.37	mg/kg	Max	(11)
	Dieldrin	mg/kg	0.053	-	0.07	0.07	mg/kg	Max	(11)
	cis-Nonachlor	mg/kg	0.036	-	0.035	0.035	mg/kg	Max	(11)
	Trans nonachlor	mg/kg	0.055	-	0.075	0.075	mg/kg	Max	(11)
	Aluminum	mg/kg	15.41	-	25.34	25.34	mg/kg	Max	(11)
	Chromium	mg/kg	0.77	-	1.19	1.19	mg/kg	Max	(11)
	Copper	mg/kg	3.20	-	5.39	5.39	mg/kg	Max	(11)
	Iron	mg/kg	118	-	221	221	mg/kg	Max	(11)
	Lead	mg/kg	1.39	-	2.7	2.7	mg/kg	Max	(11)
	Selenium	mg/kg	2.01	-	2.7	2.7	mg/kg	Max	(11)
	Zinc	mg/kg	125	-	216	216	mg/kg	Max	(11)
	Dioxin TEQ	mg/kg	0.000060	-	6.00E-05	6.00E-05	mg/kg	Max	(11)
	Nondioxin-like PCBs	mg/kg	2.98	-	2.98	2.98	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.17
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 7 Carp Fillet

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 7 Carp Fillet	Acenaphthene	mg/kg	1.73	-	1.73	1.73	mg/kg	Max	(11)
	Benzoic acid	mg/kg	6.39	-	6.39	6.39	mg/kg	Max	(11)
	Fluoranthene	mg/kg	0.41	-	0.41	0.41	mg/kg	Max	(11)
	Fluorene	mg/kg	0.64	-	0.64	0.64	mg/kg	Max	(11)
	2-Methylnaphthalene	mg/kg	0.60	-	0.60	0.60	mg/kg	Max	(11)
	Naphthalene	mg/kg	0.56	-	0.56	0.56	mg/kg	Max	(11)
	Phenanthrene	mg/kg	0.79	-	0.79	0.79	mg/kg	Max	(11)
	Pyrene	mg/kg	0.87	-	0.87	0.87	mg/kg	Max	(11)
	Chlordane - alpha	mg/kg	0.08	-	0.083	0.083	mg/kg	Max	(11)
	Chlordane - gamma	mg/kg	0.13	-	0.128 J	0.13	mg/kg	Max	(11)
	o,p'-DDD	mg/kg	0.11	-	0.11	0.11	mg/kg	Max	(11)
	p,p'-DDD	mg/kg	0.38	-	0.38	0.38	mg/kg	Max	(11)
	p,p'-DDE	mg/kg	0.23	-	0.23	0.23	mg/kg	Max	(11)
	Dieldrin	mg/kg	0.031	-	0.031	0.031	mg/kg	Max	(11)
	cis-Nonachlor	mg/kg	0.024	-	0.024	0.024	mg/kg	Max	(11)
	Trans nonachlor	mg/kg	0.056	-	0.056	0.056	mg/kg	Max	(11)
	Aluminum	mg/kg	34	-	34	34	mg/kg	Max	(11)
	Chromium	mg/kg	1.65	-	1.65	1.65	mg/kg	Max	(11)
	Copper	mg/kg	10.902	-	10.90	10.90	mg/kg	Max	(11)
	Iron	mg/kg	271	-	271	271	mg/kg	Max	(11)
	Lead	mg/kg	4.51	-	4.51	4.51	mg/kg	Max	(11)
	Selenium	mg/kg	2.90	-	2.90	2.90	mg/kg	Max	(11)
	Zinc	mg/kg	271	-	271	271	mg/kg	Max	(11)
	Dioxin TEQ	mg/kg	0.000029	-	2.91E-05	2.91E-05	mg/kg	Max	(11)
	Nondioxin-like PCBs	mg/kg	1.30	-	1.30	1.30	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 3.18
EXPOSURE POINT CONCENTRATION SUMMARY
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Reach 7 Goldfish Fillet

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL	Maximum Concentration (Qualifier)	Reasonable Maximum Exposure			
						EPC Value	EPC Units	EPC Statistic	EPC Rationale
Reach 7 Goldfish Fillet	Acenaphthene	mg/kg	3.24	-	3.24	3.24	mg/kg	Max	(11)
	Acenaphthylene	mg/kg	0.23	-	0.23	0.23	mg/kg	Max	(11)
	Anthracene	mg/kg	0.24	-	0.24	0.24	mg/kg	Max	(11)
	Benz(a)anthracene	mg/kg	0.007	-	0.007	0.007	mg/kg	Max	(11)
	Chrysene	mg/kg	0.008	-	0.008	0.008	mg/kg	Max	(11)
	Dibenzofuran	mg/kg	0.28	-	0.28	0.28	mg/kg	Max	(11)
	Fluoranthene	mg/kg	0.36	-	0.36	0.36	mg/kg	Max	(11)
	Fluorene	mg/kg	1.04	-	1.04	1.04	mg/kg	Max	(11)
	1-Methylnaphthalene	mg/kg	0.58	-	0.58	0.58	mg/kg	Max	(11)
	2-Methylnaphthalene	mg/kg	0.91	-	0.91	0.91	mg/kg	Max	(11)
	Naphthalene	mg/kg	0.91	-	0.91	0.91	mg/kg	Max	(11)
	Phenanthrene	mg/kg	0.68	-	0.68	0.68	mg/kg	Max	(11)
	Pyrene	mg/kg	0.55	-	0.55	0.55	mg/kg	Max	(11)
	Chlordane - alpha	mg/kg	0.30	-	0.30	0.30	mg/kg	Max	(11)
	Chlordane - gamma	mg/kg	0.22	-	0.223 J-	0.22	mg/kg	Max	(11)
	o,p'-DDD	mg/kg	0.18	-	0.18	0.18	mg/kg	Max	(11)
	p,p'-DDD	mg/kg	1.10	-	1.10	1.10	mg/kg	Max	(11)
	p,p'-DDE	mg/kg	0.68	-	0.68	0.68	mg/kg	Max	(11)
	Dieldrin	mg/kg	0.074	-	0.074	0.074	mg/kg	Max	(11)
	cis-Nonachlor	mg/kg	0.065	-	0.065	0.065	mg/kg	Max	(11)
	Trans nonachlor	mg/kg	0.13	-	0.13	0.13	mg/kg	Max	(11)
	Iron	mg/kg	22	-	22	22	mg/kg	Max	(11)
	Chromium	mg/kg	0.388	-	0.39	0.39	mg/kg	Max	(11)
	Copper	mg/kg	3.88	-	3.88	3.88	mg/kg	Max	(11)
	Selenium	mg/kg	2.98	-	2.98	2.98	mg/kg	Max	(11)
	Zinc	mg/kg	84	-	84	84	mg/kg	Max	(11)
	Dioxin TEQ	mg/kg	0.000091	-	9.15E-05	9.15E-05	mg/kg	Max	(11)
	Nondioxin-like PCBs	mg/kg	4.09	-	4.09	4.09	mg/kg	Max	(11)

Notes:
- = Not enough detected samples to calculate a 95% UCL.

Codes used for the "EPC Statistic":

Maximum Detected Value (Max)	95% Chebyshev UCL (95% UCL-C)
95% UCL of Normal Data (95% UCL-N)	97.5% Chebyshev UCL (97.5% UCL-C)
95% UCL of Log-transformed Data (95% UCL-T)	99% Chebyshev UCL (99% UCL-C)

EPC Rationale:
(1) Wilks/Shapiro Test indicates a normal distribution.
(2) Wilks/Shapiro Test indicates a lognormal distribution.
(3) 95% UCL based on a lognormal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(4) 95% UCL based on a normal distribution exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(5) Non-Parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(6) Non-Parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(7) Non-Parametric distribution with a standard deviation of the log-transformed data between 2 and 3. The 99% Chebyshev UCL was used as the EPC [ProUCL User's Guide, 5/01].
(8) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 0 and 1. The 95% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(9) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data between 1 and 2. The 97.5% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(10) 95% UCL based on a non-parametric distribution with a standard deviation of the log-transformed data above 2. The 99% Chebyshev UCL exceeds the maximum detected concentration, so the maximum detected concentration was used as the EPC.
(11) Not enough samples to calculate a 95% UCL, therefore the maximum concentration was used as the EPC.

TABLE 4.1 SEDIMENT
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Active Angler	Adult	Reaches 1, 2, 6 & 7	CS	Sediment	Tables 3.	mg/kg		CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Sediment	100	mg/day	Default (1)	CS*IR-S*FI*EF*ED*CF1
				FI	Fraction Ingested	0.5	unitless	50% of fishing at WBGCR (2)	BW*AT
				EF	Exposure Frequency	208	days/year	4 days/week (5)	
				ED	Exposure Duration	30	years	Default (1)	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	-	
				BW	Body Weight	70	kg	Default (1)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	10,950	days	(3)	
		Child 6-10	Reaches 1, 2, 6 & 7	CS	Sediment	Tables 3.	mg/kg		CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Sediment	187	mg/day	Default (4)	CS*IR-S*FI*EF*ED*CF1
				FI	Fraction Ingested	0.5	unitless	50% of fishing at WBGCR (2)	BW*AT
				EF	Exposure Frequency	208	days/year	4 days/week (5)	
				ED	Exposure Duration	5	years	Ages 6 to 10	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	-	
				BW	Body Weight	25.9	kg	Default (4)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	1,825	days	(3)	
	Resident Wader	Adult	Reaches 1 to 7 and Roxana Marsh	CS	Sediment	Tables 3	mg/kg		CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Sediment	100	mg/day	Default (1)	CS*IR-S*FI*EF*ED*CF1
				FI	Fraction Ingested	1	unitless	100% of wading at WBGCR (6)	BW*AT
				EF	Exposure Frequency	12	days/year	Default (7)	
				ED	Exposure Duration	30	years	Default (1)	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	-	
				BW	Body Weight	70	kg	Default (1)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	10,950	days	(3)	
		Child 3-5	Reaches 1 to 7 and Roxana Marsh	CS	Sediment	Tables 3.	mg/kg		CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Sediment	150	mg/day	Default (4)	CS*IR-S*FI*EF*ED*CF1
				FI	Fraction Ingested	1	unitless	100% of wading at WBGCR (6)	BW*AT
				EF	Exposure Frequency	12	days/year	Default (7)	
				ED	Exposure Duration	3	years	Age 3 to 5	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	-	
				BW	Body Weight	16.05	kg	Default (4)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	1,095	days	(3)	
	Maintenance / Utility Worker	Adult	Reaches 1 to 7 and Roxana Marsh	CS	Sediment	Tables 3.	mg/kg		CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Sediment	100	mg/day	Default (8)	CS*IR-S*FI*EF*ED*CF1
				FI	Fraction Ingested	1	unitless	100% of maintenance at WBGCR (6)	BW*AT
				EF	Exposure Frequency	8	days/year	Site-specific (9)	
				ED	Exposure Duration	25	years	Default (8)	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	(3)	
				BW	Body Weight	70	kg	Default (8)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	9,125	days	(3)	

TABLE 4.1 SEDIMENT
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Active Angler	Adult	Reaches 1, 2, 6 & 7	CS	Sediment	Tables 3.	mg/kg		DAD (mg/kg-day)=
				CF	Conversion Factor	1.00E-06	kg/mg	-	d*EF*ED*ET*SA
				SA	Skin Surface Area Available for Con	5,700	cm^2	Hands, forearms, lower legs and feet (10)	BW*AT
				AF	Soil to Skin Adherance Factor	0.07	mg/cm^2-ever	Default (1, 12)	
				ABS-d	Dermal Absorption Factor	Chemical-Specific	unitless	(11)	
				ET	Exposure Time	0.5	events/day	50% of fishing at WBGCR (2)	
				EF	Exposure Frequency	208	days/year	4 days/week (5)	
				ED	Exposure Duration	30	years	Default (1)	
				BW	Body Weight	70	kg	Default (1)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	10,950	days	(3)	
		Child 6-10	Reaches 1, 2, 6 & 7	CS	Sediment	Tables 3.	mg/kg		DAD (mg/kg-day)=
				CF	Conversion Factor	1.00E-06	kg/mg	-	d*EF*ED*ET*SA
				SA	Skin Surface Area Available for Con	3,000	cm^2	Hands, forearms, lower legs and feet (10)	BW*AT
				AF	Soil to Skin Adherance Factor	0.07	mg/cm^2-ever	Default (12)	
				ABS-d	Dermal Absorption Factor	Chemical-Specific	unitless	(11)	
				ET	Exposure Time	0.5	events/day	50% of fishing at WBGCR (2)	
				EF	Exposure Frequency	208	days/year	4 days/week (5)	
				ED	Exposure Duration	5	years	Ages 6 to 10	
				BW	Body Weight	25.9	kg	Default (4)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	1,825	days	(3)	
	Resident Wader	Adult	Reaches 1 to 7 and Roxana Marsh	CS	Sediment	Tables 3.	mg/kg		DAD (mg/kg-day)=
				CF	Conversion Factor	1.00E-06	kg/mg	-	d*EF*ED*ET*SA
				SA	Skin Surface Area Available for Con	5,700	cm^2	Hands, forearms, lower legs and feet (10)	BW*AT
				AF	Soil to Skin Adherance Factor	0.07	mg/cm^2-ever	Default (1, 12)	
				ABS-d	Dermal Absorption Factor	Chemical-Specific	unitless	(11)	
				ET	Exposure Time	1	events/day	100% of wading at WBGCR (6)	
				EF	Exposure Frequency	12	days/year	Default (7)	
				ED	Exposure Duration	30	years	Default (1)	
				BW	Body Weight	70	kg	Default (1)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	10,950	days	(3)	
		Child 3 - 5	Reaches 1 to 7 and Roxana Marsh	CS	Sediment	Tables 3.	mg/kg		DAD (mg/kg-day)=
				CF	Conversion Factor	1.00E-06	kg/mg	-	d*EF*ED*ET*SA
				SA	Skin Surface Area Available for Con	3,300	cm^2	Forearms, hands, legs and feet (4,10)	BW*AT
				AF	Soil to Skin Adherance Factor	0.2	mg/cm^2-ever	Default (1, 13)	
				ABS-d	Dermal Absorption Factor	Chemical-Specific	unitless	(11)	
				ET	Exposure Time	1	events/day	100% of wading at WBGCR (6)	
				EF	Exposure Frequency	12	days/year	Default (7)	
				ED	Exposure Duration	3	years	Ages 3 to 5	
				BW	Body Weight	16.05	kg	Default (4)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	1,095	days	(3)	

TABLE 4.1 SEDIMENT
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (continued)	Maintenance / Utility Worker	Adult	Reaches 1 to 7 and Roxana Marsh	CS	Sediment	Tables 3.	mg/kg		DAD (mg/kg-day)=
				CF	Conversion Factor	1.00E-06	kg/mg	-	d*EF*ED*ET*SA
				SA	Skin Surface Area Available for Con	3,300	cm^2	Face, forearms and hands (8)	BW*AT
				AF	Soil to Skin Adherance Factor	0.2	mg/cm^2-ever	Default (8, 14)	
				ABS-d	Dermal Absorption Factor	Chemical-Specific	unitless		
				ET	Exposure Time	1	events/day	100% of maintenance at WBGCR (6)	
				EF	Exposure Frequency	8	days/year	Site-specific (9)	
				ED	Exposure Duration	25	years	Default (8)	
				BW	Body Weight	70	kg	Default (8)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	9,125	days	(3)	
Inhalation	Resident Wader	Adult	Reaches 3, 4 & 5	CS	Sediment	Tables 3.	mg/kg		Inkake (mg/kg-day) =
				IR	Inhalation Rate	0.83	m^3/hour	Default (1)	CS*(1/PEF)*IR*ET*EF*ED
				PEF	Particulate Emission Factor	1.78E+09	m^3/kg	Calculated (15)	BW*AT
				ET	Exposure Time	1	hours/day	100% of wading at WBGCR (6, 7)	
				EF	Exposure Frequency	12	days/year	Default (7)	
				ED	Exposure Duration	30	years	Default (1)	
				BW	Body Weight	70	kg	Default (1)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	10,950	days	(3)	
		Child 3 - 5	Reaches 3, 4 & 5	CS	Sediment	Tables 3.	mg/kg		Inkake (mg/kg-day) =
				IR	Inhalation Rate	0.58	m^3/hour	Default (4)	CS*(1/PEF)*IR*ET*EF*ED
				PEF	Particulate Emission Factor	1.78E+09	m^3/kg	Calculated (15)	BW*AT
				ET	Exposure Time	1	hours/day	100% of wading at WBGCR (6, 7)	
				EF	Exposure Frequency	12	days/year	Default (7)	
				ED	Exposure Duration	3	years	Ages 3 to 5	
				BW	Body Weight	16.05	kg	Default (4)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	1,095	days	(3)	
	Maintenance / Utility Worker	Adult	Reaches 3, 4 & 5	CS	Sediment	Tables 3.	mg/kg		Inkake (mg/kg-day) =
				IR	Inhalation Rate	2.5	m^3/hour	Moderate activity (16)	CS*(1/PEF)*IR*ET*EF*ED
				PEF	Particulate Emission Factor	1.78E+09	m^3/kg	Calculated (15)	BW*AT
				ET	Exposure Time	8	hours/day	Default (17)	
				EF	Exposure Frequency	8	days/year	Site-specific (9)	
				ED	Exposure Duration	25	years	Default (8)	
				BW	Body Weight	70	kg	Default (8)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	9,125	days	(3)	

Notes:
(1) EPA. 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December. Exhibit 1-2, default values for resident (adult and child, age 1-6).
(2) The active angler is assumed to fish 50% of the time at the WBGCR.
(3) EPA. 1989. Risk Assessment Guidance for Superfund: Vol I - Human Health Evaluation Manual (Part A). EPA/540/1-89/002. - Value for non-carcinogenic effects is based on the ED and the value for carcinogenic effects
(4) EPA. 2001d. Technical Issue Paper: Age Group Recommendations for Assessing Childhood Exposure and the Adequacy of Exisiting Exposure Factors Data for Children. Risk Assessment Forum. October.
(5) Williams et al. 2000. An Examination of Fish Consumption by Indiana Recreational Anglers: An On-Site Survey. Appendix D. 4-days per week represents the 93-percentile of fishing frequency.
(6) EPA. 1989. Risk Assessment Guidance for Superfund: Vol I - Human Health Evaluation Manual (Part A). EPA/540/1-89/002. - Section 6.6.2. All exposure assumed to occur at WBGCR.
(7) EPA. 1997c. Exposure factors Handbook: Volume I General Factors. Table 15-176 - recommended frequency and duration for swimming.
(8) EPA. 2002c. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December. Exhibit 1-2, default values for Non-Residential (Commercial/Industrial) Outdoor Worker.
Notes (continued):
(9) Site-specific assumption that 2 days of culvert maintenance/similar activity is required quarterly.
(10) EPA. 2001a. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim, Review Draft. Exhibit C-1 Body-Part

TABLE 4.1 SEDIMENT
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name

Specific Surface Area Calculations - values correspond to forearms, hands, lower legs, and feet, except for younger child which includes whole leg.
(11) EPA. 2004a. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Recommends use of the same dermal absorption fraction for soils to be applied for sediment.
(12) EPA. 2004a. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). RME value for residential adult and children age 7 and u
(13) EPA. 2004a. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). RME value for residential child, age 1-6.
(14) EPA. 2004a. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). RME value for industrial adult.
(15) EPA. 2002b. December. Equation 5-9. Calculated value for wind erosion. See Table 4.4.
(16) EPA. 1997a. Exposure Factors Handbook: Volume III Activity Factors. Table 5-23 Recommended Inhalation Rates for Outdoor Worker with moderate activity.
(17) EPA. 2002b. December. Exhibit 1-2, The Inhalation Rate default value for Non-Residential (Commercial/Industrial) Outdoor Worker is 20 m3/day. Therefore, the ET was assigned so that ET*IR = 20m3/day.
NOTE: There are no inhalation exposure factors for Active Angler because the portions of the WBGCR that are sufficiently deep to support fish do not dry up and therefore do not produce particulates.

TABLE 4.2 SURFACE WATER
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Active Angler	Adult	Reaches 1, 2, 6 & 7	CW	Chemical Concentration in Surface Water	Table 3.	mg/L		CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.1	L/day	50 mL/hour (11)	CW*IR-W*FI*EF*ED / BW*AT
				FI	Fraction Ingested	0.5	unitless	50% of fishing at WBGCR (2)	
				EF	Exposure Frequency	208	days/year	4 days/week (5)	
				ED	Exposure Duration	30	years	Default (1)	
				BW	Body Weight	70	kg	Default (1)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	10,950	days	(3)	
		Child 6 - 10	Reaches 1, 2, 6 & 7	CW	Chemical Concentration in Surface Water	Table 3.	mg/L		CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.1	L/day	50 mL/hour (11)	CW*IR-W*FI*EF*ED / BW*AT
				FI	Fraction Ingested	0.5	unitless	50% of fishing at WBGCR (2)	
				EF	Exposure Frequency	208	days/year	4 days/week (5)	
				ED	Exposure Duration	5	years	Ages 6 to 10	
				BW	Body Weight	25.9	kg	Default (4)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	1,825	days	(3)	
	Resident Wader	Adult	Reaches 1 to 7 and Roxana Marsh	CW	Chemical Concentration in Surface Water	Table 3.	mg/L		CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.05	L/day	50 mL/hour (11)	CW*IR-W*FI*EF*ED / BW*AT
				FI	Fraction Ingested	1	unitless	100% of wading at WBGCR (6)	
				EF	Exposure Frequency	12	days/year	Default (7)	
				ED	Exposure Duration	30	years	Default (1)	
				BW	Body Weight	70	kg	Default (1)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	10,950	days	(3)	
		Child 3 - 5	Reaches 1 to 7 and Roxana Marsh	CW	Chemical Concentration in Surface Water	Table 3.	mg/L		CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.05	L/day	50 mL/hour (11)	CW*IR-W*FI*EF*ED / BW*AT
				FI	Fraction Ingested	1	unitless	100% of wading at WBGCR (6)	
				EF	Exposure Frequency	12	days/year	Default (7)	
				ED	Exposure Duration	3	years	Ages 3 to 5	
				BW	Body Weight	16.05	kg	Default (4)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	1,095	days	(3)	
	Maintenance / Utility Worker	Adult	Reaches 1 to 7 and Roxana Marsh	CW	Chemical Concentration in Surface Water	Table 3.	mg/L		CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.4	L/day	50 mL/hour (11)	CW*IR-W*FI*EF*ED / BW*AT
				FI	Fraction Ingested	1	unitless	100% of maintenance at WBGCR (6)	
				EF	Exposure Frequency	8	days/year	Site-specific (9)	
				ED	Exposure Duration	25	years	Default (8)	
				BW	Body Weight	70	kg	Default (8)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	9,125	days	(3)	
Dermal	Active Angler	Adult	Reaches 1, 2, 6 & 7	CW	Chemical Concentration in Surface Water	Table 3.	mg/L	-	DAD (mg/kg-day)=
				FA	Fraction Absorbed Water	Chemical-Specific	unitless	See Appendix A	DAevent*SA*EV*EF*ED / BW*AT
				SA	Skin Surface Area Available for Contact	5,700	cm^2	Hands, forearms, lower legs and feet (10)	
				Kp	Permeability Constant	Chemical-Specific	cm/hr	See Appendix A	
				τ-event	Lag time per event	Chemical-Specific	hours/event	See Appendix A	
				t-event	Event Duration	2	hours/event	Professional judgement	where DAevent=
				τ*	Time to Reach Steady-State	Calculated	hour	2.4*τ-event	organic compounds:
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Calculated	unitless	Kp* $\sqrt{(MW)}$ / 2.6	if tevent $\leq$ t* : CW*2*FA*Kp*CF2*$\sqrt{(6*\tau event*tevent/\pi)}$
				MW	Molecular Weight	Chemical-Specific	g/mol	See Appendix A	
				EV	Event Frequency	0.5	events/day	50% of fishing at WBGCR (2)	if tevent > t*: CW*FA*Kp*CF2*[tevent/(1+B) + 2* τevent*(1+3B+3B^2)/(1+B)^2]
				EF	Exposure Frequency	208	days/year	4 days/week (5)	
				ED	Exposure Duration	30	years	Default (1)	inorganic compounds:
				CF2	Conversion Factor 2	0.001	L/cm^3	-	CW*Kp*CF*tevent
				BW	Body Weight	70	kg	Default (1)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	10,950	days	(3)	

TABLE 4.2 SURFACE WATER
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (continued)		Child 6 - 10	Reaches 1, 2, 6 & 7	CW	Chemical Concentration in Surface Water	Table 3.	mg/L	-	DAD (mg/kg-day)=
				FA	Fraction Absorbed Water	Chemical-Specific	unitless	See Appendix A	DAevent*SA*EV*EF*ED / BW*AT
				SA	Skin Surface Area Available for Contact	3,000	cm^2	Hands, forearms, lower legs and feet (10)	
				Kp	Permeability Constant	Chemical-Specific	cm/hr	See Appendix A	
				τ–event	Lag time per event	Chemical-Specific	hours/event	See Appendix A	
				t-event	Event Duration	2	hours/event	Professional judgement	where DAevent=
				τ*	Time to Reach Steady-State	Calculated	hour	2.4*τ-event	organic compounds:
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Calculated	unitless	Kp* √(MW) / 2.6	if tevent≤t* : CW*2*FA*Kp*CF2*√(6*τevent*tevent/π)
				MW	Molecular Weight	Chemical-Specific	g/mol	See Appendix A	
				EV	Exposure Time	0.5	events/day	50% of fishing at WBGCR (2)	if tevent>t*: CW*FA*Kp*CF2*[tevent/(1+B) + 2* τevent*(1+3B+3B^2)/(1+B)^2]
				EF	Exposure Frequency	208	days/year	4 days/week (5)	
				ED	Exposure Duration	5	years	Ages 6 to 10	inorganic compounds:
				CF2	Conversion Factor 2	0.001	L/cm^3	-	CW*Kp*CF*tevent
				BW	Body Weight	25.9	kg	Default (4)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	1,825	days	(3)	
	Resident Wader	Adult	Reaches 1 to 7 and Roxana Marsh	CW	Chemical Concentration in Surface Water	Table 3.43	mg/L	-	DAD (mg/kg-day)=
				FA	Fraction Absorbed Water	Chemical-Specific	unitless	See Appendix A	DAevent*SA*EV*EF*ED / BW*AT
				SA	Skin Surface Area Available for Contact	5,700	cm^2	Hands, forearms, lower legs and feet (10)	
				Kp	Permeability Constant	Chemical-Specific	cm/hr	See Appendix A	
				τ–event	Lag time per event	Chemical-Specific	hours/event	See Appendix A	
				t-event	Event Duration	1	hours/event	Default (7)	where DAevent=
				τ*	Time to Reach Steady-State	Calculated	hour	2.4*τ-event	organic compounds:
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Calculated	unitless	Kp* √(MW) / 2.6	if tevent≤t* : CW*2*FA*Kp*CF2*√(6*τevent*tevent/π)
				MW	Molecular Weight	Chemical-Specific	g/mol	See Appendix A	
				EV	Exposure Time	1	events/day	100% of wading at WBGCR (6)	if tevent>t*: CW*FA*Kp*CF2*[tevent/(1+B) + 2* τevent*(1+3B+3B^2)/(1+B)^2]
				EF	Exposure Frequency	12	days/year	Default (7)	
				ED	Exposure Duration	30	years	Default (1)	inorganic compounds:
				CF2	Conversion Factor 2	0.001	L/cm^3	-	CW*Kp*CF*tevent
				BW	Body Weight	70	kg	Default (1)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	10,950	days	(3)	
		Child 3 - 5	Reaches 1 to 7 and Roxana Marsh	CW	Chemical Concentration in Surface Water	Table 3.43	mg/L	-	DAD (mg/kg-day)=
				FA	Fraction Absorbed Water	Chemical-Specific	unitless	See Appendix A	DAevent*SA*EV*EF*ED / BW*AT
				SA	Skin Surface Area Available for Contact	3,300	cm^2	Forearms, hands, legs and feet (4,10)	
				Kp	Permeability Constant	Chemical-Specific	cm/hr	See Appendix A	
				τ–event	Lag time per event	Chemical-Specific	hours/event	See Appendix A	
				t-event	Event Duration	1	hours/event	Default (7)	where DAevent=
				τ*	Time to Reach Steady-State	Calculated	hour	2.4*τ-event	organic compounds:
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Calculated	unitless	Kp* √(MW) / 2.6	if tevent≤t* : CW*2*FA*Kp*CF2*√(6*τevent*tevent/π)
				MW	Molecular Weight	Chemical-Specific	g/mol	See Appendix A	
				EV	Exposure Time	1	events/day	100% of wading at WBGCR (6)	if tevent>t*: CW*FA*Kp*CF2*[tevent/(1+B) + 2* τevent*(1+3B+3B^2)/(1+B)^2]
				EF	Exposure Frequency	12	days/year	Default (7)	
				ED	Exposure Duration	3	years	Ages 3 to 5	inorganic compounds:
				CF2	Conversion Factor 2	0.001	L/cm^3	-	CW*Kp*CF*tevent
				BW	Body Weight	16.05	kg	Default (4)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	1,095	days	(3)	

TABLE 4.2 SURFACE WATER
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (continued)	Maintenance / Utility Worker	Adult	Reaches 1 to 7 and Roxana Marsh	CW	Chemical Concentration in Surface Water	Table 3.43	mg/L	-	DAD (mg/kg-day)=
				FA	Fraction Absorbed Water	Chemical-Specific	unitless	See Appendix A	DAevent*SA*EV*EF*ED / BW*AT
				SA	Skin Surface Area Available for Contact	4,499	cm^2	Hands, lower legs and feet (8)	
				Kp	Permeability Constant	Chemical-Specific	cm/hr	See Appendix A	
				τ–event	Lag time per event	Chemical-Specific	hours/event	See Appendix A	
				t-event	Event Duration	8	hours/event	Full work day	where DAevent=
				τ*	Time to Reach Steady-State	Calculated	hour	2.4*τ-event	organic compounds:
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Calculated	unitless	Kp* √(MW) / 2.6	if tevent≤t* : CW*2*FA*Kp*CF2*√(6*τevent*tevent/π)
				MW	Molecular Weight	Chemical-Specific	g/mol	See Appendix A	
				EV	Exposure Time	1	events/day	100% of maintenance at WBGCR (6)	if tevent>t*: CW*FA*Kp*CF2*[tevent/(1+B) + 2* τevent*(1+3B+3B^2)/(1+B)^2]
				EF	Exposure Frequency	8	days/year	Site-specific (9)	
				ED	Exposure Duration	25	years	Default (8)	inorganic compounds:
				CF2	Conversion Factor 2	0.001	L/cm^3	-	CW*Kp*CF*tevent
				BW	Body Weight	70	kg	Default (8)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	9,125	days	(3)	

Notes:
(1) EPA 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December. Exhibit 1-2, default values for resident (adult and child, age 1-6).
(2) The active angler is assumed to fish 50% of the time at the WBGCR.
(3) EPA 1989. Risk Assessment Guidance for Superfund: Vol I - Human Health Evaluation Manual (Part A). EPA/540/1-89/002. - Value for non-carcinogenic effects is based on the ED and the value for carcinogenic effects is based on a 70 year lifetime.
(4) EPA 2001d. Technical Issue Paper: Age Group Recommendations for Assessing Childhood Exposure and the Adequacy of Exisiting Exposure Factors Data for Children. Risk Assessment Forum. October
(5) Williams et. al. 2000. An Examination of Fish Consumption by Indiana Recreational Anglers: An On-Site Survey. Appendix D. 4-days per week represents the 93-percentile of fishing frequency.
(6) EPA 1989. Risk Assessment Guidance for Superfund: Vol I - Human Health Evaluation Manual (Part A). EPA/540/1-89/002. - Section 6.6.2. All exposure assumed to occur at WBGCR.
(7) EPA 1997c. Exposure factors Handbook: Volume I General Factors. Table 15-176 - recommended frequency and duration for swimming.
(8) EPA 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December. Exhibit 1-2, default values for Non-Residential (Commercial/Industrial) Outdoor Worker.
(9) Site-specific assumption that two days of culvert maintenance/similar activity is required quarterly.
(10) EPA 2004a. Risk Assessment Guidance for Superfund: Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Exhibit C-1 Body-Part
(11) EPA 1989. Risk Assessment Guidance for Superfund: Vol I - Human Health Evaluation Manual (Part A). EPA/540/1-89/002. Exhibit 6-12 incidential ingestion rate of 50 mL/hour while swimming.

TABLE 4.3 FISH
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Fish Tissue

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Active Angler	Adult	Reaches 1, 2, 6 & 7	CFish	Chemical Concentration in Fish	Table 3.	mg/kg		CDI (mg/kg-day) =
				IR-F	Ingestion Rate of Fish	37,800	mg/day	Site-specific (5)	CFish*IR-F*FI*EF*ED*CF1
				FI	Fraction Ingested	0.5	unitless	50% of fishing at WBGCR (2)	BW*AT
				EF	Exposure Frequency	365	days/year	(7)	
				ED	Exposure Duration	30	years	Default (1)	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	-	
				BW	Body Weight	70	kg	Default (1)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	10,950	days	(3)	
		Child 6 - 10	Reaches 1, 2, 6 & 7	CFish	Chemical Concentration in Fish	Table 3	mg/kg		CDI (mg/kg-day) =
				IR-F	Ingestion Rate of Fish	14,000	mg/day	Calculated (8)	CFish*IR-F*FI*EF*ED*CF1
				FI	Fraction Ingested	0.5	unitless	50% of fishing at WBGCR (2)	BW*AT
				EF	Exposure Frequency	365	days/year	(7)	
				ED	Exposure Duration	5	years	Ages 6 to 10	
				CF1	Conversion Factor 1	1.00E-06	kg/mg	-	
				BW	Body Weight	25.9	kg	Default (4)	
				AT-C	Averaging Time - Cancer	25,550	days	(3)	
				AT-N	Averaging Time - Non-Cancer	1,825	days	(3)	

Notes:
(1) EPA 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December. Exhibit 1-2, default values for resident (adult and child, age 1-6)
(2) The active angler is assumed to fish 50% of the time at the WBGCR.
(3) EPA 1989. Risk Assessment Guidance for Superfund: Vol I - Human Health Evaluation Manual (Part A). EPA/540/1-89/002. - Value for non-carcinogenic effects is based on the ED and the value for carcinogenic effects
(4) EPA 2001d. Technical Issue Paper: Age Group Recommendations for Assessing Childhood Exposure and the Adequacy of Exisiting Exposure Factors Data for Children. Risk Assessment Forum. October
(5) Williams et. al. 2000. An Examination of Fish Consumption by Indiana Recreational Anglers: An On-Site Survey. 37.8 grams per day represents the 95-percentile for North Indiana Active Consumers
(6) EPA 1989. Risk Assessment Guidance for Superfund: Vol I - Human Health Evaluation Manual (Part A). EPA/540/1-89/002. - Section 6.6.2. All exposure assumed to occur at WBGCR.
(7) Corresponds to fish ingestion rate expressed as daily average.
(8) Proportionate to adult ingestion rate based on body weight.

TABLE 4.4
PARTICULATE EMISSION FACTOR DEVELOPMENT FOR WIND RESUSPENSION
West Branch of the Grand Calumet River, Lake County, Indiana

Parameter Code	Parameter Definition	Units	Value	Rationale/ Reference	Equation/ Model Name
PEF	Particulate Emission Factor	m^3/kg	1.78E+09	Calculated (1,2)	See Note (3)
Q/Cwind	Inverse of Mean Concentration at Center of Square Source	g/m^2-s per kg/m^3	98.43	Calculated (1,2)	See Note (4)
A	Constant Based on Air Modeling for specific climate zones	unitless	16.87	Exhibit D-2 of the cited guidance Chicago, IL (1)	
B	Constant Based on Air Modeling for specific climate zones	unitless	18.78	Exhibit D-2 of the cited guidance Chicago, IL (1)	
C	Constant Based on Air Modeling for specific climate zones	unitless	215.06	Exhibit D-2 of the cited guidance Chicago, IL (1)	
A_{site}	Areal extent of the site or contamination	acres	0.5	Default (2)	
V	Fraction of Vegetative Cover/Water Covered	unitless	0.6	Based on site observations (5)	
U_m	Mean Annual Wind Speed	m/s	4.69	Default (1,2)	
U_t	Equivalent Threshold Value of Wind Speed at 10 m	m/s	11.32	Default (1,2)	
F(x)	Function Dependent on x	unitless	0.194	Default (1,2)	

Notes:
(1) EPA 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December. Appendix D: Dispersion Factor Calculations
(2) EPA 1996c. Soil Screening Guidance: User's Guide. July.
(3) The equation used to calculate the particulate emission factor is shown below

$$PEF = \frac{Q}{C} \cdot \frac{3{,}600\ s/hr}{0.036 \cdot (1-V) \cdot \left(U_m / U_t \right)^3 \cdot F(x)}$$

(4) The equation used to calculate the inverse of the mean concentration at the center of Square Source is shown below

$$Q / C_{wind} = A \cdot e^{[(\ln A_{site} - B)^2) / C]}$$

(5) Observations made during Site Characterization (summer 2002) and site reconnaisance (winter 2004). Value shown is minimum observed

TABLE 4.5

CHEMICAL-SPECIFIC DERMAL ABSORPTION FACTORS

West Branch of the Grand Calumet River, Lake County, Indiana

Chemical of Potential Concern	Absorption Factor (ABS)	Source (1)
Benzene		(2)
Chlorodibromomethane		(2)
Acenaphthene	0.13	(1) Exhibit 3-4
Acenaphthylene	0.13	(1) Exhibit 3-4
Anthracene	0.13	(1) Exhibit 3-4
Benz(a)anthracene	0.13	(1) Exhibit 3-4
Benzo(a)anthracene	0.13	(1) Exhibit 3-4
Benzo(a)pyrene	0.13	(1) Exhibit 3-4
Benzo(b)fluoranthene	0.13	(1) Exhibit 3-4
Benzo(ghi)perylene	0.13	(1) Exhibit 3-4
Benzo(k)fluoranthene	0.13	(1) Exhibit 3-4
Benzoic acid	0.1	(1) Exhibit 3-4, value for SVOCs
bis(2-Ethylhexyl)phthalate	0.1	(1) Exhibit 3-4, value for SVOCs
Carbazole	0.1	(1) Exhibit 3-4, value for SVOCs
Chrysene	0.13	(1) Exhibit 3-4
Dibenz(a,h)anthracene	0.13	(1) Exhibit 3-4
Dibenzofuran	0.1	(1) Exhibit 3-4, value for SVOCs
Indeno(1,2,3-cd)pyrene	0.13	(1) Exhibit 3-4
Fluoranthene	0.13	(1) Exhibit 3-4
Fluorene	0.13	(1) Exhibit 3-4
1-Methylnaphthalene	0.13	Assumed value for PAHs
2-Methylnaphthalene	0.13	Assumed value for PAHs
Naphthalene	0.13	Assumed value for PAHs
Phenanthrene	0.13	(1) Exhibit 3-4
Pyrene	0.13	(1) Exhibit 3-4
Aluminum		(2)
Antimony		(2)
Arsenic	0.03	(1) Exhibit 3-4
Cadmium	0.001	(1) Exhibit 3-4
Chromium (VI)		(2)
Copper		(2)
Iron		(2)
Lead		(2)
Manganese		(2)
Manganese (Diet)		(2)
Manganese (Water)		(2)
Mercury		(2)
Nickel		(2)
Selenium		(2)
Zinc		(2)
Chlordane - alpha	0.04	Assumed value for Chlordane
Chlordane - gamma	0.04	Assumed value for Chlordane
Total Chlordane	0.04	(1) Exhibit 3-4
cis-Nonachlor	0.04	Component of Chlordane & Heptachlor
o,p'-DDD	0.03	Assumed value for DDT
p,p'-DDD	0.03	Assumed value for DDT
p,p'-DDE	0.03	Assumed value for DDT
p,p'-DDT	0.03	Assumed value for DDT
4,4'-DDT	0.03	Assumed value for DDT
Total DDT	0.03	(1) Exhibit 3-4
Dieldrin		(2)
gamma-BHC (Lindane)	0.04	(1) Exhibit 3-4
Heptachlor	0.01	(2)
Hexachlorocyclohexane-all isomers	0.04	Assumed value for Lindane
Toxaphene		(2)
Trans nonachlor	0.04	Component of Chlordane & Heptachlor
2,3,7,8-Dibenzo-p-dioxin	0.001	(1) Exhibit 3-4, TOC>10%
Aroclor 1242	0.14	(1) Exhibit 3-4
Aroclor 1248	0.14	(1) Exhibit 3-4
Aroclor 1254	0.14	(1) Exhibit 3-4
Aroclor 1260	0.14	(1) Exhibit 3-4
Dioxin TEQ	0.14	(1) Exhibit 3-4
Nondioxin-like PCBs	0.14	(1) Exhibit 3-4

Notes:

(1) EPA 2004c. Risk Assessment Guidance for Superfund, Vol I: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment.

(2) The most recent USEPA guidance for dermal risk assessment (1), does not recommend default dermal absorption values for VOCs and inorganics.

TABLE 4.6

VALUES USED FOR ABSORBED DOSE CALCULATION

West Branch of the Grand Calumet River, Lake County, Indiana

Chemical of Potential Concern	Permeability Coefficient (1) Kp (cm/hr)	Lag Time Per Event (1) tau (hr/event)	Time To Reach Steady-State (1) t* (hours)	Fraction Absorbed (1) FA (unitless)	Source
Chlorodibromomethane	3.20E-03	1.57	3.77	1	(1) Exhibit B-3
Naphthalene	4.70E-02	0.56	1.34	1	(1) Exhibit B-3
Aluminum (Total)	1.00E-03	1	1	1	(1) Exhibit B-4
Arsenic (Total)	1.00E-03	1	1	1	(1) Exhibit B-4
Chromium (Total)	2.00E-03	1	1	1	(1), Exhibit B-4 Cr VI
Lead (Total)	1.00E-04	1	1	1	(1) Exhibit B-4

Notes:

(1) EPA 2004a. Risk Assessment Guidance for Superfund, Vol I: Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment.

TABLE 4.7
VALUES USED AND RESULTS FOR IEUBK CHILD LEAD MODEL - Chlid Resident Wader - Reach 3
West Branch of the Grand Calumet River, Lake County, Indiana

Child Age (yr)	Sediment Ingestion Rate (1) (mg/day)	Lead Concentration in Sediment (2) (mg/kg)	Lead Concentration in Surface Water (3) (mg/L)	Blood Lead Level (ug/dL)	Target Blood Lead Level (ug/dL)
0.5 - 1	NA	NA	NA	3.9	10
1 - 2	100	NA	NA	4.1	10
2 - 3	100	NA	NA	3.8	10
3 - 4	150	5,200	0.013	5.5	10
4 - 5	150	5,200	0.013	5.9	10
5 - 6	150	5,200	0.013	5.6	10
6 - 7	187	5,200	0.013	5.8	10

Notes:
(1) EPA 2001d. Technical Issue Paper: Age Group Recommendations for Assessing Childhood Exposure and the Adequacy of the Existing Exposure Factors Data for Children. Risk Assessment Forum. October.
(2) See Table 3.3 for sediment exposure point concentrations.
(3) See Table 3.9 for surface water exposure point concentrations.

TABLE 4.8
VALUES USED AND RESULTS FOR IEUBK CHILD LEAD MODEL - Chlid Active Angler - Reach 1
West Branch of the Grand Calumet River, Lake County, Indiana

Child Age (yr)	Soil Ingestion Rate (1) (mg/day)	Lead Concentration in Soil (2) (mg/kg)	Lead Concentration in Surface Water (3) (mg/L)	Blood Lead Level (ug/dL)	Target Blood Lead Level (ug/dL)
0.5 - 1	NA	NA	NA	2.6	10
1 - 2	100	NA	NA	2.6	10
2 - 3	100	NA	NA	2.4	10
3 - 4	150	NA	NA	2.4	10
4 - 5	150	NA	NA	2.2	10
5 - 6	150	NA	NA	2.1	10
6 - 7	187	4,195	0.013	16.2	10

Notes:
(1) EPA 2001d. Technical Issue Paper: Age Group Recommendations for Assessing Childhood Exposure and the Adequacy of the Existing Exposure Factors Data for Children. Risk Assessment Forum. October.
(2) See Table 3.1 for sediment exposure point concentrations.
(3) See Table 3.9 for surface water exposure point concentrations.

TABLE 4.9

ADULT LEAD MODEL OUTPUT - Adult Active Angler

West Branch of the Grand Calumet River, Lake County, Indiana

Calculations of Blood Lead Concentrations (PbBs)

EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	PbB Equation[1]		Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario			
					Using Equation 1		Using Equation 2	
	1*	2**			GSDi = Hom	GSDi = Het	GSDi = Hom	GSDi = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	4195	4195	4195	4195
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	2.1	2.3	2.1	2.3
PbB_0	X	X	Baseline PbB	ug/dL	1.5	1.7	1.5	1.7
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100	0.100	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.100	0.100
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	208	208	208	208
$AT_{S,D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**			**ug/dL**	**13.0**	**13.2**	**13.0**	**13.2**
$PbB_{fetal,0.95}$	**95th percentile PbB among fetuses of adult workers**			**ug/dL**	**39.6**	**46.7**	**39.6**	**46.7**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**			**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**			**%**	**58.3%**	**58.1%**	**58.3%**	**58.1%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in EPA (1996c).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in EPA (1996c).**

PbB_{adult} =	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal,0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
West Branch of the Grand Calumet River, Lake County, Indiana

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/ Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value (2)	Units			Source(s) (3)	Date(s) (MM/DD/YYYY)
Benzene	Chronic	4.00E-03	mg/kg-day	97%	3.88E-03	mg/kg-day	Blood	300	IRIS	02/25/2004
Chlorodibromomethane	Chronic	3.00E-03	mg/kg-day	80%	2.40E-03	mg/kg-day	Hepatic necrosis	1000	ATSDR	07/01/1997
Acenaphthene	Chronic	6.00E-02	mg/kg-day	31%	1.86E-02	mg/kg-day	Hepatotoxicity	3000	IRIS	02/25/2004
Acenaphthylene	-	-	mg/kg-day	31%	-	mg/kg-day	-	-	-	-
Anthracene	Chronic	3.00E-01	mg/kg-day	76%	2.28E-01	mg/kg-day	None observed	3000	IRIS	02/25/2004
Benz(a)anthracene	-	-	mg/kg-day	31%	-	mg/kg-day	-	-	-	-
Benzo(a)anthracene	-	-	mg/kg-day	31%	-	mg/kg-day	-	-	-	-
Benzo(a)pyrene	-	-	mg/kg-day	31%	-	mg/kg-day	-	-	-	-
Benzo(b)fluoranthene	-	-	mg/kg-day	31%	-	mg/kg-day	-	-	-	-
Benzo(ghi)perylene	-	-	mg/kg-day	31%	-	mg/kg-day	-	-	-	-
Benzo(k)fluoranthene	-	-	mg/kg-day	31%	-	mg/kg-day	-	-	-	-
Benzoic acid	Chronic	4.00E+00	mg/kg-day	100%	4.00E+00	mg/kg-day	-	1	IRIS	02/25/2004
bis(2-Ethylhexyl)phthalate	Chronic	2.00E-02	mg/kg-day	19%	3.80E-03	mg/kg-day	Liver weight	1	IRIS	02/25/2004
Carbazole	-	-	mg/kg-day	70%	-	mg/kg-day	-	-	-	-
Chrysene	-	-	mg/kg-day	31%	-	mg/kg-day	-	-	-	-
Dibenz(a,h)anthracene	-	-	mg/kg-day	31%	-	mg/kg-day	-	-	-	-
Dibenzofuran	Chronic	4.00E-03	mg/kg-day	80%	3.20E-03	mg/kg-day	-	-	PPRTV	02/25/2004
Fluoranthene	Chronic	4.00E-02	mg/kg-day	31%	1.24E-02	mg/kg-day	Liver	3000	IRIS	02/25/2004
Fluorene	Chronic	4.00E-02	mg/kg-day	50%	2.00E-02	mg/kg-day	Blood	3000	IRIS	02/25/2004
Indeno(1,2,3-cd)pyrene	-	-	mg/kg-day	31%	-	mg/kg-day	-	-	-	-
1-Methylnaphthalene	-	-	mg/kg-day	80%	-	mg/kg-day	Respiratory	1000	ATSDR	08/01/1995
2-Methylnaphthalene	Chronic	4.00E-03	mg/kg-day	80%	3.20E-03	mg/kg-day	Pulmonary alveolar proteinosis	1000	IRIS	02/25/2004
Naphthalene	Chronic	2.00E-02	mg/kg-day	80%	1.60E-02	mg/kg-day	Decreased terminal body weight	3000	IRIS	02/25/2004
Phenanthrene	-	-	mg/kg-day	73%	-	mg/kg-day	-	-	-	-
Pyrene	Chronic	3.00E-02	mg/kg-day	31%	9.30E-03	mg/kg-day	Kidney	3000	IRIS	02/25/2004
Aluminum	Chronic	1.00E+00	mg/kg-day	10%	1.00E-01	mg/kg-day	-	-	-	-
Antimony	Chronic	4.00E-04	mg/kg-day	2%	8.00E-06	mg/kg-day	Blood	1000	IRIS	02/25/2004
Arsenic	Chronic	3.00E-04	mg/kg-day	41%	1.23E-04	mg/kg-day	Pigmentation/keratosis	-	IRIS	02/25/2004
Cadmium (water)	Chronic	5.00E-04	mg/kg-day	1%	5.00E-06	mg/kg-day	Proteinuria	10	IRIS	02/25/2004
Cadmium (food)	Chronic	1.00E-03	mg/kg-day	1%	1.00E-05	mg/kg-day	Proteinuria	10	IRIS	02/25/2004
Chromium (VI)	Chronic	3.00E-03	mg/kg-day	2%	6.00E-05	mg/kg-day	None reported	900	IRIS (4)	02/25/2004
Copper	na	4.00E-02	mg/kg-day	30%	1.20E-02	mg/kg-day	-	-	-	-
Iron	-	-	mg/kg-day	15%	-	mg/kg-day	-	-	-	-
Lead	-	-	mg/kg-day	15%	-	mg/kg-day	-	-	-	-
Manganese (Diet)	Chronic	1.40E-01	mg/kg-day	4%	5.60E-03	mg/kg-day	-	-	IRIS	02/25/2004
Manganese (Water)	Chronic	4.60E-02	mg/kg-day	4%	1.84E-03	mg/kg-day	-	3	IRIS (5)	02/25/2004
Mercury	na	4.00E-02	mg/kg-day	0.01%	4.00E-06	mg/kg-day	-	300	PPRTV (6)	02/25/2004
Nickel	Chronic	2.00E-02	mg/kg-day	27%	5.40E-03	mg/kg-day	Decreased body and organ weights	300	IRIS	02/25/2004
Selenium	Chronic	5.00E-03	mg/kg-day	44%	2.20E-03	mg/kg-day	Clinical selenosis	3	IRIS	02/25/2004
Zinc	Chronic	3.00E-01	mg/kg-day	20%	6.00E-02	mg/kg-day	Blood	3	IRIS	02/25/2004

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

West Branch of the Grand Calumet River, Lake County, Indiana

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/ Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value (2)	Units			Source(s) (3)	Date(s) (MM/DD/YYYY)
Chlordane - alpha	Chronic	5.00E-04	mg/kg-day	50%	2.50E-04	mg/kg-day	Hepatic necrosis	300	Surrogate	-
Chlordane - gamma	Chronic	5.00E-04	mg/kg-day	50%	2.50E-04	mg/kg-day	Hepatic necrosis	300	Surrogate	-
Total Chlordane	-	-	mg/kg-day	-	-	mg/kg-day	-	-	-	-
cis-Nonachlor	-	-	mg/kg-day	-	-	mg/kg-day	-	-	-	-
o,p'-DDD	-	-	mg/kg-day	-	-	mg/kg-day	-	-	-	-
p,p'-DDD	-	-	mg/kg-day	-	-	mg/kg-day	-	-	-	-
p,p'-DDE	-	-	mg/kg-day	-	-	mg/kg-day	-	-	-	-
p,p'-DDT	Chronic	5.00E-04	mg/kg-day	70%	3.50E-04	mg/kg-day	-	100	IRIS	09/01/2002
4,4'-DDT	Chronic	5.00E-04	mg/kg-day	70%	3.50E-04	mg/kg-day	-	100	IRIS	09/01/2002
Total DDT	Chronic	5.00E-04	mg/kg-day	-	-	mg/kg-day	Liver lesions	100	IRIS	03/04/2004
Dieldrin	Chronic	5.00E-05	mg/kg-day	50%	2.50E-05	mg/kg-day	Liver	100	IRIS	02/25/2004
gamma-BHC (Lindane)	Chronic	3.00E-04	mg/kg-day	97%	2.91E-04	mg/kg-day	Liver weight	-	-	-
Heptachlor	Chronic	5.00E-04	mg/kg-day	72%	3.60E-04	mg/kg-day	Liver	300	IRIS	02/25/2004
Hexachlorocyclohexane-all isomers	-	-	mg/kg-day	97%	-	mg/kg-day	-	-	-	-
Toxaphene	-	-	mg/kg-day	50%	-	mg/kg-day	-	-	-	-
Trans nonachlor	-	-	mg/kg-day	-	-	mg/kg-day	-	-	-	-
2,3,7,8-Dibenzo-p-dioxin	-	-	mg/kg-day	50%	-	mg/kg-day	-	-	-	-
Aroclor 1242	-	-	mg/kg-day	90%	-	mg/kg-day	-	-	-	-
Aroclor 1248	-	-	mg/kg-day	90%	-	mg/kg-day	-	-	-	-
Aroclor 1254	Chronic	2.00E-05	mg/kg-day	90%	1.80E-05	mg/kg-day	Eyes/Keritan production	300	IRIS	02/25/2004
Aroclor 1260	-	-	mg/kg-day	90%	-	mg/kg-day	-	-	-	-
Dioxin TEQ	-	-	mg/kg-day	-	-	mg/kg-day	-	-	-	-
Nondioxin-like PCBs	Chronic	2.00E-05	mg/kg-day	90%	1.80E-05	mg/kg-day	Eyes/Keritan production	300	Surrogate	-

Notes:

- = No published value

(1) EPA 2001a. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Interim Guidance. - Exhibit 4.1

(2)

(3) $RfD_D\left[\frac{mg}{kg-day}\right] = RfD_O\left[\frac{mg}{kg-day}\right] \cdot Oral\,to\,Derm\,Adjustment\,Factor$; ease Registry

IRIS = Integrated Risk Information System

HEAST = Health Effects Assessement Summary Table

PPRTV = Provisional Peer Reviewed Toxicity Values

Surrogates Used:

Non-cancer toxicity information for Aroclor 1254 assumed for Nondioxin-like PCB Congeners

Oral RfD for technical chlordane was used for alpha and gamma chlordane

(4) Toxicity values for Chromium VI particulates (as opposed to chromic acid mists) used for Chromium VI

(5) IRIS no longer separates manganese values for chronic oral RfDs into water and diet RfDs. The chronic oral RfD for the total oral intake of manganese is 1.40E-01. However, when assessing exposure to manganes from drinking water or soil, IRIS recommends using a modifying factor of 3, thereby lowering the RfD to 4.67E-02, which has been rounded to 4.6E-02. Rounding to 4.7E-02 is more accurate, but makes the value less conservative. HEAST values remain separated into water and diet subchronic RfDs.

(6) An EPA approved oral chronic RfD for elemental Mercury is currently not available. However, because of the low bioavailability similar to that of Mercuric Sulfide, the unverified oral chronic RfD for Mercuric Sulfid may be used as a proxy/surrogate. An unverified oral chronic RfD of 0.04 mg/kg-d was developed for Mercuric Sulfide by the Chemical Hazard Evaluation group of the Health and Environmental Risk Analysis sectior of the ORNL Life Sciences Division in March of 1993, based on the study by N.W. Revis, G. Holdsworth, G. Bingham, A. King, J. Elmore. 1989. An assessment of health risk associated with Mercury in soil and sediment fron East Fork Poplar Creek, Oak Ridge, Tennessee, Oak Ridge Research Institute, Final Report, pages 1-58. The UF is 300 and the MF is 1; the confidence in the RfD study=medium, database=low, and RfD=low. The derma chronic RfD associated with this unverified oral chronic RfD is 1.2E-05 mg/kg-d.

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
West Branch of the Grand Calumet River, Lake County, Indiana

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD		Primary Target Organ(s)	Combined Uncertainty / Modifying Factors	RfC : Target Organ(s) Uncertainty /	
		Value	Units	Value (1)	Units			Modifying Factors	Date(s) (MM/DD/YYYY)
Benzene	Chronic	3.00E-02	mg/m^3	8.57E-03	mg/kg-day	Lymphocyte	300	IRIS	02/25/2004
Chlorodibromomethane	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Acenaphthene	-	-	mg/m^3	6.00E-02	mg/kg-day	-	-	-	-
Acenaphthylene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Anthracene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Benz(a)anthracene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Benzo(a)anthracene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Benzo(a)pyrene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Benzo(b)fluoranthene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Benzo(ghi)perylene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Benzo(k)fluoranthene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Benzoic acid	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
bis(2-Ethylhexyl)phthalate	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Carbazole	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Chrysene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Dibenz(a,h)anthracene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Dibenzofuran	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Fluoranthene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Fluorene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Indeno(1,2,3-cd)pyrene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
1-Methylnaphthalene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
2-Methylnaphthalene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Naphthalene	Chronic	3.00E-03	mg/m^3	8.57E-04	mg/kg-day	Nasal effects	3,000	IRIS	02/25/2004
Phenanthrene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Pyrene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Aluminum	Chronic	5.00E-03	mg/m^3	1.43E-03	mg/kg-day	-	-	PPRTV	02/27/2004
Antimony	-	-	mg/m^3	-	mg/kg-day	-	-	PPRTV	02/27/2004
Arsenic	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Cadmium (water)	-	-	mg/m^3	-	mg/kg-day	-	-	-	02/27/2004
Cadmium (food)	-	-	mg/m^3	-	mg/kg-day	-	-	-	02/27/2004

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
West Branch of the Grand Calumet River, Lake County, Indiana

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD		Primary Target Organ(s)	Combined Uncertainty / Modifying Factors	RfC : Target Organ(s) Uncertainty /	
		Value	Units	Value (1)	Units			Modifying Factors	Date(s) (MM/DD/YYYY)
Chromium (VI)	-	-	mg/m^3	2.20E-06	mg/kg-day	-	-	IRIS (3)	02/27/2004
Copper	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Iron	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Lead	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Manganese	Chronic	5.00E-05	mg/m^3	1.43E-05	mg/kg-day	Neurobehavorial	1,000	IRIS	02/25/2004
Mercury	Chronic	3.00E-04	mg/m^3	8.57E-05	mg/kg-day	CNS	30	IRIS	02/25/2004
Nickel	Chronic	2.00E-04	mg/m^3	5.71E-05	mg/kg-day	Respiratory	30	ATSDR	09/01/1997
Selenium	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Zinc	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Chlordane - alpha	Chronic	7.00E-04	mg/m^3	2.00E-04	mg/kg-day	Hepatic	1,000	Surrogate/IRIS	02/25/2004
Chlordane - gamma	Chronic	7.00E-04	mg/m^3	2.00E-04	mg/kg-day	Hepatic	1,000	Surrogate/IRIS	02/25/2004
Total Chlordane	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
cis-Nonachlor	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
o,p'-DDD	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
p,p'-DDD	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
p,p'-DDE	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
p,p'-DDT	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
4,4'-DDT	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Total DDT	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Dieldrin	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
gamma-BHC (Lindane)	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Heptachlor	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Hexachlorocyclohexane-all isomers	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Toxaphene	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Trans nonachlor	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
2,3,7,8-Dibenzo-p-dioxin	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Aroclor 1242	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Aroclor 1248	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Aroclor 1254	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Aroclor 1260	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Dioxin TEQ	-	-	mg/m^3	-	mg/kg-day	-	-	-	-
Nondioxin-like PCBs	-	-	mg/m^3	-	mg/kg-day	-	-	-	-

Notes:

- = No published value

(1)

$$RfD_i\left[\frac{mg}{kg-day}\right] = RfC\left[\frac{mg}{m^3}\right]\cdot\frac{20\left[\frac{m^3}{day}\right]}{70\,[kg]}$$

(2) ATSDR = Agency for Toxic Substances and Disease Registry
IRIS = Integrated Risk Information System
HEAST = Health Effects Assessement Summary Table
PPRTV = Provisional Peer Reviewed Toxicity Values
Surrogates Used:
Inhalation RfC for technical chlordane was used for alpha and gamma chlordane.

(3) Toxicity values for Chromium VI particulates (as opposed to chromic acid mists) used for Chromium VI.

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
West Branch of the Grand Calumet River, Lake County, Indiana

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units	(1)	Value	Units		Source(s) (2)	Uncertainty / Modifying Factors
Benzene	5.50E-02	$(mg/kg\text{-}day)^{-1}$	97%	5.67E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS (3)	02/25/2004
Chlorodibromomethane	8.40E-02	$(mg/kg\text{-}day)^{-1}$	80%	1.05E-01	$(mg/kg\text{-}day)^{-1}$	-	Withdrawn-IRIS	-
Acenaphthene	-	$(mg/kg\text{-}day)^{-1}$	31%	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Acenaphthylene	-	$(mg/kg\text{-}day)^{-1}$	31%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Anthracene	-	$(mg/kg\text{-}day)^{-1}$	76%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Benzo(a)anthracene	7.30E-01	$(mg/kg\text{-}day)^{-1}$	31%	2.35E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (4)	-
Benzo(a)pyrene	7.30E+00	$(mg/kg\text{-}day)^{-1}$	31%	2.35E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	02/25/2004
Benzo(b)fluoranthene	7.30E-01	$(mg/kg\text{-}day)^{-1}$	31%	2.35E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (4)	02/26/2004
Benzo(ghi)perylene	-	$(mg/kg\text{-}day)^{-1}$	31%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Benzo(k)fluoranthene	7.30E-02	$(mg/kg\text{-}day)^{-1}$	31%	2.35E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (4)	02/26/2004
Benzoic acid	-	$(mg/kg\text{-}day)^{-1}$	100%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
bis(2-Ethylhexyl)phthalate	1.40E-02	$(mg/kg\text{-}day)^{-1}$	19%	7.37E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	02/25/2004
Carbazole	2.00E-02	$(mg/kg\text{-}day)^{-1}$	70%	2.86E-02	$(mg/kg\text{-}day)^{-1}$	B2	HEAST	02/26/2004
Chrysene	7.30E-03	$(mg/kg\text{-}day)^{-1}$	31%	2.35E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (4)	02/25/2004
Dibenz(a,h)anthracene	7.30E+00	$(mg/kg\text{-}day)^{-1}$	31%	2.35E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (4)	02/26/2004
Dibenzofuran	-	$(mg/kg\text{-}day)^{-1}$	80%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Fluoranthene	-	$(mg/kg\text{-}day)^{-1}$	31%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Fluorene	-	$(mg/kg\text{-}day)^{-1}$	50%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Indeno(1,2,3-cd)pyrene	7.30E-01	$(mg/kg\text{-}day)^{-1}$	31%	2.35E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (4)	02/26/2004
1-Methylnaphthalene	-	$(mg/kg\text{-}day)^{-1}$	80%	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
2-Methylnaphthalene	-	$(mg/kg\text{-}day)^{-1}$	80%	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Naphthalene	-	$(mg/kg\text{-}day)^{-1}$	80%	-	$(mg/kg\text{-}day)^{-1}$	C	-	-
Phenanthrene	-	$(mg/kg\text{-}day)^{-1}$	73%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Pyrene	-	$(mg/kg\text{-}day)^{-1}$	31%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Aluminum	-	$(mg/kg\text{-}day)^{-1}$	10%	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Antimony	-	$(mg/kg\text{-}day)^{-1}$	2%	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Arsenic	1.50E+00	$(mg/kg\text{-}day)^{-1}$	41%	3.66E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	02/25/2004
Cadmium (water)	-	$(mg/kg\text{-}day)^{-1}$	1%	-	$(mg/kg\text{-}day)^{-1}$	B1	-	-
Cadmium (food)	-	$(mg/kg\text{-}day)^{-1}$	1%	-	$(mg/kg\text{-}day)^{-1}$	B1	-	-
Chromium (VI)	-	$(mg/kg\text{-}day)^{-1}$	2%	-	$(mg/kg\text{-}day)^{-1}$	D	IRIS (5)	02/27/2004
Copper	-	$(mg/kg\text{-}day)^{-1}$	30%	-	$(mg/kg\text{-}day)^{-1}$	D	IRIS	02/25/2004
Iron	-	$(mg/kg\text{-}day)^{-1}$	15%	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Lead	-	$(mg/kg\text{-}day)^{-1}$	15%	-	$(mg/kg\text{-}day)^{-1}$	B2	-	-
Manganese (Diet)	-	$(mg/kg\text{-}day)^{-1}$	4%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Manganese (Water)	-	$(mg/kg\text{-}day)^{-1}$	4%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Mercury	-	$(mg/kg\text{-}day)^{-1}$	0.01%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Nickel	-	$(mg/kg\text{-}day)^{-1}$	27%	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Selenium	-	$(mg/kg\text{-}day)^{-1}$	44%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Zinc	-	$(mg/kg\text{-}day)^{-1}$	20%	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Chlordane - alpha	3.50E-01	$(mg/kg\text{-}day)^{-1}$	50%	7.00E-01	$(mg/kg\text{-}day)^{-1}$	B2	Surrogate	02/25/2004
Chlordane - gamma	3.50E-01	$(mg/kg\text{-}day)^{-1}$	50%	7.00E-01	$(mg/kg\text{-}day)^{-1}$	B2	Surrogate	02/25/2004
Total Chlordane	-	$(mg/kg\text{-}day)^{-1}$	-	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
cis-Nonachlor	-	$(mg/kg\text{-}day)^{-1}$	-	-	$(mg/kg\text{-}day)^{-1}$	-	-	-

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
West Branch of the Grand Calumet River, Lake County, Indiana

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units	(1)	Value	Units		Source(s) (2)	Uncertainty / Modifying Factors
o,p'-DDD	2.40E-01	$(mg/kg\text{-}day)^{-1}$	70%	3.43E-01	$(mg/kg\text{-}day)^{-1}$	B2	Surrogate	-
p,p'-DDD	2.40E-01	$(mg/kg\text{-}day)^{-1}$	70%	3.43E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	-
p,p'-DDE	3.40E-01	$(mg/kg\text{-}day)^{-1}$	70%	4.86E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	-
p,p'-DDT	3.40E-01	$(mg/kg\text{-}day)^{-1}$	70%	4.86E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/04/2004
4,4'-DDT	3.40E-01	$(mg/kg\text{-}day)^{-1}$	70%	4.86E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/04/2004
Total DDT	3.40E-01	$(mg/kg\text{-}day)^{-1}$	70%	4.86E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/04/2004
Dieldrin	1.60E+01	$(mg/kg\text{-}day)^{-1}$	50%	3.20E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	02/25/2004
gamma-BHC (Lindane)	1.30E+00	$(mg/kg\text{-}day)^{-1}$	-	-	$(mg/kg\text{-}day)^{-1}$	-	HEAST	-
Heptachlor	4.50E+00	$(mg/kg\text{-}day)^{-1}$	72%	6.25E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	02/25/2004
Hexachlorocyclohexane-all isomers	1.80E+00	$(mg/kg\text{-}day)^{-1}$	97%	1.86E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	02/25/2004
Toxaphene	1.10E+00	$(mg/kg\text{-}day)^{-1}$	50%	2.20E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	02/25/2004
Trans nonachlor	-	$(mg/kg\text{-}day)^{-1}$	-	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
2,3,7,8-Dibenzo-p-dioxin	1.50E+05	$(mg/kg\text{-}day)^{-1}$	50%	3.00E+05	$(mg/kg\text{-}day)^{-1}$	B2	HEAST	02/25/2004
Aroclor 1242	2.00E+00	$(mg/kg\text{-}day)^{-1}$	90%	2.22E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (6)	02/01/2003
Aroclor 1248	2.00E+00	$(mg/kg\text{-}day)^{-1}$	90%	2.22E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (6)	02/01/2003
Aroclor 1254	2.00E+00	$(mg/kg\text{-}day)^{-1}$	90%	2.22E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (6)	02/01/2003
Aroclor 1260	2.00E+00	$(mg/kg\text{-}day)^{-1}$	90%	2.22E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (6)	02/01/2003
Dioxin TEQ	1.50E+05	$(mg/kg\text{-}day)^{-1}$	90%	1.67E+05	$(mg/kg\text{-}day)^{-1}$	B2	EPA 1996a	-
Nondioxin-like PCBs	2.00E+00	$(mg/kg\text{-}day)^{-1}$	90%	2.22E+00	$(mg/kg\text{-}day)^{-1}$	B2	EPA 1996a, IRIS (6)	-

Notes:

- = No published value

(1) $$\frac{SF^{O}\left[\left(mg/kg-day\right)^{-1}\right]}{SF^{D}\left[\left(mg/kg-day\right)^{-1}\right]} = \text{Oral to Dermal Adjustment Factor}$$

(2) IRIS = Integrated Risk Information System
HEAST = Health Effects Assessement Summary Table
Surrogates Used:
Cancer slope factor for technical chlordane used for alpha and gamma chlordane.
Slope factor for p,p'-DDD used for o,p'-DDD
EPA 1996a = PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures

EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

(3) Most EPA regions have adopted a Toxicity Equivalency Factor (TEF) methodology for carcinogenic polycyclic aromatic hydrocarbons (PAHs). These TEFs are based on the potency of each compound relative to that of benzo(a)pyrene (BaP). The following TEFs were used to convert each PAH concentration to an equivalent concentration of BaP: (1) benzo(a)pyrene, TEF=1.0; (2) benz(a)anthracene, TEF=0.1; (3) benzo(b)fluoranthene, TEF=0.1; (4) benzo(k)fluoranthene, TEF=0.01; (5) chrysene, TEF=0.001; (6) dibenz(a,h)anthracene, TEF=1.0; (7) indeno(1,2,3-cd)pyrene, TEF=0.1.
(4) EPA's quantitative estimate for the cancer risk associated with oral exposure to benzene is reported as a range, from 1.5×10^{-2} to 5.5×10^{-2} per mg/kg-day.
(5) Toxicity values for Chromium VI particulates (as opposed to chromic acid mists) used for Chromium VI.
(6) The cancer potency of PCB mixtures is determined using a three tiered approach that depends on the information available. Criteria for use of the High Risk and Persistence Tier include: food chain exposure; sediment or soil ingestion; dust or aerosol inhalation; dermal exposure if an absorption factor has been applied; any early-life exposure; and the presence of dioxin-like, tumor-promoting, or persistent congeners. This value, 2.00e+00 per (mg/kg)/day, is the upper-bound slope factor for the High Risk and Persistence Tier. The central-estimate slope factor for this tier is 1.00+00 per (mg/kg)/day.

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
West Branch of the Grand Calumet River, Lake County, Indiana

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value (1)	Units		Source(s) (2)	Date(s) (MM/DD/YYYY)
Benzene	7.8E-03	$(mg/m^3)^{-1}$	2.73E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS (3)	02/25/2004
Chlorodibromomethane	2.7E-02	$(mg/m^3)^{-1}$	9.45E-02	$(mg/kg\text{-}day)^{-1}$	C	Cal EPA	03/04/2004
Acenaphthene	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Acenaphthylene	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Anthracene	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Benz(a)anthracene	1.1E-01	$(mg/m^3)^{-1}$	3.85E-01	$(mg/kg\text{-}day)^{-1}$	B2	Cal EPA	02/01/2003
Benzo(a)anthracene	1.1E-01	$(mg/m^3)^{-1}$	3.85E-01	$(mg/kg\text{-}day)^{-1}$	B2	Cal EPA	03/04/2004
Benzo(a)pyrene	1.1E+00	$(mg/m^3)^{-1}$	3.85E+00	$(mg/kg\text{-}day)^{-1}$	B2	Cal EPA	03/04/2004
Benzo(b)fluoranthene	1.1E-01	$(mg/m^3)^{-1}$	3.85E-01	$(mg/kg\text{-}day)^{-1}$	B2	Cal EPA	03/04/2004
Benzo(ghi)perylene	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	02/25/2004
Benzo(k)fluoranthene	1.1E-01	$(mg/m^3)^{-1}$	3.85E-01	$(mg/kg\text{-}day)^{-1}$	B2	Cal EPA	03/04/2004
Benzoic acid	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	02/25/2004
bis(2-Ethylhexyl)phthalate	2.4E-03	$(mg/m^3)^{-1}$	8.40E-03	$(mg/kg\text{-}day)^{-1}$	B2	Cal EPA	03/04/2004
Carbazole	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	-	-	02/01/2003
Chrysene	1.1E-02	$(mg/m^3)^{-1}$	3.85E-02	$(mg/kg\text{-}day)^{-1}$	B2	Cal EPA	02/01/2003
Dibenz(a,h)anthracene	1.2E+00	$(mg/m^3)^{-1}$	4.20E+00	$(mg/kg\text{-}day)^{-1}$	B2	Cal EPA	02/01/2003
Dibenzofuran	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	IRIS	02/25/2004
Indeno(1,2,3-cd)pyrene	1.1E-01	$(mg/m^3)^{-1}$	3.85E-01	$(mg/kg\text{-}day)^{-1}$	B2	Cal EPA	02/01/2003
Fluoranthene	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Fluorene	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
1-Methylnaphthalene	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
2-Methylnaphthalene	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Naphthalene	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	C	-	-
Phenanthrene	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Pyrene	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Aluminum	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Antimony	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Arsenic	4.3E+00	$(mg/m^3)^{-1}$	1.51E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	02/25/2004
Cadmium	1.8E+00	$(mg/m^3)^{-1}$	6.30E+00	$(mg/kg\text{-}day)^{-1}$	B1	IRIS	03/04/2004
Chromium (VI)	1.2E+01	$(mg/m^3)^{-1}$	4.20E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS (4)	02/25/2004
Copper	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	02/25/2004
Iron	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Lead	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	B2	-	-

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
West Branch of the Grand Calumet River, Lake County, Indiana

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value (1)	Units		Source(s) (2)	Date(s) (MM/DD/YYYY)
Manganese	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Manganese (Diet)	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Manganese (Water)	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Mercury	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Nickel	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
Selenium	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Zinc	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	D	-	-
Chlordane - alpha	1.0E-01	$(mg/m^3)^{-1}$	3.50E-01	$(mg/kg\text{-}day)^{-1}$	B2	Surrogate	02/25/2004
Chlordane - gamma	1.0E-01	$(mg/m^3)^{-1}$	3.50E-01	$(mg/kg\text{-}day)^{-1}$	B2	Surrogate	02/25/2004
Total Chlordane	3.4E-01	$(mg/m^3)^{-1}$	1.19E+00	$(mg/kg\text{-}day)^{-1}$	-	Cal EPA (5)	03/04/2004
cis-Nonachlor	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
o,p'-DDD	6.9E-02	$(mg/m^3)^{-1}$	2.42E-01	$(mg/kg\text{-}day)^{-1}$	-	Surrogate	03/04/2004
p,p'-DDD	6.9E-02	$(mg/m^3)^{-1}$	2.42E-01	$(mg/kg\text{-}day)^{-1}$	-	Cal EPA	03/04/2004
p,p'-DDE	9.7E-02	$(mg/m^3)^{-1}$	3.40E-01	$(mg/kg\text{-}day)^{-1}$	-	Cal EPA	03/04/2004
p,p'-DDT	9.7E-02	$(mg/m^3)^{-1}$	3.40E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/04/2004
4,4'-DDT	9.7E-02	$(mg/m^3)^{-1}$	3.40E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/04/2004
Total DDT	9.7E-02	$(mg/m^3)^{-1}$	3.40E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	03/04/2004
Dieldrin	4.6E+00	$(mg/m^3)^{-1}$	1.61E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	02/25/2004
gamma-BHC (Lindane)	3.1E-01	$(mg/m^3)^{-1}$	1.09E+00	$(mg/kg\text{-}day)^{-1}$	-	Cal EPA	03/04/2004
Heptachlor	1.3E+00	$(mg/m^3)^{-1}$	4.55E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	02/25/2004
Hexachlorocyclohexane-all isomers	5.1E-01	$(mg/m^3)^{-1}$	1.79E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (6)	02/25/2004
Toxaphene	3.2E-01	$(mg/m^3)^{-1}$	1.12E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	02/25/2004
Trans nonachlor	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	-	-	-
2,3,7,8-Dibenzo-p-dioxin	-	$(mg/m^3)^{-1}$	1.30E+05	$(mg/kg\text{-}day)^{-1}$	-	Cal EPA	03/04/2004
Aroclor 1242	5.7E-01	$(mg/m^3)^{-1}$	2.00E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (7)	02/25/2004
Aroclor 1248	5.7E-01	$(mg/m^3)^{-1}$	2.00E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (7)	02/25/2004
Aroclor 1254	5.7E-01	$(mg/m^3)^{-1}$	2.00E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (7)	02/25/2004
Aroclor 1260	5.7E-01	$(mg/m^3)^{-1}$	2.00E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (7)	02/25/2004
Dioxin TEQ	-	$(mg/m^3)^{-1}$	-	$(mg/kg\text{-}day)^{-1}$	-	Cal EPA	03/04/2004
Nondioxin-like PCBs	5.7E-01	$(mg/m^3)^{-1}$	2.00E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS (7)	02/25/2004

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
West Branch of the Grand Calumet River, Lake County, Indiana

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value (1)	Units		Source(s) (2)	Date(s) (MM/DD/YYYY)

Notes:
- = No published value

(1)
$$SF_I\left[\left(\frac{mg}{kg-day}\right)^{-1}\right] = UR\left[\left(\frac{mg}{m^3}\right)^{-1}\right]\cdot\frac{70[kg]}{20\left[\frac{m^3}{day}\right]}$$

(2) Cal EPA = California EPA
IRIS = Integrated Risk Information System
Surrogates Used:
Cancer slope factor for technical chlordane used for alpha and gamma chlordane.
Slope factor for p,p'-DDD used for o,p'-DDD

(3) EPA's quantitative estimate for the cancer risk associated with inhalation exposure to benzene was recently updated (EPA 1998). The new inhalation unit risk estimate is reported as a range, from 2.2 × 10-6 to 7.8 × 10-6 per µg/m3 (EPA 1999c).

(4) Toxicity values for Chromium VI particulates (as opposed to chromic acid mists) used for Chromium VI.

(5) Weight of Evidence/ Cancer Guideline Description for technical chlordane was used for alpha and gamma chlordane.

(6) Inhalation Unit Risk and Weight of Evideince Classification for Hexachlorocyclohexane-Technical was used as a surrogate for Hexachlorocyclohexane-all isomers

(7) The cancer potency of PCB mixtures is determined using a three tiered approach that depends on the information available. Criteria for use of the High Risk and Persistnece Tier include: food chain exposure; sediment or soil ingestion; dust or aerosol inhalation; dermal exposure if an absorption factor has been applied; any early-life exposure; and the presence of dioxin-like, tumor-promoting, or persistent congeners. This value, 2.00e+00 per (mg/kg)/day, is the upper-bound slope factor for the High Risk and Persistence Tier. The central-estimate slope factor for this tier is 1.00+00 per (mg/kg)/day.

EPA Group:
A - Human carcinogen
B1 - Probable human carcinogen - indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 7.1 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Sediment	Surface Sediment	Incidental Ingestion	bis(2-Ethylhexyl)phthalate	81	mg/kg	1.63E-06	mg/kg-day	1.40E-02	(mg/kg-day)$^{-1}$	2.28E-08	3.80E-06	mg/kg-day	2.00E-02	mg/kg-day	1.90E-04
13.56%				Benzo(a)anthracene	280	mg/kg	5.64E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	4.11E-06	1.32E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	2.21E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.62E-05	5.17E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	99	mg/kg	1.99E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.45E-06	4.65E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	89	mg/kg	1.79E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.18E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	42	mg/kg	8.45E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	6.17E-08	1.97E-06	mg/kg-day	-	mg/kg-day	-
				Carbazole	47	mg/kg	9.46E-07	mg/kg-day	2.00E-02	(mg/kg-day)$^{-1}$	1.89E-08	2.21E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	600	mg/kg	1.21E-05	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	8.82E-08	2.82E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	41	mg/kg	8.25E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	6.02E-06	1.93E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	50	mg/kg	1.01E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	7.35E-07	2.35E-06	mg/kg-day	-	mg/kg-day	-
				Naphthalene	896	mg/kg	1.80E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.21E-05	mg/kg-day	2.00E-02	mg/kg-day	2.11E-03
				Phenanthrene	1,900	mg/kg	3.82E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.92E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	720	mg/kg	1.45E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.38E-05	mg/kg-day	3.00E-02	mg/kg-day	1.13E-03
				Dieldrin	0.12	mg/kg	2.42E-09	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	3.86E-08	5.64E-09	mg/kg-day	5.00E-05	mg/kg-day	1.13E-04
				Aluminum	25,100	mg/kg	5.05E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.18E-03	mg/kg-day	1.00E+00	mg/kg-day	1.18E-03
				Antimony	72	mg/kg	1.45E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.37E-06	mg/kg-day	4.00E-04	mg/kg-day	8.43E-03
				Arsenic	165	mg/kg	3.32E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	4.98E-06	7.75E-06	mg/kg-day	3.00E-04	mg/kg-day	2.58E-02
				Cadmium	52	mg/kg	1.05E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.45E-06	mg/kg-day	1.00E-03	mg/kg-day	2.45E-03
				Chromium	622	mg/kg	1.25E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.92E-05	mg/kg-day	3.00E-03	mg/kg-day	9.74E-03
				Iron	85,000	mg/kg	1.71E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.99E-03	mg/kg-day	-	mg/kg-day	-
				Lead	4,195	mg/kg	8.44E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.97E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	907	mg/kg	1.83E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.26E-05	mg/kg-day	1.40E-01	mg/kg-day	3.04E-04
				Nickel	1,140	mg/kg	2.29E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.35E-05	mg/kg-day	2.00E-02	mg/kg-day	2.68E-03
				Zinc	3,305	mg/kg	6.65E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.55E-04	mg/kg-day	3.00E-01	mg/kg-day	5.17E-04
				Aroclor 1242	6.80	mg/kg	1.37E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.74E-07	3.19E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	7.94	mg/kg	1.60E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	3.20E-07	3.73E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	1.32	mg/kg	2.66E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	5.31E-08	6.20E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.43E-05					0.055
			Dermal Absorption	bis(2-Ethylhexyl)phthalate	81	mg/kg	6.51E-07	mg/kg-day	7.37E-02	(mg/kg-day)$^{-1}$	4.79E-08	1.52E-06	mg/kg-day	3.80E-03	mg/kg-day	3.99E-04
				Benzo(a)anthracene	280	mg/kg	2.92E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	6.88E-06	6.82E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.15E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.70E-05	2.68E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	99	mg/kg	1.03E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	2.43E-06	2.41E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	89	mg/kg	9.29E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.17E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	42	mg/kg	4.39E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	1.03E-07	1.02E-06	mg/kg-day	-	mg/kg-day	-
				Carbazole	47	mg/kg	3.77E-07	mg/kg-day	2.86E-02	(mg/kg-day)$^{-1}$	1.08E-08	8.81E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	600	mg/kg	6.26E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	1.48E-07	1.46E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	41	mg/kg	4.28E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.01E-05	9.99E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	50	mg/kg	5.22E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.23E-06	1.22E-06	mg/kg-day	-	mg/kg-day	-
				Naphthalene	896	mg/kg	9.36E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.18E-05	mg/kg-day	1.60E-02	mg/kg-day	1.36E-03
				Phenanthrene	1,900	mg/kg	1.98E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.63E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	720	mg/kg	7.52E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.75E-05	mg/kg-day	9.30E-03	mg/kg-day	1.89E-03
				Dieldrin	0.12	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Aluminum	25,100	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	72	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	165	mg/kg	3.97E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.45E-06	9.27E-07	mg/kg-day	1.23E-04	mg/kg-day	7.54E-03
				Cadmium	52	mg/kg	4.19E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.78E-09	mg/kg-day	1.00E-05	mg/kg-day	9.78E-04
				Chromium	622	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	85,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	4,195	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	907	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Nickel	1,140	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.40E-03	mg/kg-day	

TABLE 7.1 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Sediment	Surface Sediment	Dermal Absorption	Zinc	3,305	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-02	mg/kg-day	
				Aroclor 1242	6.80	mg/kg	7.65E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.70E-07	1.78E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	7.94	mg/kg	8.92E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.98E-07	2.08E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	1.32	mg/kg	1.48E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	3.30E-08	3.46E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								4.98E-05					0.01
		Exposure Point Total									8.42E-05					0.07
	Exposure Medium Total										8.42E-05					0.07
Area Total											8.42E-05					0.07
Reach 2	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	172	mg/kg	3.46E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.53E-06	8.08E-06	mg/kg-day	-	mg/kg-day	-
19.16%				Benzo(a)pyrene	120	mg/kg	2.41E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.76E-05	5.63E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	34	mg/kg	6.84E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	5.00E-07	1.60E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	29	mg/kg	5.84E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.36E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11.16	mg/kg	2.25E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	1.64E-08	5.24E-07	mg/kg-day	-	mg/kg-day	-
				Carbazole	33	mg/kg	6.64E-07	mg/kg-day	2.00E-02	(mg/kg-day)$^{-1}$	1.33E-08	1.55E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	326	mg/kg	6.56E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	4.79E-08	1.53E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	15.77	mg/kg	3.17E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	2.32E-06	7.41E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	17.59	mg/kg	3.54E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.58E-07	8.26E-07	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	372	mg/kg	7.49E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.75E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	254	mg/kg	5.12E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.20E-05	mg/kg-day	3.00E-02	mg/kg-day	3.98E-04
				Total Chlordane	2.35	mg/kg	4.73E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.10E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	8.84	mg/kg	1.78E-07	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	6.05E-08	4.15E-07	mg/kg-day	-	mg/kg-day	-
				Total DDT	10.30	mg/kg	2.07E-07	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	7.05E-08	4.84E-07	mg/kg-day	5.00E-04	mg/kg-day	9.68E-04
				Dieldrin	4.25	mg/kg	8.55E-08	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	1.37E-06	2.00E-07	mg/kg-day	5.00E-05	mg/kg-day	3.99E-03
				gamma-BHC (Lindane)	3.16	mg/kg	6.36E-08	mg/kg-day	1.30E+00	(mg/kg-day)$^{-1}$	8.27E-08	1.48E-07	mg/kg-day	3.00E-04	mg/kg-day	4.95E-04
				Heptachlor	4.61	mg/kg	9.28E-08	mg/kg-day	4.50E+00	(mg/kg-day)$^{-1}$	4.18E-07	2.17E-07	mg/kg-day	5.00E-04	mg/kg-day	4.33E-04
				Hexachlorocyclohexane-all isomers	3.16	mg/kg	6.36E-08	mg/kg-day	1.80E+00	(mg/kg-day)$^{-1}$	1.14E-07	1.48E-07	mg/kg-day	-	mg/kg-day	-
				Toxaphene		mg/kg		mg/kg-day	1.10E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Aluminum	10,507	mg/kg	2.11E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.93E-04	mg/kg-day	1.00E+00	mg/kg-day	4.93E-04
				Antimony	47	mg/kg	9.54E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.23E-06	mg/kg-day	4.00E-04	mg/kg-day	5.56E-03
				Arsenic	180	mg/kg	3.62E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	5.43E-06	8.45E-06	mg/kg-day	3.00E-04	mg/kg-day	2.82E-02
				Cadmium	74	mg/kg	1.49E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.47E-06	mg/kg-day	1.00E-03	mg/kg-day	3.47E-03
				Chromium	620	mg/kg	1.25E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.91E-05	mg/kg-day	3.00E-03	mg/kg-day	9.71E-03
				Iron	186,911	mg/kg	3.76E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.78E-03	mg/kg-day	-	mg/kg-day	-
				Lead	3,201	mg/kg	6.44E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.50E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	1,113	mg/kg	2.24E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.23E-05	mg/kg-day	1.40E-01	mg/kg-day	3.74E-04
				Mercury	7.20	mg/kg	1.45E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.38E-07	mg/kg-day	4.00E-02	mg/kg-day	8.45E-06
				Zinc	8,436	mg/kg	1.70E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.96E-04	mg/kg-day	3.00E-01	mg/kg-day	1.32E-03
				2,3,7,8-Dibenzo-p-dioxin	6.00E-06	mg/kg	1.21E-13	mg/kg-day	1.50E+05	(mg/kg-day)$^{-1}$	1.81E-08	2.82E-13	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	10.40	mg/kg	2.09E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	4.19E-07	4.88E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.13E-05					0.055
			Dermal Absorption	Benzo(a)anthracene	172	mg/kg	1.80E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.23E-06	4.19E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	120	mg/kg	1.25E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.95E-05	2.92E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	34	mg/kg	3.55E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	8.36E-07	8.28E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	29	mg/kg	3.03E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.06E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11.16	mg/kg	1.17E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	2.74E-08	2.72E-07	mg/kg-day	-	mg/kg-day	-
				Carbazole	33	mg/kg	2.65E-07	mg/kg-day	2.86E-02	(mg/kg-day)$^{-1}$	7.57E-09	6.18E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	326	mg/kg	3.40E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	8.02E-08	7.94E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	15.77	mg/kg	1.65E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	3.88E-06	3.84E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	17.59	mg/kg	1.84E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.32E-07	4.29E-07	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	372	mg/kg	3.88E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.06E-06	mg/kg-day	-	mg/kg-day	-

TABLE 7.1 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 2	Sediment	Surface Sediment	Dermal Absorption	Pyrene	254	mg/kg	2.66E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.20E-06	mg/kg-day	9.30E-03	mg/kg-day	6.67E-04
				Total Chlordane	2.35	mg/kg	7.55E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.76E-08	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	8.84	mg/kg	2.13E-08	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	1.03E-08	4.97E-08	mg/kg-day	-	mg/kg-day	-
				Total DDT	10.30	mg/kg	2.48E-08	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	1.21E-08	5.79E-08	mg/kg-day	3.50E-04	mg/kg-day	1.65E-04
				Dieldrin	4.25	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				gamma-BHC (Lindane)	3.16	mg/kg	1.02E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.37E-08	mg/kg-day	2.91E-04	mg/kg-day	8.14E-05
				Heptachlor	4.61	mg/kg	3.70E-09	mg/kg-day	6.25E+00	(mg/kg-day)$^{-1}$	2.31E-08	8.64E-09	mg/kg-day	3.60E-04	mg/kg-day	2.40E-05
				Hexachlorocyclohexane-all isomers	3.16	mg/kg	1.02E-08	mg/kg-day	1.86E+00	(mg/kg-day)$^{-1}$	1.88E-08	2.37E-08	mg/kg-day	-	mg/kg-day	-
				Toxaphene		mg/kg		mg/kg-day	2.20E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Aluminum	10,507	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	47	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	180	mg/kg	4.34E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.59E-06	1.01E-06	mg/kg-day	1.23E-04	mg/kg-day	8.23E-03
				Cadmium	74	mg/kg	5.93E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.38E-08	mg/kg-day	1.00E-05	mg/kg-day	1.38E-03
				Chromium	620	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	186,911	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	3,201	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	1,113	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	7.20	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Zinc	8,436	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-02	mg/kg-day	
				2,3,7,8-Dibenzo-p-dioxin	6.00E-06	mg/kg	4.82E-16	mg/kg-day	3.00E+05	(mg/kg-day)$^{-1}$	1.45E-10	1.12E-15	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	10.40	mg/kg	1.17E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	2.60E-07	2.73E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								4.09E-05					0.01
		Exposure Point Total									7.21E-05					0.07
	Exposure Medium Total										7.21E-05					0.07
Area Total											7.21E-05					0.07
Reach 3	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	27	mg/kg	5.43E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.97E-07	1.27E-06	mg/kg-day	-	mg/kg-day	-
9.98%				Benzo(a)pyrene	16	mg/kg	3.22E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	2.35E-06	7.51E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	12	mg/kg	2.42E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.76E-07	5.64E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.70	mg/kg	1.35E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.15E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11	mg/kg	2.21E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	1.62E-08	5.17E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	1.37E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	9.99E-09	3.19E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.00	mg/kg	8.05E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	5.88E-07	1.88E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.90	mg/kg	9.86E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	7.20E-08	2.30E-07	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	120	mg/kg	2.42E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.64E-06	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.028	mg/kg	5.64E-10	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	9.02E-09	1.32E-09	mg/kg-day	5.00E-05	mg/kg-day	2.63E-05
				Arsenic	110	mg/kg	2.21E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	3.32E-06	5.17E-06	mg/kg-day	3.00E-04	mg/kg-day	1.72E-02
				Cadmium	36	mg/kg	7.25E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.69E-06	mg/kg-day	1.00E-03	mg/kg-day	1.69E-03
				Chromium	410	mg/kg	8.25E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.93E-05	mg/kg-day	3.00E-03	mg/kg-day	6.42E-03
				Lead	5,200	mg/kg	1.05E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.44E-04	mg/kg-day	-	mg/kg-day	-
				Mercury	15	mg/kg	3.02E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.05E-07	mg/kg-day	4.00E-02	mg/kg-day	1.76E-05
				Aroclor 1248	1.20	mg/kg	2.42E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	4.83E-08	5.64E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.55	mg/kg	1.11E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.21E-08	2.58E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								7.01E-06					0.025
			Dermal Absorption	Benzo(a)anthracene	27	mg/kg	2.82E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	6.64E-07	6.58E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	16	mg/kg	1.67E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	3.93E-06	3.90E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	12	mg/kg	1.25E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	2.95E-07	2.92E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.70	mg/kg	7.00E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.63E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11	mg/kg	1.15E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	2.70E-08	2.68E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	7.10E-07	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	1.67E-08	1.66E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.00	mg/kg	4.18E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	9.83E-07	9.74E-08	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.90	mg/kg	5.12E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.20E-07	1.19E-07	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	120	mg/kg	1.25E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.92E-06	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.028	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Arsenic	110	mg/kg	2.65E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	9.70E-07	6.18E-07	mg/kg-day	1.23E-04	mg/kg-day	5.03E-03

TABLE 7.1 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 3	Sediment	Surface Sediment	Dermal Absorption	Cadmium	36	mg/kg	2.89E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.75E-09	mg/kg-day	1.00E-05	mg/kg-day	6.75E-04
				Chromium	410	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Lead	5,200	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Mercury	15	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1248	1.20	mg/kg	1.35E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	3.00E-08	3.15E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.55	mg/kg	6.18E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.37E-08	1.44E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								7.05E-06					0.01
			Inhalation	Benzo(a)anthracene	27	mg/kg	2.53E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	9.76E-13	5.91E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	16	mg/kg	1.50E-12	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	5.78E-12	3.50E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	12	mg/kg	1.13E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	4.34E-13	2.63E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.70	mg/kg	6.29E-13	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.47E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11	mg/kg	1.03E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	3.97E-13	2.41E-12	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	6.38E-12	mg/kg-day	3.85E-02	(mg/kg-day)$^{-1}$	2.46E-13	1.49E-11	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.00	mg/kg	3.75E-13	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	1.58E-12	8.76E-13	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.90	mg/kg	4.60E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.77E-13	1.07E-12	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	120	mg/kg	1.13E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.63E-11	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.028	mg/kg	2.63E-15	mg/kg-day	1.61E+01	(mg/kg-day)$^{-1}$	4.23E-14	6.13E-15	mg/kg-day	-	mg/kg-day	-
				Arsenic	110	mg/kg	1.03E-11	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	1.55E-10	2.41E-11	mg/kg-day	-	mg/kg-day	-
				Cadmium	36	mg/kg	3.38E-12	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	2.13E-11	7.88E-12	mg/kg-day	1.00E-03	mg/kg-day	7.88E-09
				Chromium	410	mg/kg	3.85E-11	mg/kg-day	4.20E+01	(mg/kg-day)$^{-1}$	1.62E-09	8.98E-11	mg/kg-day	3.00E-03	mg/kg-day	2.99E-08
				Lead	5,200	mg/kg	4.88E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.14E-09	mg/kg-day	-	mg/kg-day	-
				Mercury	15	mg/kg	1.41E-12	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.29E-12	mg/kg-day	8.57E-05	mg/kg-day	3.83E-08
				Aroclor 1248	1.20	mg/kg	1.13E-13	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.25E-13	2.63E-13	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.55	mg/kg	5.16E-14	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.03E-13	1.20E-13	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.80E-09					0.00000008
		Exposure Point Total									1.41E-05					0.03
	Exposure Medium Total										1.41E-05					0.03
Area Total											1.41E-05					0.03
Reach 4	Sediment	Surface Sediment	Incidental Ingestion	Acenaphthene	1,300	mg/kg	2.62E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.11E-05	mg/kg-day	6.00E-02	mg/kg-day	1.02E-03
5.41%				Benzo(a)anthracene	170	mg/kg	3.42E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.50E-06	7.98E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	98	mg/kg	1.97E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.44E-05	4.60E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	17	mg/kg	3.42E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.50E-07	7.98E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	9.10	mg/kg	1.83E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.27E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	27	mg/kg	5.43E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	3.97E-08	1.27E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	190	mg/kg	3.82E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	2.79E-08	8.92E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.50	mg/kg	9.06E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	6.61E-07	2.11E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	43	mg/kg	8.66E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	6.32E-07	2.02E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	2,000	mg/kg	4.03E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.39E-05	mg/kg-day	4.00E-03	mg/kg-day	2.35E-02
				Naphthalene	2,900	mg/kg	5.84E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.36E-04	mg/kg-day	2.00E-02	mg/kg-day	6.81E-03
				Phenanthrene	1,400	mg/kg	2.82E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.58E-05	mg/kg-day	-	mg/kg-day	-
				Antimony	280	mg/kg	5.64E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.32E-05	mg/kg-day	4.00E-04	mg/kg-day	3.29E-02
				Arsenic	40	mg/kg	8.05E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	1.21E-06	1.88E-06	mg/kg-day	3.00E-04	mg/kg-day	6.26E-03
				Cadmium	23	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.08E-06	mg/kg-day	1.00E-03	mg/kg-day	1.08E-03
				Chromium	250	mg/kg	5.03E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.17E-05	mg/kg-day	3.00E-03	mg/kg-day	3.91E-03
				Iron	64,000	mg/kg	1.29E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.01E-03	mg/kg-day	-	mg/kg-day	-
				Lead	1,000	mg/kg	2.01E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.70E-05	mg/kg-day	-	mg/kg-day	-
				Manganese		mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.40E-01	mg/kg-day	
				Mercury	12	mg/kg	2.42E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.64E-07	mg/kg-day	4.00E-02	mg/kg-day	1.41E-05
				Aroclor 1248	0.40	mg/kg	8.05E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.61E-08	1.88E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.29	mg/kg	5.84E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.17E-08	1.36E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.97E-05					0.075

TABLE 7.1 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 4	Sediment	Surface Sediment	Dermal Absorption	Acenaphthene	1,300	mg/kg	1.36E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.17E-05	mg/kg-day	1.86E-02	mg/kg-day	1.70E-03
				Benzo(a)anthracene	170	mg/kg	1.77E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.18E-06	4.14E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	98	mg/kg	1.02E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.41E-05	2.39E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	17	mg/kg	1.77E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.18E-07	4.14E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	9.10	mg/kg	9.50E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.22E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	27	mg/kg	2.82E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	6.64E-08	6.58E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	190	mg/kg	1.98E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	4.67E-08	4.63E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.50	mg/kg	4.70E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.11E-06	1.10E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	43	mg/kg	4.49E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.06E-06	1.05E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	2,000	mg/kg	2.09E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.87E-05	mg/kg-day	3.20E-03	mg/kg-day	1.52E-02
				Naphthalene	2,900	mg/kg	3.03E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.06E-05	mg/kg-day	1.60E-02	mg/kg-day	4.42E-03
				Phenanthrene	1,400	mg/kg	1.46E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.41E-05	mg/kg-day	-	mg/kg-day	-
				Antimony	280	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	40	mg/kg	9.64E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	3.53E-07	2.25E-07	mg/kg-day	1.23E-04	mg/kg-day	1.83E-03
				Cadmium	23	mg/kg	1.85E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.31E-09	mg/kg-day	1.00E-05	mg/kg-day	4.31E-04
				Chromium	250	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	64,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	1,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese		mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	12	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1248	0.40	mg/kg	4.50E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	9.99E-09	1.05E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.29	mg/kg	3.26E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	7.25E-09	7.61E-09	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.13E-05					0.02
			Inhalation	Acenaphthene	1,300	mg/kg	1.22E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.85E-10	mg/kg-day	6.00E-02	mg/kg-day	4.75E-09
				Benzo(a)anthracene	170	mg/kg	1.60E-11	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	6.14E-12	3.72E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	98	mg/kg	9.20E-12	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	3.54E-11	2.15E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	17	mg/kg	1.60E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	6.14E-13	3.72E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	9.10	mg/kg	8.54E-13	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.99E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	27	mg/kg	2.53E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	9.76E-13	5.91E-12	mg/kg-day	-	mg/kg-day	-
				Chrysene	190	mg/kg	1.78E-11	mg/kg-day	3.85E-02	(mg/kg-day)$^{-1}$	6.87E-13	4.16E-11	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.50	mg/kg	4.22E-13	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	1.77E-12	9.86E-13	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	43	mg/kg	4.04E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.55E-12	9.42E-12	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	2,000	mg/kg	1.88E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.38E-10	mg/kg-day	-	mg/kg-day	-
				Naphthalene	2,900	mg/kg	2.72E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.35E-10	mg/kg-day	8.57E-04	mg/kg-day	7.41E-07
				Phenanthrene	1,400	mg/kg	1.31E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.07E-10	mg/kg-day	-	mg/kg-day	-
				Antimony	280	mg/kg	2.63E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.13E-11	mg/kg-day	-	mg/kg-day	-
				Arsenic	40	mg/kg	3.75E-12	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	5.65E-11	8.76E-12	mg/kg-day	-	mg/kg-day	-
				Cadmium	23	mg/kg	2.16E-12	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	1.36E-11	5.04E-12	mg/kg-day	-	mg/kg-day	-
				Chromium	250	mg/kg	2.35E-11	mg/kg-day	4.20E+01	(mg/kg-day)$^{-1}$	9.86E-10	5.48E-11	mg/kg-day	2.20E-06	mg/kg-day	2.49E-05
				Iron	64,000	mg/kg	6.01E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.40E-08	mg/kg-day	-	mg/kg-day	-
				Lead	1,000	mg/kg	9.39E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.19E-10	mg/kg-day	-	mg/kg-day	-
				Manganese		mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.43E-05	mg/kg-day	
				Mercury	12	mg/kg	1.13E-12	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.63E-12	mg/kg-day	8.57E-05	mg/kg-day	3.07E-08
				Aroclor 1248	0.40	mg/kg	3.75E-14	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	7.50E-14	8.76E-14	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.29	mg/kg	2.72E-14	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	5.44E-14	6.35E-14	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.10E-09					0.000026
		Exposure Point Total									5.11E-05					0.10
	Exposure Medium Total										5.11E-05					0.10
Area Total											5.11E-05					0.10

TABLE 7.1 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 5	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	20	mg/kg	4.03E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.94E-07	9.39E-07	mg/kg-day	-	mg/kg-day	-
6.52%				Benzo(a)pyrene	7.20	mg/kg	1.45E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.06E-06	3.38E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	4.60	mg/kg	9.26E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	6.76E-08	2.16E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	2.20	mg/kg	4.43E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.03E-07	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	0.62	mg/kg	1.25E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	9.11E-08	2.91E-08	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	1.80	mg/kg	3.62E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.64E-08	8.45E-08	mg/kg-day	-	mg/kg-day	-
				Aluminum	9,900	mg/kg	1.99E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.65E-04	mg/kg-day	1.00E+00	mg/kg-day	4.65E-04
				Antimony	212	mg/kg	4.27E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.96E-06	mg/kg-day	4.00E-04	mg/kg-day	2.49E-02
				Arsenic	21	mg/kg	4.13E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	6.19E-07	9.63E-07	mg/kg-day	3.00E-04	mg/kg-day	3.21E-03
				Cadmium	10.30	mg/kg	2.07E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.84E-07	mg/kg-day	1.00E-03	mg/kg-day	4.84E-04
				Iron	33,000	mg/kg	6.64E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.55E-03	mg/kg-day	-	mg/kg-day	-
				Lead	600	mg/kg	1.21E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.82E-05	mg/kg-day	-	mg/kg-day	-
				Manganese	2,860	mg/kg	5.76E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.34E-04	mg/kg-day	1.40E-01	mg/kg-day	9.59E-04
				Aroclor 1248	0.68	mg/kg	1.36E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.72E-08	3.18E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.18E-06					0.030
			Dermal Absorption	Benzo(a)anthracene	20	mg/kg	2.09E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.92E-07	4.87E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	7.20	mg/kg	7.52E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.77E-06	1.75E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	4.60	mg/kg	4.80E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.13E-07	1.12E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	2.20	mg/kg	2.30E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.36E-08	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	0.62	mg/kg	6.47E-09	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.52E-07	1.51E-08	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	1.80	mg/kg	1.88E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.43E-08	4.39E-08	mg/kg-day	-	mg/kg-day	-
				Aluminum	9,900	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	212	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	21	mg/kg	4.94E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.81E-07	1.15E-07	mg/kg-day	1.23E-04	mg/kg-day	9.37E-04
				Cadmium	10.30	mg/kg	8.27E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.93E-09	mg/kg-day	1.00E-05	mg/kg-day	1.93E-04
				Iron	33,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	600	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	2,860	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Aroclor 1248	0.68	mg/kg	7.60E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.69E-08	1.77E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.77E-06					0.00
			Inhalation	Benzo(a)anthracene	20	mg/kg	1.88E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	7.23E-13	4.38E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	7.20	mg/kg	6.76E-13	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	2.60E-12	1.58E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	4.60	mg/kg	4.32E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.66E-13	1.01E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	2.20	mg/kg	2.06E-13	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.82E-13	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	0.62	mg/kg	5.82E-14	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	2.44E-13	1.36E-13	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	1.80	mg/kg	1.69E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	6.50E-14	3.94E-13	mg/kg-day	-	mg/kg-day	-
				Aluminum	9,900	mg/kg	9.29E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.17E-09	mg/kg-day	1.43E-03	mg/kg-day	1.52E-06
				Antimony	212	mg/kg	1.99E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.64E-11	mg/kg-day	-	mg/kg-day	-
				Arsenic	21	mg/kg	1.92E-12	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	2.90E-11	4.49E-12	mg/kg-day	-	mg/kg-day	-
				Cadmium	10.30	mg/kg	9.67E-13	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	6.09E-12	2.26E-12	mg/kg-day	-	mg/kg-day	-
				Iron	33,000	mg/kg	3.10E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.23E-09	mg/kg-day	-	mg/kg-day	-
				Lead	600	mg/kg	5.63E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.31E-10	mg/kg-day	-	mg/kg-day	-
				Manganese	2,860	mg/kg	2.68E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.26E-10	mg/kg-day	1.43E-05	mg/kg-day	4.38E-05
				Aroclor 1248	0.68	mg/kg	6.35E-14	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.27E-13	1.48E-13	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.90E-11					0.000045
		Exposure Point Total									4.95E-06					0.03
	Exposure Medium Total										4.95E-06					0.03
Area Total											4.95E-06					0.03

TABLE 7.1 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 6	Sediment	Surface Sediment	Incidental Ingestion	Benzene	44	mg/kg	8.86E-07	mg/kg-day	5.50E-02	(mg/kg-day)$^{-1}$	4.87E-08	2.07E-06	mg/kg-day	4.00E-03	mg/kg-day	5.17E-04
3.40%				Acenaphthene	1,400	mg/kg	2.82E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.58E-05	mg/kg-day	6.00E-02	mg/kg-day	1.10E-03
				Benzo(a)anthracene	197	mg/kg	3.96E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.89E-06	9.24E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	128	mg/kg	2.58E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.88E-05	6.01E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	22	mg/kg	4.43E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	3.23E-08	1.03E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	195	mg/kg	3.92E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	2.86E-08	9.16E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	7.20	mg/kg	1.45E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.06E-06	3.38E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	23	mg/kg	4.63E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.38E-07	1.08E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	3,400	mg/kg	6.84E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.60E-04	mg/kg-day	4.00E-03	mg/kg-day	3.99E-02
				Naphthalene	3,800	mg/kg	7.65E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.78E-04	mg/kg-day	2.00E-02	mg/kg-day	8.92E-03
				Phenanthrene	1,900	mg/kg	3.82E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.92E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	638	mg/kg	1.28E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.00E-05	mg/kg-day	3.00E-02	mg/kg-day	9.99E-04
				Aluminum	13,000	mg/kg	2.62E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.11E-04	mg/kg-day	1.00E+00	mg/kg-day	6.11E-04
				Antimony	69	mg/kg	1.39E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.24E-06	mg/kg-day	4.00E-04	mg/kg-day	8.10E-03
				Arsenic	40	mg/kg	8.11E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	1.22E-06	1.89E-06	mg/kg-day	3.00E-04	mg/kg-day	6.31E-03
				Cadmium	34	mg/kg	6.86E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.60E-06	mg/kg-day	1.00E-03	mg/kg-day	1.60E-03
				Chromium	228	mg/kg	4.58E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.07E-05	mg/kg-day	3.00E-03	mg/kg-day	3.56E-03
				Iron	160,000	mg/kg	3.22E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.51E-03	mg/kg-day	-	mg/kg-day	-
				Lead	1,523	mg/kg	3.06E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.15E-05	mg/kg-day	-	mg/kg-day	-
				Manganese	980	mg/kg	1.97E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.60E-05	mg/kg-day	1.40E-01	mg/kg-day	3.29E-04
			Exp. Route Total								2.44E-05					0.072
			Dermal Absorption	Benzene	44	mg/kg		mg/kg-day	5.67E-02	(mg/kg-day)$^{-1}$			mg/kg-day	3.88E-03	mg/kg-day	
				Acenaphthene	1,400	mg/kg	1.46E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.41E-05	mg/kg-day	1.86E-02	mg/kg-day	1.83E-03
				Benzo(a)anthracene	197	mg/kg	2.05E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.84E-06	4.79E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	128	mg/kg	1.34E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	3.15E-05	3.12E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	22	mg/kg	2.30E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	5.41E-08	5.36E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	195	mg/kg	2.04E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	4.79E-08	4.75E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	7.20	mg/kg	7.52E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.77E-06	1.75E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	23	mg/kg	2.40E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	5.65E-07	5.60E-07	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	3,400	mg/kg	3.55E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.28E-05	mg/kg-day	3.20E-03	mg/kg-day	2.59E-02
				Naphthalene	3,800	mg/kg	3.97E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.26E-05	mg/kg-day	1.60E-02	mg/kg-day	5.79E-03
				Phenanthrene	1,900	mg/kg	1.98E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.63E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	638	mg/kg	6.66E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.55E-05	mg/kg-day	9.30E-03	mg/kg-day	1.67E-03
				Aluminum	13,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	69	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	40	mg/kg	9.71E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	3.55E-07	2.26E-07	mg/kg-day	1.23E-04	mg/kg-day	1.84E-03
				Cadmium	34	mg/kg	2.74E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.38E-09	mg/kg-day	1.00E-05	mg/kg-day	6.38E-04
				Chromium	228	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	160,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	1,523	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	980	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
			Exp. Route Total								3.91E-05					0.04
		Exposure Point Total									6.35E-05					0.11
	Exposure Medium Total										6.35E-05					0.11
Area Total											6.35E-05					0.11
Reach 7	Sediment	Surface Sediment	Incidental Ingestion	Benzene	25	mg/kg	5.03E-07	mg/kg-day	5.50E-02	(mg/kg-day)$^{-1}$	2.77E-08	1.17E-06	mg/kg-day	4.00E-03	mg/kg-day	2.94E-04
4.45%				Benzo(a)anthracene	66	mg/kg	1.33E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	9.70E-07	3.10E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	2.20E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.61E-05	5.14E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	7.50	mg/kg	1.51E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.10E-07	3.52E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.50	mg/kg	1.31E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.05E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	14	mg/kg	2.82E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	2.06E-08	6.58E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	1.37E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	9.99E-09	3.19E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	2.20	mg/kg	4.43E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	3.23E-07	1.03E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.70	mg/kg	9.46E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	6.91E-08	2.21E-07	mg/kg-day	-	mg/kg-day	-

TABLE 7.1 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 7	Sediment	Surface Sediment	Incidental Ingestion	2-Methylnaphthalene	630	mg/kg	1.27E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.96E-05	mg/kg-day	4.00E-03	mg/kg-day	7.40E-03
4.45%				Naphthalene	820	mg/kg	1.65E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.85E-05	mg/kg-day	2.00E-02	mg/kg-day	1.93E-03
				Phenanthrene	440	mg/kg	8.86E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.07E-05	mg/kg-day	-	mg/kg-day	-
				Total Chlordane	2.14	mg/kg	4.31E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.01E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	6.80	mg/kg	1.37E-07	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	4.65E-08	3.19E-07	mg/kg-day	-	mg/kg-day	-
				Total DDT	2.80	mg/kg	5.64E-08	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	1.92E-08	1.32E-07	mg/kg-day	5.00E-04	mg/kg-day	2.63E-04
				Dieldrin	2.83	mg/kg	5.70E-08	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	9.11E-07	1.33E-07	mg/kg-day	5.00E-05	mg/kg-day	2.66E-03
				Heptachlor	0.19	mg/kg	3.82E-09	mg/kg-day	4.50E+00	(mg/kg-day)$^{-1}$	1.72E-08	8.92E-09	mg/kg-day	5.00E-04	mg/kg-day	1.78E-05
				Toxaphene	2.05	mg/kg	4.13E-08	mg/kg-day	1.10E+00	(mg/kg-day)$^{-1}$	4.54E-08	9.63E-08	mg/kg-day	-	mg/kg-day	-
				Arsenic	24	mg/kg	4.83E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	7.25E-07	1.13E-06	mg/kg-day	3.00E-04	mg/kg-day	3.76E-03
				Cadmium	18	mg/kg	3.62E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.45E-07	mg/kg-day	1.00E-03	mg/kg-day	8.45E-04
				Lead	1,306	mg/kg	2.63E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.13E-05	mg/kg-day	-	mg/kg-day	-
				Manganese	614	mg/kg	1.24E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.88E-05	mg/kg-day	1.40E-01	mg/kg-day	2.06E-04
				Mercury	6.30	mg/kg	1.27E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.96E-07	mg/kg-day	4.00E-02	mg/kg-day	7.40E-06
				Aroclor 1248	14	mg/kg	2.75E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	5.50E-07	6.41E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.36	mg/kg	7.25E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.45E-08	1.69E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.99E-05					0.017
			Dermal Absorption	Benzene	25	mg/kg		mg/kg-day	5.67E-02	(mg/kg-day)$^{-1}$			mg/kg-day	3.88E-03	mg/kg-day	
				Benzo(a)anthracene	66	mg/kg	6.89E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.62E-06	1.61E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.14E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.69E-05	2.67E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	7.50	mg/kg	7.83E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.84E-07	1.83E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.50	mg/kg	6.79E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.58E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	14	mg/kg	1.46E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	3.44E-08	3.41E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	7.10E-07	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	1.67E-08	1.66E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	2.20	mg/kg	2.30E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	5.41E-07	5.36E-08	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.70	mg/kg	4.91E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.16E-07	1.14E-07	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	630	mg/kg	6.58E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.53E-05	mg/kg-day	3.20E-03	mg/kg-day	4.80E-03
				Naphthalene	820	mg/kg	8.56E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.00E-05	mg/kg-day	1.60E-02	mg/kg-day	1.25E-03
				Phenanthrene	440	mg/kg	4.59E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.07E-05	mg/kg-day	-	mg/kg-day	-
				Total Chlordane	2.14	mg/kg	6.87E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.60E-08	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	6.80	mg/kg	1.64E-08	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	7.96E-09	3.82E-08	mg/kg-day	-	mg/kg-day	-
				Total DDT	2.80	mg/kg	6.75E-09	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	3.28E-09	1.57E-08	mg/kg-day	-	mg/kg-day	-
				Dieldrin	2.83	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Heptachlor	0.19	mg/kg	1.53E-10	mg/kg-day	6.25E+00	(mg/kg-day)$^{-1}$	9.54E-10	3.56E-10	mg/kg-day	3.60E-04	mg/kg-day	9.89E-07
				Toxaphene	2.05	mg/kg		mg/kg-day	2.20E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Arsenic	24	mg/kg	5.78E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	2.12E-07	1.35E-07	mg/kg-day	1.23E-04	mg/kg-day	1.10E-03
				Cadmium	18	mg/kg	1.45E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.37E-09	mg/kg-day	1.00E-05	mg/kg-day	3.37E-04
				Lead	1,306	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	614	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	6.30	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1248	14	mg/kg	1.53E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	3.41E-07	3.58E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.36	mg/kg	4.05E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	9.00E-09	9.44E-09	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.00E-05					0.01
		Exposure Point Total									5.00E-05					0.02
	Exposure Medium Total										5.00E-05					0.02
Area Total											5.00E-05					0.02
Roxanna Marsh	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	77	mg/kg	1.55E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.13E-06	3.63E-06	mg/kg-day	-	mg/kg-day	-
37.53%				Benzo(a)pyrene	27	mg/kg	5.52E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	4.03E-06	1.29E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	45	mg/kg	9.05E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	6.61E-07	2.11E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	36	mg/kg	7.28E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.70E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	5.18	mg/kg	1.04E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	7.61E-09	2.43E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	258	mg/kg	5.19E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	3.79E-08	1.21E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	30	mg/kg	6.04E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	4.41E-06	1.41E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	35	mg/kg	7.00E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	5.11E-07	1.63E-06	mg/kg-day	-	mg/kg-day	-

TABLE 7.1 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Roxanna Marsh	Sediment	Surface Sediment	Incidental Ingestion	Pyrene	376	mg/kg	7.57E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.77E-05	mg/kg-day	3.00E-02	mg/kg-day	5.89E-04
37.53%				Dieldrin	0.036	mg/kg	7.25E-10	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	1.16E-08	1.69E-09	mg/kg-day	5.00E-05	mg/kg-day	3.38E-05
				Arsenic	100	mg/kg	2.02E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	3.03E-06	4.72E-06	mg/kg-day	3.00E-04	mg/kg-day	1.57E-02
				Cadmium	63	mg/kg	1.27E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.96E-06	mg/kg-day	1.00E-03	mg/kg-day	2.96E-03
				Chromium	696	mg/kg	1.40E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.27E-05	mg/kg-day	3.00E-03	mg/kg-day	1.09E-02
				Iron	12,800	mg/kg	2.58E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.01E-04	mg/kg-day	-	mg/kg-day	-
				Lead	3,443	mg/kg	6.93E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.62E-04	mg/kg-day	-	mg/kg-day	-
				Mercury	5.60	mg/kg	1.13E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.63E-07	mg/kg-day	4.00E-02	mg/kg-day	6.58E-06
				Aroclor 1260	2.10	mg/kg	4.23E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	8.45E-08	9.86E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1254	4.27	mg/kg	8.59E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.72E-07	2.01E-07	mg/kg-day	2.00E-05	mg/kg-day	1.00E-02
				Aroclor 1248	3.23	mg/kg	6.50E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.30E-07	1.52E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.42E-05					0.040
			Dermal Absorption	Benzo(a)anthracene	77	mg/kg	8.06E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.90E-06	1.88E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	27	mg/kg	2.86E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	6.74E-06	6.68E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	45	mg/kg	4.70E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.11E-06	1.10E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	36	mg/kg	3.78E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.81E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	5.18	mg/kg	5.41E-08	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	1.27E-08	1.26E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	258	mg/kg	2.69E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	6.34E-08	6.28E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	30	mg/kg	3.13E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	7.38E-06	7.31E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	35	mg/kg	3.63E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	8.56E-07	8.48E-07	mg/kg-day	-	mg/kg-day	-
				Pyrene	376	mg/kg	3.93E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.17E-06	mg/kg-day	9.30E-03	mg/kg-day	9.86E-04
				Dieldrin	0.036	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Arsenic	100	mg/kg	2.42E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	8.85E-07	5.64E-07	mg/kg-day	1.23E-04	mg/kg-day	4.59E-03
				Cadmium	63	mg/kg	5.05E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.18E-08	mg/kg-day	1.00E-05	mg/kg-day	1.18E-03
				Chromium	696	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	12,800	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	3,443	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Mercury	5.60	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1260	2.10	mg/kg	2.36E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	5.25E-08	5.51E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1254	4.27	mg/kg	4.80E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.07E-07	1.12E-07	mg/kg-day	1.80E-05	mg/kg-day	6.22E-03
				Aroclor 1248	3.23	mg/kg	3.63E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	8.07E-08	8.47E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.92E-05					0.01
			Inhalation	Benzo(a)anthracene	77	mg/kg	7.24E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	2.79E-12	1.69E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	27	mg/kg	2.57E-12	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	9.91E-12	6.01E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	45	mg/kg	4.22E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.63E-12	9.85E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	36	mg/kg	3.39E-12	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.92E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	5.18	mg/kg	4.86E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.87E-13	1.13E-12	mg/kg-day	-	mg/kg-day	-
				Chrysene	258	mg/kg	2.42E-11	mg/kg-day	3.85E-02	(mg/kg-day)$^{-1}$	9.32E-13	5.65E-11	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	30	mg/kg	2.82E-12	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	1.18E-11	6.57E-12	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	35	mg/kg	3.27E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.26E-12	7.62E-12	mg/kg-day	-	mg/kg-day	-
				Pyrene	376	mg/kg	3.53E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.24E-11	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.036	mg/kg	3.38E-15	mg/kg-day	1.61E+01	(mg/kg-day)$^{-1}$	5.44E-14	7.88E-15	mg/kg-day	-	mg/kg-day	-
				Arsenic	100	mg/kg	9.42E-12	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	1.42E-10	2.20E-11	mg/kg-day	-	mg/kg-day	-
				Cadmium	63	mg/kg	5.91E-12	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	3.72E-11	1.38E-11	mg/kg-day	-	mg/kg-day	-
				Chromium	696	mg/kg	6.53E-11	mg/kg-day	4.20E+01	(mg/kg-day)$^{-1}$	2.74E-09	1.52E-10	mg/kg-day	2.20E-06	mg/kg-day	6.92E-05
				Iron	12,800	mg/kg	1.20E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.80E-09	mg/kg-day	-	mg/kg-day	-
				Lead	3,443	mg/kg	3.23E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.54E-10	mg/kg-day	-	mg/kg-day	-
				Mercury	5.60	mg/kg	5.26E-13	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.23E-12	mg/kg-day	8.57E-05	mg/kg-day	1.43E-08

TABLE 7.1 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Roxanna Marsh 37.53%	Sediment	Surface Sediment	Inhalation	Aroclor 1260	2.10	mg/kg	1.97E-13	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	3.94E-13	4.60E-13	mg/kg-day	-	mg/kg-day	-
				Aroclor 1254	4.27	mg/kg	4.01E-13	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	8.00E-13	9.35E-13	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	3.23	mg/kg	3.03E-13	mg/kg-day	2.00E+00	$(mg/kg\text{-}day)^{-1}$	6.06E-13	7.07E-13	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.95E-09					0.000069
		Exposure Point Total									3.34E-05					0.053
	Exposure Medium Total										3.34E-05					0.053
Area Total											3.34E-05					0.053
Surface Water	Surface Water	Surface Water	Incidental Ingestion	Chlorodibromomethane	0.0015	mg/L	1.51E-08	mg/kg-day	8.40E-02	$(mg/kg\text{-}day)^{-1}$	1.27E-09	3.52E-08	mg/kg-day	3.00E-03	mg/kg-day	1.17E-05
				Naphthalene	0.0012	mg/L	1.16E-08	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	2.70E-08	mg/kg-day	2.00E-02	mg/kg-day	1.35E-06
				Aluminum (Total)	1.38	mg/L	1.39E-05	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	3.24E-05	mg/kg-day	1.00E+00	mg/kg-day	3.24E-05
				Arsenic (Total)	0.004	mg/L	4.03E-08	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	6.04E-08	9.39E-08	mg/kg-day	3.00E-04	mg/kg-day	3.13E-04
				Chromium (Total)	0.0051	mg/L	5.13E-08	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	1.20E-07	mg/kg-day	3.00E-03	mg/kg-day	3.99E-05
				Lead (Total)	0.013	mg/L	1.31E-07	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	3.05E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								6.17E-08					0.0004
			Dermal Absorption	Chlorodibromomethane	0.0015	mg/L	1.91E-08	mg/kg-day	8.40E-02	$(mg/kg\text{-}day)^{-1}$	1.60E-09	4.45E-08	mg/kg-day	2.40E-03	mg/kg-day	1.85E-05
				Naphthalene	0.0012	mg/L	1.28E-07	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	2.99E-07	mg/kg-day	1.60E-02	mg/kg-day	1.87E-05
				Aluminum (Total)	1.38	mg/L	1.58E-06	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	3.69E-06	mg/kg-day	1.00E-01	mg/kg-day	3.69E-05
				Arsenic (Total)	0.004	mg/L	4.59E-09	mg/kg-day	3.66E+00	$(mg/kg\text{-}day)^{-1}$	1.68E-08	1.07E-08	mg/kg-day	1.23E-04	mg/kg-day	8.71E-05
				Chromium (Total)	0.0051	mg/L	1.17E-08	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	2.73E-08	mg/kg-day	6.00E-05	mg/kg-day	4.55E-04
				Lead (Total)	0.013	mg/L	1.49E-09	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	3.48E-09	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.84E-08					0.00062
		Exposure Point Total									8.00E-08					0.001
	Exposure Medium Total										8.00E-08					0.001
Area Total											8.00E-08					0.001
Weighted Sums of Risk Estimates									Total of Receptor Risks Across All Media		4.67E-05			Total of Receptor Hazards Across All Media		0.058

TABLE 7.2 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentratio		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient
% of Total Area			% of Total Area				Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Sediment	Surface Sediment	Incidental Ingestion	bis(2-Ethylhexyl)phthalate	81	mg/kg	1.07E-06	mg/kg-day	1.40E-02	(mg/kg-day)$^{-1}$	1.49E-08	2.49E-05	mg/kg-day	2.00E-02	mg/kg-day	1.24E-03
13.56%				Benzo(a)anthracene	280	mg/kg	3.69E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.69E-06	8.60E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.45E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.06E-05	3.38E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	99	mg/kg	1.30E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	9.52E-07	3.04E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	89	mg/kg	1.17E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.73E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	42	mg/kg	5.53E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	4.04E-08	1.29E-05	mg/kg-day	-	mg/kg-day	-
				Carbazole	47	mg/kg	6.19E-07	mg/kg-day	2.00E-02	(mg/kg-day)$^{-1}$	1.24E-08	1.44E-05	mg/kg-day	-	mg/kg-day	-
				Chrysene	600	mg/kg	7.90E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	5.77E-08	1.84E-04	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	41	mg/kg	5.40E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	3.94E-06	1.26E-05	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	50	mg/kg	6.58E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	4.81E-07	1.54E-05	mg/kg-day	-	mg/kg-day	-
				Naphthalene	896	mg/kg	1.18E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.75E-04	mg/kg-day	2.00E-02	mg/kg-day	1.38E-02
				Phenanthrene	1,900	mg/kg	2.50E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.84E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	720	mg/kg	9.48E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.21E-04	mg/kg-day	3.00E-02	mg/kg-day	7.37E-03
				Dieldrin	0.12	mg/kg	1.58E-09	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	2.53E-08	3.69E-08	mg/kg-day	5.00E-05	mg/kg-day	7.37E-04
				Aluminum	25,100	mg/kg	3.31E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.71E-03	mg/kg-day	1.00E+00	mg/kg-day	7.71E-03
				Antimony	72	mg/kg	9.45E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.21E-05	mg/kg-day	4.00E-04	mg/kg-day	5.52E-02
				Arsenic	165	mg/kg	2.17E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	3.26E-06	5.07E-05	mg/kg-day	3.00E-04	mg/kg-day	1.69E-01
				Cadmium	52	mg/kg	6.88E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.60E-05	mg/kg-day	1.00E-03	mg/kg-day	1.60E-02
				Chromium	622	mg/kg	8.19E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.91E-04	mg/kg-day	3.00E-03	mg/kg-day	6.37E-02
				Iron	85,000	mg/kg	1.12E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.61E-02	mg/kg-day	-	mg/kg-day	-
				Lead	4,195	mg/kg	5.52E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.29E-03	mg/kg-day	-	mg/kg-day	-
				Manganese	907	mg/kg	1.19E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.79E-04	mg/kg-day	1.40E-01	mg/kg-day	1.99E-03
				Nickel	1,140	mg/kg	1.50E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.50E-04	mg/kg-day	2.00E-02	mg/kg-day	1.75E-02
				Zinc	3,305	mg/kg	4.35E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.02E-03	mg/kg-day	3.00E-01	mg/kg-day	3.39E-03
				Aroclor 1242	6.80	mg/kg	8.95E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.79E-07	2.09E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	7.94	mg/kg	1.05E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.09E-07	2.44E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	1.32	mg/kg	1.74E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	3.48E-08	4.06E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.25E-05					0.36
			Dermal Absorption	bis(2-Ethylhexyl)phthalate	81	mg/kg	4.69E-07	mg/kg-day	7.37E-02	(mg/kg-day)$^{-1}$	3.46E-08	1.10E-05	mg/kg-day	3.80E-03	mg/kg-day	2.88E-03
				Benzo(a)anthracene	280	mg/kg	2.11E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.97E-06	4.92E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	8.29E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.95E-05	1.93E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	99	mg/kg	7.46E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.76E-06	1.74E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	89	mg/kg	6.70E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.56E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	42	mg/kg	3.16E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	7.45E-08	7.38E-06	mg/kg-day	-	mg/kg-day	-
				Carbazole	47	mg/kg	2.72E-07	mg/kg-day	2.86E-02	(mg/kg-day)$^{-1}$	7.78E-09	6.35E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	600	mg/kg	4.52E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	1.06E-07	1.05E-04	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	41	mg/kg	3.09E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	7.27E-06	7.21E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	50	mg/kg	3.77E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	8.87E-07	8.79E-06	mg/kg-day	-	mg/kg-day	-
				Naphthalene	896	mg/kg	6.75E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.58E-04	mg/kg-day	1.60E-02	mg/kg-day	9.85E-03
				Phenanthrene	1,900	mg/kg	1.43E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.34E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	720	mg/kg	5.42E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.27E-04	mg/kg-day	9.30E-03	mg/kg-day	1.36E-02
				Dieldrin	0.12	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Aluminum	25,100	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	72	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	165	mg/kg	2.87E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.05E-06	6.69E-06	mg/kg-day	1.23E-04	mg/kg-day	5.44E-02
				Cadmium	52	mg/kg	3.03E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.06E-08	mg/kg-day	1.00E-05	mg/kg-day	7.06E-03
				Chromium	622	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	85,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	4,195	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	907	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Nickel	1,140	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.40E-03	mg/kg-day	

TABLE 7.2 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentratio		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient
% of Total Area			% of Total Area				Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Sediment	Surface Sediment	Dermal Absorption	Zinc	3,305	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-02	mg/kg-day	
13.56%				Aroclor 1242	6.80	mg/kg	5.52E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.23E-07	1.29E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	7.94	mg/kg	6.44E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.43E-07	1.50E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	1.32	mg/kg	1.07E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	2.38E-08	2.50E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.60E-05					0.09
		Exposure Point Total									5.84E-05					0.45
	Exposure Medium Total										5.84E-05					0.45
Area Total											5.84E-05					0.45
Reach 2	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	172	mg/kg	2.27E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.65E-06	5.29E-05	mg/kg-day	-	mg/kg-day	-
19.16%				Benzo(a)pyrene	120	mg/kg	1.58E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.15E-05	3.68E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	34	mg/kg	4.48E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.27E-07	1.04E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	29	mg/kg	3.82E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.91E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11.16	mg/kg	1.47E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	1.07E-08	3.43E-06	mg/kg-day	-	mg/kg-day	-
				Carbazole	33	mg/kg	4.35E-07	mg/kg-day	2.00E-02	(mg/kg-day)$^{-1}$	8.69E-09	1.01E-05	mg/kg-day	-	mg/kg-day	-
				Chrysene	326	mg/kg	4.29E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	3.13E-08	1.00E-04	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	15.77	mg/kg	2.08E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.52E-06	4.85E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	17.59	mg/kg	2.32E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.69E-07	5.40E-06	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	372	mg/kg	4.90E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.14E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	254	mg/kg	3.35E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.82E-05	mg/kg-day	3.00E-02	mg/kg-day	2.61E-03
				Total Chlordane	2.35	mg/kg	3.09E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.22E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	8.84	mg/kg	1.16E-07	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	3.96E-08	2.72E-06	mg/kg-day	-	mg/kg-day	-
				Total DDT	10.30	mg/kg	1.36E-07	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	4.61E-08	3.16E-06	mg/kg-day	5.00E-04	mg/kg-day	6.33E-03
				Dieldrin	4.25	mg/kg	5.60E-08	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	8.95E-07	1.31E-06	mg/kg-day	5.00E-05	mg/kg-day	2.61E-02
				gamma-BHC (Lindane)	3.16	mg/kg	4.16E-08	mg/kg-day	1.30E+00	(mg/kg-day)$^{-1}$	5.41E-08	9.71E-07	mg/kg-day	3.00E-04	mg/kg-day	3.24E-03
				Heptachlor	4.61	mg/kg	6.07E-08	mg/kg-day	4.50E+00	(mg/kg-day)$^{-1}$	2.73E-07	1.42E-06	mg/kg-day	5.00E-04	mg/kg-day	2.83E-03
				Hexachlorocyclohexane-all isomers	3.16	mg/kg	4.16E-08	mg/kg-day	1.80E+00	(mg/kg-day)$^{-1}$	7.49E-08	9.71E-07	mg/kg-day	-	mg/kg-day	-
				Toxaphene		mg/kg		mg/kg-day	1.10E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Aluminum	10,507	mg/kg	1.38E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.23E-03	mg/kg-day	1.00E+00	mg/kg-day	3.23E-03
				Antimony	47	mg/kg	6.24E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.46E-05	mg/kg-day	4.00E-04	mg/kg-day	3.64E-02
				Arsenic	180	mg/kg	2.37E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	3.56E-06	5.53E-05	mg/kg-day	3.00E-04	mg/kg-day	1.84E-01
				Cadmium	74	mg/kg	9.73E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.27E-05	mg/kg-day	1.00E-03	mg/kg-day	2.27E-02
				Chromium	620	mg/kg	8.16E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.90E-04	mg/kg-day	3.00E-03	mg/kg-day	6.35E-02
				Iron	186,911	mg/kg	2.46E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.74E-02	mg/kg-day	-	mg/kg-day	-
				Lead	3,201	mg/kg	4.22E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.84E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	1,113	mg/kg	1.47E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.42E-04	mg/kg-day	1.40E-01	mg/kg-day	2.44E-03
				Mercury	7.20	mg/kg	9.48E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.21E-06	mg/kg-day	4.00E-02	mg/kg-day	5.53E-05
				Zinc	8,436	mg/kg	1.11E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.59E-03	mg/kg-day	3.00E-01	mg/kg-day	8.64E-03
				2,3,7,8-Dibenzo-p-dioxin	6.00E-06	mg/kg	7.90E-14	mg/kg-day	1.50E+05	(mg/kg-day)$^{-1}$	1.19E-08	1.84E-12	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	10.40	mg/kg	1.37E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.74E-07	3.20E-06	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.05E-05					0.36
			Dermal Absorption	Benzo(a)anthracene	172	mg/kg	1.30E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	3.05E-06	3.02E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	120	mg/kg	9.03E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.13E-05	2.11E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	34	mg/kg	2.56E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	6.03E-07	5.98E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	29	mg/kg	2.18E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.10E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11.16	mg/kg	8.41E-08	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	1.98E-08	1.96E-06	mg/kg-day	-	mg/kg-day	-
				Carbazole	33	mg/kg	1.91E-07	mg/kg-day	2.86E-02	(mg/kg-day)$^{-1}$	5.46E-09	4.46E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	326	mg/kg	2.46E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	5.78E-08	5.73E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	15.77	mg/kg	1.19E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.80E-06	2.77E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	17.59	mg/kg	1.32E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	3.12E-07	3.09E-06	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	372	mg/kg	2.80E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.54E-05	mg/kg-day	-	mg/kg-day	-

TABLE 7.2 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentratio		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient
% of Total Area			% of Total Area				Value	Units	Value	Units		Value	Units	Value	Units	
Reach 2	Sediment	Surface Sediment	Dermal Absorption	Pyrene	254	mg/kg	1.92E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.47E-05	mg/kg-day	9.30E-03	mg/kg-day	4.81E-03
19.16%				Total Chlordane	2.35	mg/kg	5.45E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.27E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	8.84	mg/kg	1.54E-08	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	7.46E-09	3.59E-07	mg/kg-day	-	mg/kg-day	-
				Total DDT	10.30	mg/kg	1.79E-08	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	8.70E-09	4.18E-07	mg/kg-day	3.50E-04	mg/kg-day	1.19E-03
				Dieldrin	4.25	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				gamma-BHC (Lindane)	3.16	mg/kg	7.32E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.71E-07	mg/kg-day	2.91E-04	mg/kg-day	5.87E-04
				Heptachlor	4.61	mg/kg	2.67E-09	mg/kg-day	6.25E+00	(mg/kg-day)$^{-1}$	1.67E-08	6.23E-08	mg/kg-day	3.60E-04	mg/kg-day	1.73E-04
				Hexachlorocyclohexane-all isomers	3.16	mg/kg	7.32E-09	mg/kg-day	1.86E+00	(mg/kg-day)$^{-1}$	1.36E-08	1.71E-07	mg/kg-day	-	mg/kg-day	-
				Toxaphene		mg/kg		mg/kg-day	2.20E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Aluminum	10,507	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	47	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	180	mg/kg	3.13E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.14E-06	7.30E-06	mg/kg-day	1.23E-04	mg/kg-day	5.94E-02
				Cadmium	74	mg/kg	4.28E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.99E-08	mg/kg-day	1.00E-05	mg/kg-day	9.99E-03
				Chromium	620	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	186,911	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	3,201	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	1,113	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	7.20	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Zinc	8,436	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-02	mg/kg-day	
				2,3,7,8-Dibenzo-p-dioxin	6.00E-06	mg/kg	3.48E-16	mg/kg-day	3.00E+05	(mg/kg-day)$^{-1}$	1.04E-10	8.11E-15	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	10.40	mg/kg	8.44E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.87E-07	1.97E-06	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.95E-05					0.08
		Exposure Point Total									4.99E-05					0.44
	Exposure Medium Total										4.99E-05					0.44
Area Total											4.99E-05					0.44
Reach 3	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	27	mg/kg	3.56E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.60E-07	8.30E-06	mg/kg-day	-	mg/kg-day	-
9.98%				Benzo(a)pyrene	16	mg/kg	2.11E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.54E-06	4.92E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	12	mg/kg	1.58E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.15E-07	3.69E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.70	mg/kg	8.82E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.06E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11	mg/kg	1.45E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	1.06E-08	3.38E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	8.95E-07	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	6.54E-09	2.09E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.00	mg/kg	5.27E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	3.85E-07	1.23E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.90	mg/kg	6.45E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	4.71E-08	1.51E-06	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	120	mg/kg	1.58E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.69E-05	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.028	mg/kg	3.69E-10	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	5.90E-09	8.60E-09	mg/kg-day	5.00E-05	mg/kg-day	1.72E-04
				Arsenic	110	mg/kg	1.45E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	2.17E-06	3.38E-05	mg/kg-day	3.00E-04	mg/kg-day	1.13E-01
				Cadmium	36	mg/kg	4.74E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.11E-05	mg/kg-day	1.00E-03	mg/kg-day	1.11E-02
				Chromium	410	mg/kg	5.40E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.26E-04	mg/kg-day	3.00E-03	mg/kg-day	4.20E-02
				Lead	5,200	mg/kg	6.85E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.60E-03	mg/kg-day	-	mg/kg-day	-
				Mercury	15	mg/kg	1.98E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.61E-06	mg/kg-day	4.00E-02	mg/kg-day	1.15E-04
				Aroclor 1248	1.20	mg/kg	1.58E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	3.16E-08	3.69E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.55	mg/kg	7.24E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.45E-08	1.69E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								4.59E-06					0.17
			Dermal Absorption	Benzo(a)anthracene	27	mg/kg	2.03E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.79E-07	4.75E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	16	mg/kg	1.21E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.84E-06	2.81E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	12	mg/kg	9.04E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	2.13E-07	2.11E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.70	mg/kg	5.05E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.18E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11	mg/kg	8.29E-08	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	1.95E-08	1.93E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	5.12E-07	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	1.21E-08	1.20E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.00	mg/kg	3.01E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	7.09E-07	7.03E-07	mg/kg-day	-	mg/kg-day	-

TABLE 7.2 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentratio		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient
% of Total Area			% of Total Area				Value	Units	Value	Units		Value	Units	Value	Units	
Reach 3	Sediment	Surface Sediment	Dermal Absorption	Indeno(1,2,3-cd)pyrene	4.90	mg/kg	3.69E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	8.69E-08	8.61E-07	mg/kg-day	-	mg/kg-day	-
9.98%				Phenanthrene	120	mg/kg	9.04E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.11E-05	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.028	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Arsenic	110	mg/kg	1.91E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	7.00E-07	4.46E-06	mg/kg-day	1.23E-04	mg/kg-day	3.63E-02
				Cadmium	36	mg/kg	2.09E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.87E-08	mg/kg-day	1.00E-05	mg/kg-day	4.87E-03
				Chromium	410	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Lead	5,200	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Mercury	15	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1248	1.20	mg/kg	9.73E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	2.16E-08	2.27E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.55	mg/kg	4.46E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	9.91E-09	1.04E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								5.09E-06					0.04
			Inhalation	Benzo(a)anthracene	27	mg/kg	7.72E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	2.97E-13	1.80E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	16	mg/kg	4.58E-13	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	1.76E-12	1.07E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	12	mg/kg	3.43E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.32E-13	8.01E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.70	mg/kg	1.92E-13	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.47E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11	mg/kg	3.15E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.21E-13	7.34E-12	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	1.95E-12	mg/kg-day	3.85E-02	(mg/kg-day)$^{-1}$	7.49E-14	4.54E-11	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.00	mg/kg	1.14E-13	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	4.81E-13	2.67E-12	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.90	mg/kg	1.40E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	5.40E-14	3.27E-12	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	120	mg/kg	3.43E-12	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.01E-11	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.028	mg/kg	8.01E-16	mg/kg-day	1.61E+01	(mg/kg-day)$^{-1}$	1.29E-14	1.87E-14	mg/kg-day	-	mg/kg-day	-
				Arsenic	110	mg/kg	3.15E-12	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	4.74E-11	7.34E-11	mg/kg-day	-	mg/kg-day	-
				Cadmium	36	mg/kg	1.03E-12	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	6.49E-12	2.40E-11	mg/kg-day	-	mg/kg-day	-
				Chromium	410	mg/kg	1.17E-11	mg/kg-day	4.20E+01	(mg/kg-day)$^{-1}$	4.93E-10	2.74E-10	mg/kg-day	2.20E-06	mg/kg-day	1.24E-04
				Lead	5,200	mg/kg	1.49E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.47E-09	mg/kg-day	-	mg/kg-day	-
				Mercury	15	mg/kg	4.29E-13	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.00E-11	mg/kg-day	8.57E-05	mg/kg-day	1.17E-07
				Aroclor 1248	1.20	mg/kg	3.43E-14	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	6.86E-14	8.01E-13	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.55	mg/kg	1.57E-14	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	3.14E-14	3.67E-13	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								5.49E-10					0.00012
		Exposure Point Total									9.68E-06					0.21
	Exposure Medium Total										9.68E-06					0.21
Area Total											9.68E-06					0.21
Reach 4	Sediment	Surface Sediment	Incidental Ingestion	Acenaphthene	1,300	mg/kg	1.71E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.99E-04	mg/kg-day	6.00E-02	mg/kg-day	6.66E-03
5.41%				Benzo(a)anthracene	170	mg/kg	2.24E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.63E-06	5.22E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	98	mg/kg	1.29E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	9.42E-06	3.01E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	17	mg/kg	2.24E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.63E-07	5.22E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	9.10	mg/kg	1.20E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.80E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	27	mg/kg	3.56E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	2.60E-08	8.30E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	190	mg/kg	2.50E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	1.83E-08	5.84E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.50	mg/kg	5.93E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	4.33E-07	1.38E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	43	mg/kg	5.66E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	4.13E-07	1.32E-05	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	2,000	mg/kg	2.63E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.15E-04	mg/kg-day	4.00E-03	mg/kg-day	1.54E-01
				Naphthalene	2,900	mg/kg	3.82E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.91E-04	mg/kg-day	2.00E-02	mg/kg-day	4.46E-02
				Phenanthrene	1,400	mg/kg	1.84E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.30E-04	mg/kg-day	-	mg/kg-day	-
				Antimony	280	mg/kg	3.69E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.60E-05	mg/kg-day	4.00E-04	mg/kg-day	2.15E-01
				Arsenic	40	mg/kg	5.27E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	7.90E-07	1.23E-05	mg/kg-day	3.00E-04	mg/kg-day	4.10E-02
				Cadmium	23	mg/kg	3.03E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.07E-06	mg/kg-day	1.00E-03	mg/kg-day	7.07E-03
				Chromium	250	mg/kg	3.29E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.68E-05	mg/kg-day	3.00E-03	mg/kg-day	2.56E-02

TABLE 7.2 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentratio		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient
% of Total Area			% of Total Area				Value	Units	Value	Units		Value	Units	Value	Units	
Reach 4	Sediment	Surface Sediment	Incidental Ingestion	Iron	64,000	mg/kg	8.43E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.97E-02	mg/kg-day	-	mg/kg-day	-
5.41%				Lead	1,000	mg/kg	1.32E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.07E-04	mg/kg-day	-	mg/kg-day	-
				Manganese		mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.40E-01	mg/kg-day	
				Mercury	12	mg/kg	1.58E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.69E-06	mg/kg-day	4.00E-02	mg/kg-day	9.22E-05
				Aroclor 1248	0.40	mg/kg	5.27E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.05E-08	1.23E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.29	mg/kg	3.82E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	7.64E-09	8.91E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.29E-05					0.49
			Dermal Absorption	Acenaphthene	1,300	mg/kg	9.79E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.28E-04	mg/kg-day	1.86E-02	mg/kg-day	1.23E-02
				Benzo(a)anthracene	170	mg/kg	1.28E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	3.02E-06	2.99E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	98	mg/kg	7.38E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.74E-05	1.72E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	17	mg/kg	1.28E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	3.02E-07	2.99E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	9.10	mg/kg	6.85E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.60E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	27	mg/kg	2.03E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	4.79E-08	4.75E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	190	mg/kg	1.43E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	3.37E-08	3.34E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.50	mg/kg	3.39E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	7.98E-07	7.91E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	43	mg/kg	3.24E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	7.63E-07	7.56E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	2,000	mg/kg	1.51E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.52E-04	mg/kg-day	3.20E-03	mg/kg-day	1.10E-01
				Naphthalene	2,900	mg/kg	2.18E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.10E-04	mg/kg-day	1.60E-02	mg/kg-day	3.19E-02
				Phenanthrene	1,400	mg/kg	1.05E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.46E-04	mg/kg-day	-	mg/kg-day	-
				Antimony	280	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	40	mg/kg	6.95E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	2.54E-07	1.62E-06	mg/kg-day	1.23E-04	mg/kg-day	1.32E-02
				Cadmium	23	mg/kg	1.33E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.11E-08	mg/kg-day	1.00E-05	mg/kg-day	3.11E-03
				Chromium	250	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	64,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	1,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese		mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	12	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1248	0.40	mg/kg	3.24E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	7.21E-09	7.57E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.29	mg/kg	2.35E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	5.23E-09	5.49E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.26E-05					0.17
			Inhalation	Acenaphthene	1,300	mg/kg	3.72E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.68E-10	mg/kg-day	6.00E-02	mg/kg-day	1.45E-08
				Benzo(a)anthracene	170	mg/kg	4.86E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.87E-12	1.13E-10	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	98	mg/kg	2.80E-12	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	1.08E-11	6.54E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	17	mg/kg	4.86E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.87E-13	1.13E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	9.10	mg/kg	2.60E-13	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.07E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	27	mg/kg	7.72E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	2.97E-13	1.80E-11	mg/kg-day	-	mg/kg-day	-
				Chrysene	190	mg/kg	5.43E-12	mg/kg-day	3.85E-02	(mg/kg-day)$^{-1}$	2.09E-13	1.27E-10	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.50	mg/kg	1.29E-13	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	5.41E-13	3.00E-12	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	43	mg/kg	1.23E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	4.74E-13	2.87E-11	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	2,000	mg/kg	5.72E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.33E-09	mg/kg-day	-	mg/kg-day	-
				Naphthalene	2,900	mg/kg	8.30E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.94E-09	mg/kg-day	8.57E-04	mg/kg-day	2.26E-06
				Phenanthrene	1,400	mg/kg	4.00E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.34E-10	mg/kg-day	-	mg/kg-day	-
				Antimony	280	mg/kg	8.01E-12	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.87E-10	mg/kg-day	-	mg/kg-day	-
				Arsenic	40	mg/kg	1.14E-12	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	1.72E-11	2.67E-11	mg/kg-day	-	mg/kg-day	-
				Cadmium	23	mg/kg	6.58E-13	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	4.14E-12	1.54E-11	mg/kg-day	-	mg/kg-day	-

TABLE 7.2 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentratio		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient
% of Total Area			% of Total Area				Value	Units	Value	Units		Value	Units	Value	Units	
Reach 4	Sediment	Surface Sediment	Inhalation	Chromium	250	mg/kg	7.15E-12	mg/kg-day	4.20E+01	(mg/kg-day)$^{-1}$	3.00E-10	1.67E-10	mg/kg-day	2.20E-06	mg/kg-day	7.58E-05
5.41%				Iron	64,000	mg/kg	1.83E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.27E-08	mg/kg-day	-	mg/kg-day	-
				Lead	1,000	mg/kg	2.86E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.67E-10	mg/kg-day	-	mg/kg-day	-
				Manganese		mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.43E-05	mg/kg-day	
				Mercury	12	mg/kg	3.43E-13	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.01E-12	mg/kg-day	8.57E-05	mg/kg-day	9.34E-08
				Aroclor 1248	0.40	mg/kg	1.14E-14	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.29E-14	2.67E-13	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.29	mg/kg	8.30E-15	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.66E-14	1.94E-13	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.36E-10					0.00008
		Exposure Point Total									3.55E-05					0.66
	Exposure Medium Total										3.55E-05					0.66
Area Total											3.55E-05					0.66
Reach 5	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	20	mg/kg	2.63E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.92E-07	6.15E-06	mg/kg-day	-	mg/kg-day	-
6.52%				Benzo(a)pyrene	7.20	mg/kg	9.48E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	6.92E-07	2.21E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	4.60	mg/kg	6.06E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	4.42E-08	1.41E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	2.20	mg/kg	2.90E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.76E-07	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	0.62	mg/kg	8.16E-09	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	5.96E-08	1.91E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	1.80	mg/kg	2.37E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.73E-08	5.53E-07	mg/kg-day	-	mg/kg-day	-
				Aluminum	9,900	mg/kg	1.30E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.04E-03	mg/kg-day	1.00E+00	mg/kg-day	3.04E-03
				Antimony	212	mg/kg	2.79E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.51E-05	mg/kg-day	4.00E-04	mg/kg-day	1.63E-01
				Arsenic	21	mg/kg	2.70E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	4.05E-07	6.30E-06	mg/kg-day	3.00E-04	mg/kg-day	2.10E-02
				Cadmium	10.30	mg/kg	1.36E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.16E-06	mg/kg-day	1.00E-03	mg/kg-day	3.16E-03
				Iron	33,000	mg/kg	4.35E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.01E-02	mg/kg-day	-	mg/kg-day	-
				Lead	600	mg/kg	7.90E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.84E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	2,860	mg/kg	3.77E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.79E-04	mg/kg-day	1.40E-01	mg/kg-day	6.28E-03
				Aroclor 1248	0.68	mg/kg	8.91E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.78E-08	2.08E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.43E-06					0.20
			Dermal Absorption	Benzo(a)anthracene	20	mg/kg	1.51E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	3.55E-07	3.52E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	7.20	mg/kg	5.42E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.28E-06	1.27E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	4.60	mg/kg	3.46E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	8.16E-08	8.08E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	2.20	mg/kg	1.66E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.87E-07	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	0.62	mg/kg	4.67E-09	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.10E-07	1.09E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	1.80	mg/kg	1.36E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	3.19E-08	3.16E-07	mg/kg-day	-	mg/kg-day	-
				Aluminum	9,900	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	212	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	21	mg/kg	3.56E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.30E-07	8.31E-07	mg/kg-day	1.23E-04	mg/kg-day	6.76E-03
				Cadmium	10.30	mg/kg	5.97E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.39E-08	mg/kg-day	1.00E-05	mg/kg-day	1.39E-03
				Iron	33,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	600	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	2,860	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Aroclor 1248	0.68	mg/kg	5.49E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.22E-08	1.28E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.00E-06					0.01
			Inhalation	Benzo(a)anthracene	20	mg/kg	5.72E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	2.20E-13	1.33E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	7.20	mg/kg	2.06E-13	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	7.93E-13	4.81E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	4.60	mg/kg	1.32E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	5.07E-14	3.07E-12	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	2.20	mg/kg	6.29E-14	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.47E-12	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	0.62	mg/kg	1.77E-14	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	7.45E-14	4.14E-13	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	1.80	mg/kg	5.15E-14	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.98E-14	1.20E-12	mg/kg-day	-	mg/kg-day	-
				Aluminum	9,900	mg/kg	2.83E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.61E-09	mg/kg-day	1.43E-03	mg/kg-day	4.63E-06
				Antimony	212	mg/kg	6.06E-12	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.42E-10	mg/kg-day	-	mg/kg-day	-
				Arsenic	21	mg/kg	5.86E-13	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	8.83E-12	1.37E-11	mg/kg-day	-	mg/kg-day	-
				Cadmium	10.30	mg/kg	2.95E-13	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	1.86E-12	6.87E-12	mg/kg-day	-	mg/kg-day	-
				Iron	33,000	mg/kg	9.44E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.20E-08	mg/kg-day	-	mg/kg-day	-

TABLE 7.2 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentratio		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient
% of Total Area			% of Total Area				Value	Units	Value	Units		Value	Units	Value	Units	
Reach 5				Lead	600	mg/kg	1.72E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.00E-10	mg/kg-day	-	mg/kg-day	-
6.52%				Manganese	2,860	mg/kg	8.18E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.91E-09	mg/kg-day	1.43E-05	mg/kg-day	1.34E-04
				Aroclor 1248	0.68	mg/kg	1.93E-14	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	3.87E-14	4.51E-13	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.19E-11					0.00014
		Exposure Point Total									3.43E-06					0.20
	Exposure Medium Total										3.43E-06					0.20
Area Total											3.43E-06					0.20
Reach 6	Sediment	Surface Sediment	Incidental Ingestion	Benzene	44	mg/kg	5.79E-07	mg/kg-day	5.50E-02	(mg/kg-day)$^{-1}$	3.19E-08	1.35E-05	mg/kg-day	4.00E-03	mg/kg-day	3.38E-03
3.40%				Acenaphthene	1,400	mg/kg	1.84E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.30E-04	mg/kg-day	6.00E-02	mg/kg-day	7.17E-03
				Benzo(a)anthracene	197	mg/kg	2.59E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.89E-06	6.04E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	128	mg/kg	1.68E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.23E-05	3.93E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	22	mg/kg	2.90E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	2.11E-08	6.76E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	195	mg/kg	2.57E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	1.87E-08	5.99E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	7.20	mg/kg	9.48E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	6.92E-07	2.21E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	23	mg/kg	3.03E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.21E-07	7.07E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	3,400	mg/kg	4.48E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.04E-03	mg/kg-day	4.00E-03	mg/kg-day	2.61E-01
				Naphthalene	3,800	mg/kg	5.00E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.17E-03	mg/kg-day	2.00E-02	mg/kg-day	5.84E-02
				Phenanthrene	1,900	mg/kg	2.50E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.84E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	638	mg/kg	8.40E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.96E-04	mg/kg-day	3.00E-02	mg/kg-day	6.53E-03
				Aluminum	13,000	mg/kg	1.71E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.99E-03	mg/kg-day	1.00E+00	mg/kg-day	3.99E-03
				Antimony	69	mg/kg	9.09E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.12E-05	mg/kg-day	4.00E-04	mg/kg-day	5.30E-02
				Arsenic	40	mg/kg	5.30E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	7.96E-07	1.24E-05	mg/kg-day	3.00E-04	mg/kg-day	4.13E-02
				Cadmium	34	mg/kg	4.49E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.05E-05	mg/kg-day	1.00E-03	mg/kg-day	1.05E-02
				Chromium	228	mg/kg	3.00E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.00E-05	mg/kg-day	3.00E-03	mg/kg-day	2.33E-02
				Iron	160,000	mg/kg	2.11E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.92E-02	mg/kg-day	-	mg/kg-day	-
				Lead	1,523	mg/kg	2.00E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.68E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	980	mg/kg	1.29E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.01E-04	mg/kg-day	1.40E-01	mg/kg-day	2.15E-03
			Exp. Route Total								1.60E-05					4.71E-01
			Dermal Absorption	Benzene	44	mg/kg		mg/kg-day	5.67E-02	(mg/kg-day)$^{-1}$			mg/kg-day	3.88E-03	mg/kg-day	
				Acenaphthene	1,400	mg/kg	1.05E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.46E-04	mg/kg-day	1.86E-02	mg/kg-day	1.32E-02
				Benzo(a)anthracene	197	mg/kg	1.48E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	3.49E-06	3.46E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	128	mg/kg	9.64E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.27E-05	2.25E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	22	mg/kg	1.66E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	3.90E-08	3.87E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	195	mg/kg	1.47E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	3.46E-08	3.43E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	7.20	mg/kg	5.42E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.28E-06	1.27E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	23	mg/kg	1.73E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.08E-07	4.04E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	3,400	mg/kg	2.56E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.98E-04	mg/kg-day	3.20E-03	mg/kg-day	1.87E-01
				Naphthalene	3,800	mg/kg	2.86E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.68E-04	mg/kg-day	1.60E-02	mg/kg-day	4.17E-02
				Phenanthrene	1,900	mg/kg	1.43E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.34E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	638	mg/kg	4.80E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.12E-04	mg/kg-day	9.30E-03	mg/kg-day	1.21E-02
				Aluminum	13,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	69	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	40	mg/kg	7.00E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	2.56E-07	1.63E-06	mg/kg-day	1.23E-04	mg/kg-day	1.33E-02
				Cadmium	34	mg/kg	1.97E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.60E-08	mg/kg-day	1.00E-05	mg/kg-day	4.60E-03
				Chromium	228	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	160,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	1,523	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	980	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
			Exp. Route Total								2.82E-05					0.27
		Exposure Point Total									4.42E-05					0.74
	Exposure Medium Total										4.42E-05					0.74
Area Total											4.42E-05					0.74

TABLE 7.2 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentratio		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient
% of Total Area			% of Total Area				Value	Units	Value	Units		Value	Units	Value	Units	
Reach 7	Sediment	Surface Sediment	Incidental Ingestion	Benzene	25	mg/kg	3.29E-07	mg/kg-day	5.50E-02	(mg/kg-day)$^{-1}$	1.81E-08	7.68E-06	mg/kg-day	4.00E-03	mg/kg-day	1.92E-03
4.45%				Benzo(a)anthracene	66	mg/kg	8.69E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	6.34E-07	2.03E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.44E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.05E-05	3.36E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	7.50	mg/kg	9.88E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	7.21E-08	2.30E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.50	mg/kg	8.56E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.00E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	14	mg/kg	1.84E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	1.35E-08	4.30E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	8.95E-07	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	6.54E-09	2.09E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	2.20	mg/kg	2.90E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	2.11E-07	6.76E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.70	mg/kg	6.19E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	4.52E-08	1.44E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	630	mg/kg	8.30E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.94E-04	mg/kg-day	4.00E-03	mg/kg-day	4.84E-02
				Naphthalene	820	mg/kg	1.08E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.52E-04	mg/kg-day	2.00E-02	mg/kg-day	1.26E-02
				Phenanthrene	440	mg/kg	5.79E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.35E-04	mg/kg-day	-	mg/kg-day	-
				Total Chlordane	2.14	mg/kg	2.82E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.58E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	6.80	mg/kg	8.95E-08	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	3.04E-08	2.09E-06	mg/kg-day	-	mg/kg-day	-
				Total DDT	2.80	mg/kg	3.69E-08	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	1.25E-08	8.60E-07	mg/kg-day	5.00E-04	mg/kg-day	1.72E-03
			Incidental Ingestion	Dieldrin	2.83	mg/kg	3.73E-08	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	5.96E-07	8.70E-07	mg/kg-day	5.00E-05	mg/kg-day	1.74E-02
				Heptachlor	0.19	mg/kg	2.50E-09	mg/kg-day	4.50E+00	(mg/kg-day)$^{-1}$	1.13E-08	5.84E-08	mg/kg-day	5.00E-04	mg/kg-day	1.17E-04
				Toxaphene	2.05	mg/kg	2.70E-08	mg/kg-day	1.10E+00	(mg/kg-day)$^{-1}$	2.97E-08	6.30E-07	mg/kg-day	-	mg/kg-day	-
				Arsenic	24	mg/kg	3.16E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	4.74E-07	7.37E-06	mg/kg-day	3.00E-04	mg/kg-day	2.46E-02
				Cadmium	18	mg/kg	2.37E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.53E-06	mg/kg-day	1.00E-03	mg/kg-day	5.53E-03
				Lead	1,306	mg/kg	1.72E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.01E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	614	mg/kg	8.09E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.89E-04	mg/kg-day	1.40E-01	mg/kg-day	1.35E-03
				Mercury	6.30	mg/kg	8.30E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.94E-06	mg/kg-day	4.00E-02	mg/kg-day	4.84E-05
				Aroclor 1248	14	mg/kg	1.80E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	3.59E-07	4.19E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.36	mg/kg	4.74E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	9.48E-09	1.11E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.31E-05					0.11
			Dermal Absorption	Benzene	25	mg/kg		mg/kg-day	5.67E-02	(mg/kg-day)$^{-1}$			mg/kg-day	3.88E-03	mg/kg-day	
				Benzo(a)anthracene	66	mg/kg	4.97E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.17E-06	1.16E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	8.25E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.94E-05	1.92E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	7.50	mg/kg	5.65E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.33E-07	1.32E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.50	mg/kg	4.90E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.14E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	14	mg/kg	1.05E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	2.48E-08	2.46E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	5.12E-07	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	1.21E-08	1.20E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	2.20	mg/kg	1.66E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	3.90E-07	3.87E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.70	mg/kg	3.54E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	8.34E-08	8.26E-07	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	630	mg/kg	4.75E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.11E-04	mg/kg-day	3.20E-03	mg/kg-day	3.46E-02
				Naphthalene	820	mg/kg	6.18E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.44E-04	mg/kg-day	1.60E-02	mg/kg-day	9.01E-03
				Phenanthrene	440	mg/kg	3.31E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.73E-05	mg/kg-day	-	mg/kg-day	-
				Total Chlordane	2.14	mg/kg	4.96E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.16E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	6.80	mg/kg	1.18E-08	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	5.74E-09	2.76E-07	mg/kg-day	-	mg/kg-day	-
				Total DDT	2.80	mg/kg	4.87E-09	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	2.36E-09	1.14E-07	mg/kg-day	-	mg/kg-day	-
				Dieldrin	2.83	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Heptachlor	0.19	mg/kg	1.10E-10	mg/kg-day	6.25E+00	(mg/kg-day)$^{-1}$	6.88E-10	2.57E-09	mg/kg-day	3.60E-04	mg/kg-day	7.14E-06
				Toxaphene	2.05	mg/kg		mg/kg-day	2.20E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Arsenic	24	mg/kg	4.17E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.53E-07	9.73E-07	mg/kg-day	1.23E-04	mg/kg-day	7.91E-03
				Cadmium	18	mg/kg	1.04E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.43E-08	mg/kg-day	1.00E-05	mg/kg-day	2.43E-03
				Lead	1,306	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	614	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	6.30	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1248	14	mg/kg	1.11E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	2.46E-07	2.58E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.36	mg/kg	2.92E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	6.49E-09	6.81E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.17E-05					0.05
		Exposure Point Total									3.47E-05					0.17
	Exposure Medium Total										3.47E-05					0.17
Area Total											3.47E-05					0.17

TABLE 7.2 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentratio		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient
% of Total Area			% of Total Area				Value	Units	Value	Units		Value	Units	Value	Units	
Roxanna Marsh 37.53%	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	77	mg/kg	1.02E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	7.42E-07	2.37E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	27	mg/kg	3.61E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	2.64E-06	8.43E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	45	mg/kg	5.92E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	4.32E-07	1.38E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	36	mg/kg	4.76E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.11E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	5.18	mg/kg	6.82E-08	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	4.98E-09	1.59E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	258	mg/kg	3.39E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	2.48E-08	7.92E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	30	mg/kg	3.95E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	2.89E-06	9.22E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	35	mg/kg	4.58E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.35E-07	1.07E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	376	mg/kg	4.96E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.16E-04	mg/kg-day	3.00E-02	mg/kg-day	3.85E-03
				Dieldrin	0.036	mg/kg	4.74E-10	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	7.58E-09	1.11E-08	mg/kg-day	5.00E-05	mg/kg-day	2.21E-04
				Arsenic	100	mg/kg	1.32E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	1.98E-06	3.09E-05	mg/kg-day	3.00E-04	mg/kg-day	1.03E-01
				Cadmium	63	mg/kg	8.29E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.93E-05	mg/kg-day	1.00E-03	mg/kg-day	1.93E-02
				Chromium	696	mg/kg	9.16E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.14E-04	mg/kg-day	3.00E-03	mg/kg-day	7.12E-02
				Iron	12,800	mg/kg	1.69E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.93E-03	mg/kg-day	-	mg/kg-day	-
				Lead	3,443	mg/kg	4.53E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.06E-03	mg/kg-day	-	mg/kg-day	-
				Mercury	5.60	mg/kg	7.37E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.72E-06	mg/kg-day	4.00E-02	mg/kg-day	4.30E-05
				Aroclor 1260	2.10	mg/kg	2.77E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	5.53E-08	6.45E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1254	4.27	mg/kg	5.62E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.12E-07	1.31E-06	mg/kg-day	2.00E-05	mg/kg-day	6.56E-02
				Aroclor 1248	3.23	mg/kg	4.25E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	8.51E-08	9.92E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								9.30E-06					0.26
			Dermal Absorption	Benzo(a)anthracene	77	mg/kg	5.81E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.37E-06	1.36E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	27	mg/kg	2.07E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	4.86E-06	4.82E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	45	mg/kg	3.39E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	7.98E-07	7.91E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	36	mg/kg	2.72E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.36E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	5.18	mg/kg	3.90E-08	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	9.19E-09	9.10E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	258	mg/kg	1.94E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	4.57E-08	4.53E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	30	mg/kg	2.26E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	5.32E-06	5.28E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	35	mg/kg	2.62E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	6.17E-07	6.12E-06	mg/kg-day	-	mg/kg-day	-
				Pyrene	376	mg/kg	2.83E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.61E-05	mg/kg-day	9.30E-03	mg/kg-day	7.11E-03
				Dieldrin	0.036	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Arsenic	100	mg/kg	1.75E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	6.39E-07	4.07E-06	mg/kg-day	1.23E-04	mg/kg-day	3.31E-02
				Cadmium	63	mg/kg	3.65E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.51E-08	mg/kg-day	1.00E-05	mg/kg-day	8.51E-03
				Chromium	696	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	12,800	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	3,443	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Mercury	5.60	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1260	2.10	mg/kg	1.70E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	3.79E-08	3.97E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1254	4.27	mg/kg	3.46E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	7.70E-08	8.08E-07	mg/kg-day	1.80E-05	mg/kg-day	4.49E-02
				Aroclor 1248	3.23	mg/kg	2.62E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	5.82E-08	6.11E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.38E-05					9.36E-02
			Inhalation	Benzo(a)anthracene	77	mg/kg	2.21E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	8.50E-13	5.15E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	27	mg/kg	7.84E-13	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	3.02E-12	1.83E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	45	mg/kg	1.29E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	4.95E-13	3.00E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	36	mg/kg	1.03E-12	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.41E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	5.18	mg/kg	1.48E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	5.70E-14	3.46E-12	mg/kg-day	-	mg/kg-day	-
				Chrysene	258	mg/kg	7.37E-12	mg/kg-day	3.85E-02	(mg/kg-day)$^{-1}$	2.84E-13	1.72E-10	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	30	mg/kg	8.59E-13	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	3.61E-12	2.00E-11	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	35	mg/kg	9.95E-13	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	3.83E-13	2.32E-11	mg/kg-day	-	mg/kg-day	-
				Pyrene	376	mg/kg	1.08E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.51E-10	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.036	mg/kg	1.03E-15	mg/kg-day	1.61E+01	(mg/kg-day)$^{-1}$	1.66E-14	2.40E-14	mg/kg-day	-	mg/kg-day	-
				Arsenic	100	mg/kg	2.87E-12	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	4.32E-11	6.70E-11	mg/kg-day	-	mg/kg-day	-
				Cadmium	63	mg/kg	1.80E-12	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	1.13E-11	4.20E-11	mg/kg-day	-	mg/kg-day	-
				Chromium	696	mg/kg	1.99E-11	mg/kg-day	4.20E+01	(mg/kg-day)$^{-1}$	8.36E-10	4.64E-10	mg/kg-day	2.20E-06	mg/kg-day	2.11E-04

TABLE 7.2 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentratio		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Quotient
% of Total Area			% of Total Area				Value	Units	Value	Units		Value	Units	Value	Units	
Roxanna Marsh 37.53%	Sediment	Surface Sediment	Incidental Ingestion	Iron	12,800	mg/kg	3.66E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.54E-09	mg/kg-day	-	mg/kg-day	-
				Lead	3,443	mg/kg	9.85E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.30E-09	mg/kg-day	-	mg/kg-day	-
				Mercury	5.60	mg/kg	1.60E-13	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.74E-12	mg/kg-day	8.57E-05	mg/kg-day	4.36E-08
				Aroclor 1260	2.10	mg/kg	6.01E-14	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.20E-13	1.40E-12	mg/kg-day	-	mg/kg-day	-
				Aroclor 1254	4.27	mg/kg	1.22E-13	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.44E-13	2.85E-12	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	3.23	mg/kg	9.24E-14	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.85E-13	2.16E-12	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								9.00E-10					0.00021
		Exposure Point Total									2.31E-05					0.36
	Exposure Medium Total										2.31E-05					0.36
Area Total											2.31E-05					0.36
Surface Water	Surface Water	Surface Water	Incidental Ingestion	Chlorodibromomethane	0.0015	mg/L	6.58E-09	mg/kg-day	8.40E-02	(mg/kg-day)$^{-1}$	5.53E-10	1.54E-07	mg/kg-day	3.00E-03	mg/kg-day	5.12E-05
				Naphthalene	0.0012	mg/L	5.05E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.18E-07	mg/kg-day	2.00E-02	mg/kg-day	5.89E-06
				Aluminum (Total)	1.38	mg/L	6.06E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.41E-04	mg/kg-day	1.00E+00	mg/kg-day	1.41E-04
				Arsenic (Total)	0.004	mg/L	1.76E-08	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	2.63E-08	4.10E-07	mg/kg-day	3.00E-04	mg/kg-day	1.37E-03
				Chromium (Total)	0.0051	mg/L	2.24E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.22E-07	mg/kg-day	3.00E-03	mg/kg-day	1.74E-04
				Lead (Total)	0.013	mg/L	5.71E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.33E-06	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.69E-08					0.0017
			Dermal Absorption	Chlorodibromomethane	0.0015	mg/L	4.82E-09	mg/kg-day	8.40E-02	(mg/kg-day)$^{-1}$	4.05E-10	1.12E-07	mg/kg-day	2.40E-03	mg/kg-day	4.68E-05
				Naphthalene	0.0012	mg/L	3.24E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.56E-07	mg/kg-day	1.60E-02	mg/kg-day	4.72E-05
				Aluminum (Total)	1.38	mg/L	4.00E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.33E-06	mg/kg-day	1.00E-01	mg/kg-day	9.33E-05
				Arsenic (Total)	0.004	mg/L	1.16E-09	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	4.24E-09	2.70E-08	mg/kg-day	1.23E-04	mg/kg-day	2.20E-04
				Chromium (Total)	0.0051	mg/L	2.95E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.89E-08	mg/kg-day	6.00E-05	mg/kg-day	1.15E-03
				Lead (Total)	0.013	mg/L	3.77E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.79E-09	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								4.64E-09					0.0016
		Exposure Point Total									3.15E-08					0.0033
	Exposure Medium Total										3.15E-08					0.0033
Area Total											3.15E-08					0.0033
Weighted Sums of Risk Estimates									Total of Receptor Risks Across All Media		3.24E-05			Total of Receptor Hazards Across All Media		0.38

TABLE 7.3 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Sediment	Surface Sediment	Incidental Ingestion	bis(2-Ethylhexyl)phthalate	81	mg/kg	1.41E-05	mg/kg-day	1.40E-02	(mg/kg-day)$^{-1}$	1.98E-07	3.30E-05	mg/kg-day	2.00E-02	mg/kg-day	1.65E-03
33.42%				Benzo(a)anthracene	280	mg/kg	4.88E-05	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.57E-05	1.14E-04	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.92E-05	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.40E-04	4.48E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	99	mg/kg	1.73E-05	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.26E-05	4.03E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	89	mg/kg	1.55E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.62E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	42	mg/kg	7.33E-06	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	5.35E-07	1.71E-05	mg/kg-day	-	mg/kg-day	-
				Carbazole	47	mg/kg	8.20E-06	mg/kg-day	2.00E-02	(mg/kg-day)$^{-1}$	1.64E-07	1.91E-05	mg/kg-day	-	mg/kg-day	-
				Chrysene	600	mg/kg	1.05E-04	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	7.64E-07	2.44E-04	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	41	mg/kg	7.15E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	5.22E-05	1.67E-05	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	50	mg/kg	8.72E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	6.37E-06	2.04E-05	mg/kg-day	-	mg/kg-day	-
				Naphthalene	896	mg/kg	1.56E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.65E-04	mg/kg-day	2.00E-02	mg/kg-day	1.82E-02
				Phenanthrene	1,900	mg/kg	3.31E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.73E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	720	mg/kg	1.26E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.93E-04	mg/kg-day	3.00E-02	mg/kg-day	9.77E-03
				Dieldrin	0.12	mg/kg	2.09E-08	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	3.35E-07	4.88E-08	mg/kg-day	5.00E-05	mg/kg-day	9.77E-04
				Aluminum	25,100	mg/kg	4.38E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.02E-02	mg/kg-day	1.00E+00	mg/kg-day	1.02E-02
				Antimony	72	mg/kg	1.25E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.92E-05	mg/kg-day	4.00E-04	mg/kg-day	7.31E-02
				Arsenic	165	mg/kg	2.88E-05	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	4.32E-05	6.71E-05	mg/kg-day	3.00E-04	mg/kg-day	2.24E-01
				Cadmium	52	mg/kg	9.11E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.13E-05	mg/kg-day	1.00E-03	mg/kg-day	2.13E-02
				Chromium	622	mg/kg	1.09E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.53E-04	mg/kg-day	3.00E-03	mg/kg-day	8.44E-02
				Iron	85,000	mg/kg	1.48E-02	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.46E-02	mg/kg-day	-	mg/kg-day	-
				Lead	4,195	mg/kg	7.32E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.71E-03	mg/kg-day	-	mg/kg-day	-
				Manganese	907	mg/kg	1.58E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.69E-04	mg/kg-day	1.40E-01	mg/kg-day	2.64E-03
				Nickel	1,140	mg/kg	1.99E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.64E-04	mg/kg-day	2.00E-02	mg/kg-day	2.32E-02
				Zinc	3,305	mg/kg	5.77E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.35E-03	mg/kg-day	3.00E-01	mg/kg-day	4.48E-03
				Aroclor 1242	6.80	mg/kg	1.19E-06	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.37E-06	2.77E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	7.94	mg/kg	1.38E-06	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.77E-06	3.23E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	1.32	mg/kg	2.30E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	4.61E-07	5.37E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.98E-04					0.47
			Dermal Absorption	bis(2-Ethylhexyl)phthalate	81	mg/kg	5.64E-06	mg/kg-day	7.37E-02	(mg/kg-day)$^{-1}$	4.15E-07	1.32E-05	mg/kg-day	3.80E-03	mg/kg-day	3.46E-03
				Benzo(a)anthracene	280	mg/kg	2.53E-05	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	5.97E-05	5.91E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	9.95E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.34E-04	2.32E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	99	mg/kg	8.96E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	2.11E-05	2.09E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	89	mg/kg	8.05E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.88E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	42	mg/kg	3.80E-06	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	8.95E-07	8.87E-06	mg/kg-day	-	mg/kg-day	-
				Carbazole	47	mg/kg	3.27E-06	mg/kg-day	2.86E-02	(mg/kg-day)$^{-1}$	9.35E-08	7.63E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	600	mg/kg	5.43E-05	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	1.28E-06	1.27E-04	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	41	mg/kg	3.71E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	8.74E-05	8.66E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	50	mg/kg	4.52E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.07E-05	1.06E-05	mg/kg-day	-	mg/kg-day	-
				Naphthalene	896	mg/kg	8.11E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.89E-04	mg/kg-day	1.60E-02	mg/kg-day	1.18E-02
				Phenanthrene	1,900	mg/kg	1.72E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.01E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	720	mg/kg	6.51E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.52E-04	mg/kg-day	9.30E-03	mg/kg-day	1.63E-02
				Dieldrin	0.12	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Aluminum	25,100	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	72	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	165	mg/kg	3.44E-06	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.26E-05	8.03E-06	mg/kg-day	1.23E-04	mg/kg-day	6.53E-02
				Cadmium	52	mg/kg	3.63E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.48E-08	mg/kg-day	1.00E-05	mg/kg-day	8.48E-03
				Chromium	622	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	85,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	4,195	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-

TABLE 7.3 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Sediment	Surface Sediment	Dermal Absorption	Manganese	907	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Nickel	1,140	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.40E-03	mg/kg-day	
				Zinc	3,305	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-02	mg/kg-day	
				Aroclor 1242	6.80	mg/kg	6.63E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.47E-06	1.55E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	7.94	mg/kg	7.73E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.72E-06	1.80E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	1.32	mg/kg	1.29E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	2.86E-07	3.00E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								4.32E-04					0.11
		Exposure Point Total									7.30E-04					0.58
	Exposure Medium Total										7.30E-04					0.58
	Fish	Carp Fillet 25.0%	Ingestion	Acenaphthene	0.013	mg/kg	1.50E-06	mg/kg-day	-	(mg/kg-day)-1	-	3.51E-06	mg/kg-day	6.00E-02	mg/kg-day	5.85E-05
				Acenaphthylene	0.005	mg/kg	5.79E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.35E-06	mg/kg-day	-	mg/kg-day	-
				Anthracene	0.007	mg/kg	8.10E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	3.00E-01	mg/kg-day	6.30E-06
				Fluoranthene	0.004	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	4.00E-02	mg/kg-day	2.70E-05
				Fluorene	0.023	mg/kg	2.66E-06	mg/kg-day	-	(mg/kg-day)-1	-	6.21E-06	mg/kg-day	4.00E-02	mg/kg-day	1.55E-04
				1-Methylnaphthalene	0.007	mg/kg	8.10E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	0.008	mg/kg	9.26E-07	mg/kg-day	-	(mg/kg-day)-1	-	2.16E-06	mg/kg-day	4.00E-03	mg/kg-day	5.40E-04
				Phenanthrene	0.007	mg/kg	8.10E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	-	mg/kg-day	-
				Pyrene	0.006	mg/kg	6.94E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.62E-06	mg/kg-day	3.00E-02	mg/kg-day	5.40E-05
				Chlordane - alpha	0.024	mg/kg	2.78E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	9.72E-07	6.48E-06	mg/kg-day	5.00E-04	mg/kg-day	1.30E-02
				Chlordane - gamma	0.018	mg/kg	2.08E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	7.29E-07	4.86E-06	mg/kg-day	5.00E-04	mg/kg-day	9.72E-03
				o,p'-DDD	0.047	mg/kg	5.44E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	1.31E-06	1.27E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.20	mg/kg	2.28E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	5.47E-06	5.32E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.15	mg/kg	1.74E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	5.90E-06	4.05E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.035	mg/kg	4.05E-06	mg/kg-day	-	(mg/kg-day)-1	-	9.45E-06	mg/kg-day	-	mg/kg-day	-
				Chromium	0.52	mg/kg	5.97E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.39E-04	mg/kg-day	1.00E-03	mg/kg-day	1.39E-01
				Copper	3.19	mg/kg	3.69E-04	mg/kg-day	-	(mg/kg-day)-1	-	8.62E-04	mg/kg-day	4.00E-02	mg/kg-day	2.15E-02
				Iron	33	mg/kg	3.80E-03	mg/kg-day	-	(mg/kg-day)-1	-	8.87E-03	mg/kg-day	-	mg/kg-day	-
				Selenium	7.98	mg/kg	9.24E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.15E-03	mg/kg-day	5.00E-03	mg/kg-day	4.31E-01
				Zinc	122	mg/kg	1.41E-02	mg/kg-day	-	(mg/kg-day)-1	-	3.30E-02	mg/kg-day	3.00E-01	mg/kg-day	1.10E-01
				Dioxin TEQ	2.03E-05	mg/kg	2.35E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	3.53E-04	5.48E-09	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	0.68	mg/kg	7.84E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	1.57E-04	1.83E-04	mg/kg-day	2.00E-05	mg/kg-day	9.15E+00
			Exp. Route Total								5.24E-04					10
		Exposure Point Total									5.24E-04					10
		Chinook Fillet 25.0%	Ingestion	Acenaphthene	0.008	mg/kg	9.26E-07	mg/kg-day	-	(mg/kg-day)-1	-	2.16E-06	mg/kg-day	6.00E-02	mg/kg-day	3.60E-05
				Acenaphthylene	0.004	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	-	mg/kg-day	-
				Anthracene	0.004	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	3.00E-01	mg/kg-day	3.60E-06
				Fluoranthene	0.005	mg/kg	5.79E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.35E-06	mg/kg-day	4.00E-02	mg/kg-day	3.38E-05
				Fluorene	0.024	mg/kg	2.78E-06	mg/kg-day	-	(mg/kg-day)-1	-	6.48E-06	mg/kg-day	4.00E-02	mg/kg-day	1.62E-04
				1-Methylnaphthalene	0.005	mg/kg	5.79E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.35E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	0.004	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	4.00E-03	mg/kg-day	2.70E-04
				Phenanthrene	0.017	mg/kg	1.97E-06	mg/kg-day	-	(mg/kg-day)-1	-	4.59E-06	mg/kg-day	-	mg/kg-day	-
				Chlordane - alpha	0.056	mg/kg	6.48E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	2.27E-06	1.51E-05	mg/kg-day	5.00E-04	mg/kg-day	3.02E-02
				Chlordane - gamma	0.041	mg/kg	4.74E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	1.66E-06	1.11E-05	mg/kg-day	5.00E-04	mg/kg-day	2.21E-02
				p,p'-DDD	0.13	mg/kg	1.55E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	3.72E-06	3.62E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	2.82	mg/kg	3.27E-04	mg/kg-day	3.40E-01	(mg/kg-day)-1	1.11E-04	7.62E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDT	0.17	mg/kg	1.98E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	6.73E-06	4.62E-05	mg/kg-day	5.00E-04	mg/kg-day	9.23E-02
				Dieldrin	0.027	mg/kg	3.12E-06	mg/kg-day	1.60E+01	(mg/kg-day)-1	5.00E-05	7.29E-06	mg/kg-day	5.00E-05	mg/kg-day	1.46E-01
				cis-Nonachlor	0.16	mg/kg	1.82E-05	mg/kg-day	-	(mg/kg-day)-1	-	4.24E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.25	mg/kg	2.89E-05	mg/kg-day	-	(mg/kg-day)-1	-	6.75E-05	mg/kg-day	-	mg/kg-day	-

TABLE 7.3 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Fish	Chinook Fillet	Ingestion	Chromium	0.60	mg/kg	6.97E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.63E-04	mg/kg-day	1.00E-03	mg/kg-day	1.63E-01
				Copper	3.52	mg/kg	4.07E-04	mg/kg-day	-	(mg/kg-day)-1	-	9.50E-04	mg/kg-day	4.00E-02	mg/kg-day	2.38E-02
				Iron	34	mg/kg	3.96E-03	mg/kg-day	-	(mg/kg-day)-1	-	9.25E-03	mg/kg-day	-	mg/kg-day	-
				Mercury	1.11	mg/kg	1.29E-04	mg/kg-day	-	(mg/kg-day)-1	-	3.00E-04	mg/kg-day	4.00E-02	mg/kg-day	7.50E-03
				Selenium	3.10	mg/kg	3.59E-04	mg/kg-day	-	(mg/kg-day)-1	-	8.38E-04	mg/kg-day	5.00E-03	mg/kg-day	1.68E-01
				Zinc	25.46	mg/kg	2.95E-03	mg/kg-day	-	(mg/kg-day)-1	-	6.88E-03	mg/kg-day	3.00E-01	mg/kg-day	2.29E-02
				Dioxin TEQ	5.98E-05	mg/kg	6.92E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	1.04E-03	1.62E-08	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	0.90	mg/kg	1.04E-04	mg/kg-day	2.00E+00	(mg/kg-day)-1	2.08E-04	2.42E-04	mg/kg-day	2.00E-05	mg/kg-day	1.21E+01
			Exp. Route Total								1.42E-03					13
		Exposure Point Total									1.42E-03					13
		Goldfish Fillet 25.0%	Ingestion	Bis(2-ethylhexyl)phthalate	5.61	mg/kg	6.49E-04	mg/kg-day	1.40E-02	(mg/kg-day)-1	9.09E-06	1.52E-03	mg/kg-day	2.00E-02	mg/kg-day	7.58E-02
				Fluorene	0.007	mg/kg	8.10E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	4.00E-02	mg/kg-day	4.73E-05
				1-Methylnaphthalene	0.006	mg/kg	6.94E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.62E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	0.007	mg/kg	8.10E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	4.00E-03	mg/kg-day	4.73E-04
				Naphthalene	0.006	mg/kg	6.94E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.62E-06	mg/kg-day	2.00E-02	mg/kg-day	8.10E-05
				Chlordane - alpha	0.032	mg/kg	3.70E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	1.30E-06	8.64E-06	mg/kg-day	5.00E-04	mg/kg-day	1.73E-02
				Chlordane - gamma	0.019	mg/kg	2.20E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	7.70E-07	5.13E-06	mg/kg-day	5.00E-04	mg/kg-day	1.03E-02
				o,p'-DDD	0.031	mg/kg	3.59E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	8.61E-07	8.37E-06	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.15	mg/kg	1.77E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	4.25E-06	4.13E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.18	mg/kg	2.07E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	7.04E-06	4.83E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.04	mg/kg	4.28E-06	mg/kg-day	-	(mg/kg-day)-1	-	9.99E-06	mg/kg-day	-	mg/kg-day	-
				Chromium	0.51	mg/kg	5.90E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.38E-04	mg/kg-day	1.00E-03	mg/kg-day	1.38E-01
				Copper	2.55	mg/kg	2.95E-04	mg/kg-day	-	(mg/kg-day)-1	-	6.89E-04	mg/kg-day	4.00E-02	mg/kg-day	1.72E-02
				Iron	56	mg/kg	6.49E-03	mg/kg-day	-	(mg/kg-day)-1	-	1.52E-02	mg/kg-day	-	mg/kg-day	-
				Lead	0.61	mg/kg	7.08E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.65E-04	mg/kg-day	-	mg/kg-day	-
				Selenium	5.61	mg/kg	6.49E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.52E-03	mg/kg-day	5.00E-03	mg/kg-day	3.03E-01
				Zinc	133	mg/kg	1.53E-02	mg/kg-day	-	(mg/kg-day)-1	-	3.58E-02	mg/kg-day	3.00E-01	mg/kg-day	1.19E-01
				Dioxin TEQ	2.15E-05	mg/kg	2.48E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	3.72E-04	5.79E-09	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	0.79	mg/kg	9.14E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	1.83E-04	2.13E-04	mg/kg-day	2.00E-05	mg/kg-day	1.07E+01
			Exp. Route Total								5.79E-04					11
		Exposure Point Total									5.79E-04					11
		Steelhead Fillet 25.0%	Ingestion	Acenaphthene	0.006	mg/kg	6.94E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.62E-06	mg/kg-day	6.00E-02	mg/kg-day	2.70E-05
				Anthracene	0.004	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	3.00E-01	mg/kg-day	3.60E-06
				Fluoranthene	0.004	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	4.00E-02	mg/kg-day	2.70E-05
				Fluorene	0.014	mg/kg	1.62E-06	mg/kg-day	-	(mg/kg-day)-1	-	3.78E-06	mg/kg-day	4.00E-02	mg/kg-day	9.45E-05
				1-Methylnaphthalene	0.004	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	0.013	mg/kg	1.50E-06	mg/kg-day	-	(mg/kg-day)-1	-	3.51E-06	mg/kg-day	-	mg/kg-day	-
				Chlordane - alpha	0.033	mg/kg	3.82E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	1.34E-06	8.91E-06	mg/kg-day	5.00E-04	mg/kg-day	1.78E-02
				Chlordane - gamma	0.020	mg/kg	2.31E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	8.10E-07	5.40E-06	mg/kg-day	5.00E-04	mg/kg-day	1.08E-02
				p,p'-DDD	0.082	mg/kg	9.49E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	2.28E-06	2.21E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	2.36	mg/kg	2.73E-04	mg/kg-day	3.40E-01	(mg/kg-day)-1	9.28E-05	6.37E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDT	0.13	mg/kg	1.48E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	5.04E-06	3.46E-05	mg/kg-day	5.00E-04	mg/kg-day	6.91E-02
				cis-Nonachlor	0.12	mg/kg	1.42E-05	mg/kg-day	-	(mg/kg-day)-1	-	3.32E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.17	mg/kg	1.96E-05	mg/kg-day	-	(mg/kg-day)-1	-	4.56E-05	mg/kg-day	-	mg/kg-day	-
				Chromium	0.77	mg/kg	8.90E-05	mg/kg-day	-	(mg/kg-day)-1	-	2.08E-04	mg/kg-day	1.00E-03	mg/kg-day	2.08E-01
				Copper	6.15	mg/kg	7.12E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.66E-03	mg/kg-day	4.00E-02	mg/kg-day	4.15E-02
				Iron	72	mg/kg	8.31E-03	mg/kg-day	-	(mg/kg-day)-1	-	1.94E-02	mg/kg-day	-	mg/kg-day	-
				Lead	0.49	mg/kg	5.64E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.31E-04	mg/kg-day	-	mg/kg-day	-
				Mercury	1.90	mg/kg	2.20E-04	mg/kg-day	-	(mg/kg-day)-1	-	5.12E-04	mg/kg-day	4.00E-02	mg/kg-day	1.28E-02

TABLE 7.3 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Fish	Steelhead Fillet	Ingestion	Selenium	3.18	mg/kg	3.68E-04	mg/kg-day	-	(mg/kg-day)-1	-	8.58E-04	mg/kg-day	5.00E-03	mg/kg-day	1.72E-01
				Zinc	35	mg/kg	4.09E-03	mg/kg-day	-	(mg/kg-day)-1	-	9.55E-03	mg/kg-day	3.00E-01	mg/kg-day	3.18E-02
				Dioxin TEQ	5.50E-05	mg/kg	6.36E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	9.54E-04	1.48E-08	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	0.67	mg/kg	7.77E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	1.55E-04	1.81E-04	mg/kg-day	2.00E-05	mg/kg-day	9.06E+00
			Exp. Route Total								1.21E-03					10
		Exposure Point Total									1.21E-03					10
	Exposure Medium Total - Weighted Sum of Risk Estimates										9.34E-04					11
Area Total											1.66E-03					11
Reach 2	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	172	mg/kg	3.00E-05	mg/kg-day	7.30E-01	(mg/kg-day)-1	2.19E-05	7.01E-05	mg/kg-day	-	mg/kg-day	-
47.22%				Benzo(a)pyrene	120	mg/kg	2.09E-05	mg/kg-day	7.30E+00	(mg/kg-day)-1	1.53E-04	4.88E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	34	mg/kg	5.93E-06	mg/kg-day	7.30E-01	(mg/kg-day)-1	4.33E-06	1.38E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	29	mg/kg	5.06E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.18E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11.16	mg/kg	1.95E-06	mg/kg-day	7.30E-02	(mg/kg-day)-1	1.42E-07	4.54E-06	mg/kg-day	-	mg/kg-day	-
				Carbazole	33	mg/kg	5.76E-06	mg/kg-day	2.00E-02	(mg/kg-day)-1	1.15E-07	1.34E-05	mg/kg-day	-	mg/kg-day	-
				Chrysene	326	mg/kg	5.69E-05	mg/kg-day	7.30E-03	(mg/kg-day)-1	4.15E-07	1.33E-04	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	15.77	mg/kg	2.75E-06	mg/kg-day	7.30E+00	(mg/kg-day)-1	2.01E-05	6.42E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	17.59	mg/kg	3.07E-06	mg/kg-day	7.30E-01	(mg/kg-day)-1	2.24E-06	7.16E-06	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	372	mg/kg	6.49E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.51E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	254	mg/kg	4.44E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.04E-04	mg/kg-day	3.00E-02	mg/kg-day	3.45E-03
				Total Chlordane	2.35	mg/kg	4.10E-07	mg/kg-day	-	(mg/kg-day)-1	-	9.57E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	8.84	mg/kg	1.54E-06	mg/kg-day	3.40E-01	(mg/kg-day)-1	5.24E-07	3.60E-06	mg/kg-day	-	mg/kg-day	-
				Total DDT	10.30	mg/kg	1.80E-06	mg/kg-day	3.40E-01	(mg/kg-day)-1	6.11E-07	4.19E-06	mg/kg-day	5.00E-04	mg/kg-day	8.39E-03
				Dieldrin	4.25	mg/kg	7.41E-07	mg/kg-day	1.60E+01	(mg/kg-day)-1	1.19E-05	1.73E-06	mg/kg-day	5.00E-05	mg/kg-day	3.46E-02
				gamma-BHC (Lindane)	3.16	mg/kg	5.51E-07	mg/kg-day	1.30E+00	(mg/kg-day)-1	7.17E-07	1.29E-06	mg/kg-day	3.00E-04	mg/kg-day	4.29E-03
				Heptachlor	4.61	mg/kg	8.04E-07	mg/kg-day	4.50E+00	(mg/kg-day)-1	3.62E-06	1.88E-06	mg/kg-day	5.00E-04	mg/kg-day	3.75E-03
				Hexachlorocyclohexane-all isomers	3.16	mg/kg	5.51E-07	mg/kg-day	1.80E+00	(mg/kg-day)-1	9.92E-07	1.29E-06	mg/kg-day	-	mg/kg-day	-
				Toxaphene		mg/kg		mg/kg-day	1.10E+00	(mg/kg-day)-1			mg/kg-day	-	mg/kg-day	-
				Aluminum	10,507	mg/kg	1.83E-03	mg/kg-day	-	(mg/kg-day)-1	-	4.28E-03	mg/kg-day	1.00E+00	mg/kg-day	4.28E-03
				Antimony	47	mg/kg	8.27E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.93E-05	mg/kg-day	4.00E-04	mg/kg-day	4.82E-02
				Arsenic	180	mg/kg	3.14E-05	mg/kg-day	1.50E+00	(mg/kg-day)-1	4.71E-05	7.33E-05	mg/kg-day	3.00E-04	mg/kg-day	2.44E-01
				Cadmium	74	mg/kg	1.29E-05	mg/kg-day	-	(mg/kg-day)-1	-	3.01E-05	mg/kg-day	1.00E-03	mg/kg-day	3.01E-02
				Chromium	620	mg/kg	1.08E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.52E-04	mg/kg-day	3.00E-03	mg/kg-day	8.41E-02
				Iron	186,911	mg/kg	3.26E-02	mg/kg-day	-	(mg/kg-day)-1	-	7.61E-02	mg/kg-day	-	mg/kg-day	-
				Lead	3,201	mg/kg	5.58E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.30E-03	mg/kg-day	-	mg/kg-day	-
				Manganese	1,113	mg/kg	1.94E-04	mg/kg-day	-	(mg/kg-day)-1	-	4.53E-04	mg/kg-day	1.40E-01	mg/kg-day	3.24E-03
				Mercury	7.20	mg/kg	1.26E-06	mg/kg-day	-	(mg/kg-day)-1	-	2.93E-06	mg/kg-day	4.00E-02	mg/kg-day	7.33E-05
				Zinc	8,436	mg/kg	1.47E-03	mg/kg-day	-	(mg/kg-day)-1	-	3.43E-03	mg/kg-day	3.00E-01	mg/kg-day	1.14E-02
				2,3,7,8-Dibenzo-p-dioxin	6.00E-06	mg/kg	1.05E-12	mg/kg-day	1.50E+05	(mg/kg-day)-1	1.57E-07	2.44E-12	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	10.40	mg/kg	1.81E-06	mg/kg-day	2.00E+00	(mg/kg-day)-1	3.63E-06	4.23E-06	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.71E-04					0.48
			Dermal Absorption	Benzo(a)anthracene	172	mg/kg	1.56E-05	mg/kg-day	2.35E+00	(mg/kg-day)-1	3.67E-05	3.63E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	120	mg/kg	1.08E-05	mg/kg-day	2.35E+01	(mg/kg-day)-1	2.55E-04	2.53E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	34	mg/kg	3.08E-06	mg/kg-day	2.35E+00	(mg/kg-day)-1	7.24E-06	7.18E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	29	mg/kg	2.62E-06	mg/kg-day	-	(mg/kg-day)-1	-	6.12E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11.16	mg/kg	1.01E-06	mg/kg-day	2.35E-01	(mg/kg-day)-1	2.38E-07	2.36E-06	mg/kg-day	-	mg/kg-day	-
				Carbazole	33	mg/kg	2.30E-06	mg/kg-day	2.86E-02	(mg/kg-day)-1	6.56E-08	5.36E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	326	mg/kg	2.95E-05	mg/kg-day	2.35E-02	(mg/kg-day)-1	6.95E-07	6.88E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	15.77	mg/kg	1.43E-06	mg/kg-day	2.35E+01	(mg/kg-day)-1	3.36E-05	3.33E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	17.59	mg/kg	1.59E-06	mg/kg-day	2.35E+00	(mg/kg-day)-1	3.75E-06	3.71E-06	mg/kg-day	-	mg/kg-day	-

TABLE 7.3 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 2	Sediment	Surface Sediment	Dermal Absorption	Phenanthrene	372	mg/kg	3.37E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.86E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	254	mg/kg	2.30E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.37E-05	mg/kg-day	9.30E-03	mg/kg-day	5.78E-03
				Total Chlordane	2.35	mg/kg	6.54E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.53E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	8.84	mg/kg	1.85E-07	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	8.97E-08	4.31E-07	mg/kg-day	-	mg/kg-day	-
				Total DDT	10.30	mg/kg	2.15E-07	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	1.04E-07	5.02E-07	mg/kg-day	3.50E-04	mg/kg-day	1.43E-03
				Dieldrin	4.25	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				gamma-BHC (Lindane)	3.16	mg/kg	8.80E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.05E-07	mg/kg-day	2.91E-04	mg/kg-day	7.05E-04
				Heptachlor	4.61	mg/kg	3.21E-08	mg/kg-day	6.25E+00	(mg/kg-day)$^{-1}$	2.01E-07	7.49E-08	mg/kg-day	3.60E-04	mg/kg-day	2.08E-04
				Hexachlorocyclohexane-all isomers	3.16	mg/kg	8.80E-08	mg/kg-day	1.86E+00	(mg/kg-day)$^{-1}$	1.63E-07	2.05E-07	mg/kg-day	-	mg/kg-day	-
				Toxaphene		mg/kg		mg/kg-day	2.20E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Aluminum	10,507	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	47	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	180	mg/kg	3.76E-06	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.38E-05	8.77E-06	mg/kg-day	1.23E-04	mg/kg-day	7.13E-02
				Cadmium	74	mg/kg	5.14E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.20E-07	mg/kg-day	1.00E-05	mg/kg-day	1.20E-02
				Chromium	620	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	186,911	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	3,201	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	1,113	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	7.20	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Zinc	8,436	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-02	mg/kg-day	
				2,3,7,8-Dibenzo-p-dioxin	6.00E-06	mg/kg	4.18E-15	mg/kg-day	3.00E+05	(mg/kg-day)$^{-1}$	1.25E-09	9.74E-15	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	10.40	mg/kg	1.01E-06	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	2.25E-06	2.36E-06	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.54E-04					0.09
		Exposure Point Total									6.25E-04					0.57
	Exposure Medium Total										6.25E-04					0.57
	Fish	Chinook Fillet 50.0%	Ingestion	Acenaphthene	0.012	mg/kg	1.39E-06	mg/kg-day	-	(mg/kg-day)-1	-	3.24E-06	mg/kg-day	6.00E-02	mg/kg-day	5.40E-05
				Anthracene	0.004	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	3.00E-01	mg/kg-day	3.60E-06
				Fluoranthene	0.005	mg/kg	5.79E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.35E-06	mg/kg-day	4.00E-02	mg/kg-day	3.38E-05
				Fluorene	0.016	mg/kg	1.85E-06	mg/kg-day	-	(mg/kg-day)-1	-	4.32E-06	mg/kg-day	4.00E-02	mg/kg-day	1.08E-04
				1-Methylnaphthalene	0.004	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	0.015	mg/kg	1.74E-06	mg/kg-day	-	(mg/kg-day)-1	-	4.05E-06	mg/kg-day	-	mg/kg-day	-
				Chlordane - alpha	0.057	mg/kg	6.60E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	2.31E-06	1.54E-05	mg/kg-day	5.00E-04	mg/kg-day	3.08E-02
				o,p'-DDD	0.050	mg/kg	5.79E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	1.39E-06	1.35E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.20	mg/kg	2.36E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	5.67E-06	5.51E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	2.09	mg/kg	2.41E-04	mg/kg-day	3.40E-01	(mg/kg-day)-1	8.21E-05	5.63E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDT	0.13	mg/kg	1.52E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	5.15E-06	3.54E-05	mg/kg-day	5.00E-04	mg/kg-day	7.07E-02
				Dieldrin	0.02	mg/kg	2.31E-06	mg/kg-day	1.60E+01	(mg/kg-day)-1	3.70E-05	5.40E-06	mg/kg-day	5.00E-05	mg/kg-day	1.08E-01
				cis-Nonachlor	0.12	mg/kg	1.35E-05	mg/kg-day	-	(mg/kg-day)-1	-	3.16E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.19	mg/kg	2.24E-05	mg/kg-day	-	(mg/kg-day)-1	-	5.24E-05	mg/kg-day	-	mg/kg-day	-
				Aluminum	61	mg/kg	7.09E-03	mg/kg-day	-	(mg/kg-day)-1	-	1.65E-02	mg/kg-day	1.00E+00	mg/kg-day	1.65E-02
				Chromium	1.51	mg/kg	1.75E-04	mg/kg-day	-	(mg/kg-day)-1	-	4.07E-04	mg/kg-day	1.00E-03	mg/kg-day	4.07E-01
				Copper	10.61	mg/kg	1.23E-03	mg/kg-day	-	(mg/kg-day)-1	-	2.86E-03	mg/kg-day	4.00E-02	mg/kg-day	7.16E-02
				Iron	236	mg/kg	2.74E-02	mg/kg-day	-	(mg/kg-day)-1	-	6.39E-02	mg/kg-day	-	mg/kg-day	-
				Lead	3.28	mg/kg	3.79E-04	mg/kg-day	-	(mg/kg-day)-1	-	8.85E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	5.79	mg/kg	6.70E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.56E-03	mg/kg-day	1.40E-01	mg/kg-day	1.12E-02
				Mercury	1.12	mg/kg	1.29E-04	mg/kg-day	-	(mg/kg-day)-1	-	3.02E-04	mg/kg-day	4.00E-02	mg/kg-day	7.54E-03
				Selenium	3.84	mg/kg	4.44E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.04E-03	mg/kg-day	5.00E-03	mg/kg-day	2.07E-01
				Zinc	180	mg/kg	2.08E-02	mg/kg-day	-	(mg/kg-day)-1	-	4.85E-02	mg/kg-day	3.00E-01	mg/kg-day	1.62E-01
				Dioxin TEQ	4.95E-05	mg/kg	5.73E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	8.59E-04	1.34E-08	mg/kg-day	-	mg/kg-day	-

TABLE 7.3 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 2	Fish	Chinook Fillet	Ingestion	Nondioxin-like PCBs	0.84	mg/kg	9.77E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	1.95E-04	2.28E-04	mg/kg-day	2.00E-05	mg/kg-day	1.14E+01
			Exp. Route Total								1.19E-03					12
		Exposure Point Total									1.19E-03					12
		Goldfish Fillet 50.0%	Ingestion	Acenaphthene	0.005	mg/kg	5.79E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.35E-06	mg/kg-day	6.00E-02	mg/kg-day	2.25E-05
				Anthracene	0.007	mg/kg	8.10E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	3.00E-01	mg/kg-day	6.30E-06
				Fluorene	0.018	mg/kg	2.08E-06	mg/kg-day	-	(mg/kg-day)-1	-	4.86E-06	mg/kg-day	4.00E-02	mg/kg-day	1.22E-04
				1-Methylnaphthalene	0.008	mg/kg	9.26E-07	mg/kg-day	-	(mg/kg-day)-1	-	2.16E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	0.011	mg/kg	1.27E-06	mg/kg-day	-	(mg/kg-day)-1	-	2.97E-06	mg/kg-day	4.00E-03	mg/kg-day	7.43E-04
				Chlordane - alpha	0.030	mg/kg	3.47E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	1.22E-06	8.10E-06	mg/kg-day	5.00E-04	mg/kg-day	1.62E-02
				Chlordane - gamma	0.024	mg/kg	2.78E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	9.72E-07	6.48E-06	mg/kg-day	5.00E-04	mg/kg-day	1.30E-02
				o,p'-DDD	0.11	mg/kg	1.23E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	2.94E-06	2.86E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.53	mg/kg	6.11E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	1.47E-05	1.43E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.14	mg/kg	1.63E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	5.55E-06	3.81E-05	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.018	mg/kg	2.08E-06	mg/kg-day	1.60E+01	(mg/kg-day)-1	3.33E-05	4.86E-06	mg/kg-day	5.00E-05	mg/kg-day	9.72E-02
				gamma-BHC (Lindane)	0.013	mg/kg	1.50E-06	mg/kg-day	1.30E+00	(mg/kg-day)-1	1.96E-06	3.51E-06	mg/kg-day	3.00E-04	mg/kg-day	1.17E-02
				Trans nonachlor	0.035	mg/kg	4.05E-06	mg/kg-day	-	(mg/kg-day)-1	-	9.45E-06	mg/kg-day	-	mg/kg-day	-
				Iron	35	mg/kg	4.07E-03	mg/kg-day	-	(mg/kg-day)-1	-	9.51E-03	mg/kg-day	-	mg/kg-day	-
				Chromium	0.39	mg/kg	4.48E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.04E-04	mg/kg-day	1.00E-03	mg/kg-day	1.04E-01
				Copper	2.01	mg/kg	2.32E-04	mg/kg-day	-	(mg/kg-day)-1	-	5.42E-04	mg/kg-day	4.00E-02	mg/kg-day	1.35E-02
				Selenium	4.23	mg/kg	4.89E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.14E-03	mg/kg-day	5.00E-03	mg/kg-day	2.28E-01
				Zinc	106	mg/kg	1.22E-02	mg/kg-day	-	(mg/kg-day)-1	-	2.85E-02	mg/kg-day	3.00E-01	mg/kg-day	9.51E-02
				Dioxin TEQ	2.20E-05	mg/kg	2.54E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	3.82E-04	5.94E-09	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	0.84	mg/kg	9.75E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	1.95E-04	2.27E-04	mg/kg-day	2.00E-05	mg/kg-day	1.14E+01
			Exp. Route Total								6.37E-04					12
		Exposure Point Total									6.37E-04					12
	Exposure Medium Total - Weighted Sum of Risk Estimates										9.13E-04					12
Area Total											1.54E-03					13
Reach 6 8.39%	Sediment	Surface Sediment	Incidental Ingestion	Benzene	44	mg/kg	7.68E-06	mg/kg-day	5.50E-02	(mg/kg-day)$^{-1}$	4.22E-07	1.79E-05	mg/kg-day	4.00E-03	mg/kg-day	4.48E-03
				Acenaphthene	1,400	mg/kg	2.44E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.70E-04	mg/kg-day	6.00E-02	mg/kg-day	9.50E-03
				Benzo(a)anthracene	197	mg/kg	3.43E-05	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.51E-05	8.01E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	128	mg/kg	2.23E-05	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.63E-04	5.21E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	22	mg/kg	3.84E-06	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	2.80E-07	8.95E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	195	mg/kg	3.40E-05	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	2.48E-07	7.94E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	7.20	mg/kg	1.26E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	9.17E-06	2.93E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	23	mg/kg	4.01E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.93E-06	9.36E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	3,400	mg/kg	5.93E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.38E-03	mg/kg-day	4.00E-03	mg/kg-day	3.46E-01
				Naphthalene	3,800	mg/kg	6.63E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.55E-03	mg/kg-day	2.00E-02	mg/kg-day	7.73E-02
				Phenanthrene	1,900	mg/kg	3.31E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.73E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	638	mg/kg	1.11E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.60E-04	mg/kg-day	3.00E-02	mg/kg-day	8.66E-03
				Aluminum	13,000	mg/kg	2.27E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.29E-03	mg/kg-day	1.00E+00	mg/kg-day	5.29E-03
				Antimony	69	mg/kg	1.20E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.81E-05	mg/kg-day	4.00E-04	mg/kg-day	7.02E-02
				Arsenic	40	mg/kg	7.03E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	1.05E-05	1.64E-05	mg/kg-day	3.00E-04	mg/kg-day	5.47E-02
				Cadmium	34	mg/kg	5.94E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.39E-05	mg/kg-day	1.00E-03	mg/kg-day	1.39E-02
				Chromium	228	mg/kg	3.97E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.27E-05	mg/kg-day	3.00E-03	mg/kg-day	3.09E-02
				Iron	160,000	mg/kg	2.79E-02	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.51E-02	mg/kg-day	-	mg/kg-day	-
				Lead	1,523	mg/kg	2.66E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.20E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	980	mg/kg	1.71E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.99E-04	mg/kg-day	1.40E-01	mg/kg-day	2.85E-03
			Exp. Route Total								2.12E-04					0.62

TABLE 7.3 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 6	Sediment	Surface Sediment	Dermal Absorption	Benzene	44	mg/kg		mg/kg-day	5.67E-02	(mg/kg-day)$^{-1}$			mg/kg-day	3.88E-03	mg/kg-day	
				Acenaphthene	1,400	mg/kg	1.27E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.96E-04	mg/kg-day	1.86E-02	mg/kg-day	1.59E-02
				Benzo(a)anthracene	197	mg/kg	1.78E-05	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.19E-05	4.15E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	128	mg/kg	1.16E-05	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.73E-04	2.70E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	22	mg/kg	1.99E-06	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	4.69E-07	4.64E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	195	mg/kg	1.76E-05	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	4.15E-07	4.12E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	7.20	mg/kg	6.51E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.53E-05	1.52E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	23	mg/kg	2.08E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.90E-06	4.86E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	3,400	mg/kg	3.08E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.18E-04	mg/kg-day	3.20E-03	mg/kg-day	2.24E-01
				Naphthalene	3,800	mg/kg	3.44E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.02E-04	mg/kg-day	1.60E-02	mg/kg-day	5.01E-02
				Phenanthrene	1,900	mg/kg	1.72E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.01E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	638	mg/kg	5.77E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.35E-04	mg/kg-day	9.30E-03	mg/kg-day	1.45E-02
				Aluminum	13,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	69	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	40	mg/kg	8.41E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	3.08E-06	1.96E-06	mg/kg-day	1.23E-04	mg/kg-day	1.60E-02
				Cadmium	34	mg/kg	2.37E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.53E-08	mg/kg-day	1.00E-05	mg/kg-day	5.53E-03
				Chromium	228	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	160,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	1,523	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	980	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
			Exp. Route Total								3.39E-04					0.33
		Exposure Point Total									5.50E-04					0.95
	Exposure Medium Total										5.50E-04					0.95
	Fish	Carp Fillet 100.0%	Ingestion	Acenaphthene	1.59	mg/kg	1.83E-04	mg/kg-day	-	(mg/kg-day)-1	-	4.28E-04	mg/kg-day	6.00E-02	mg/kg-day	7.13E-03
				Acenaphthylene	0.042	mg/kg	4.86E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.13E-05	mg/kg-day	-	mg/kg-day	-
				Anthracene	0.062	mg/kg	7.17E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.67E-05	mg/kg-day	3.00E-01	mg/kg-day	5.58E-05
				Benzo(a)anthracene	0.006	mg/kg	6.94E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	5.07E-07	1.62E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	0.004	mg/kg	4.63E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	3.38E-07	1.08E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	0.009	mg/kg	1.04E-06	mg/kg-day	7.30E-03	(mg/kg-day)-1	7.60E-09	2.43E-06	mg/kg-day	-	mg/kg-day	-
				Fluoranthene	0.21	mg/kg	2.45E-05	mg/kg-day	-	(mg/kg-day)-1	-	5.72E-05	mg/kg-day	4.00E-02	mg/kg-day	1.43E-03
				Fluorene	0.47	mg/kg	5.39E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.26E-04	mg/kg-day	4.00E-02	mg/kg-day	3.15E-03
				1-Methylnaphthalene	0.72	mg/kg	8.33E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.94E-04	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	1.00	mg/kg	1.16E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.71E-04	mg/kg-day	4.00E-03	mg/kg-day	6.76E-02
				Naphthalene	1.12	mg/kg	1.29E-04	mg/kg-day	-	(mg/kg-day)-1	-	3.02E-04	mg/kg-day	2.00E-02	mg/kg-day	1.51E-02
				Phenanthrene	0.42	mg/kg	4.86E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.13E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	0.35	mg/kg	4.05E-05	mg/kg-day	-	(mg/kg-day)-1	-	9.45E-05	mg/kg-day	3.00E-02	mg/kg-day	3.15E-03
				Chlordane - alpha	0.15	mg/kg	1.70E-05	mg/kg-day	3.50E-01	(mg/kg-day)-1	5.95E-06	3.97E-05	mg/kg-day	5.00E-04	mg/kg-day	7.94E-02
				Chlordane - gamma	0.12	mg/kg	1.35E-05	mg/kg-day	3.50E-01	(mg/kg-day)-1	4.74E-06	3.16E-05	mg/kg-day	5.00E-04	mg/kg-day	6.32E-02
				o,p'-DDD	0.14	mg/kg	1.56E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	3.75E-06	3.65E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.51	mg/kg	5.92E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	1.42E-05	1.38E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.37	mg/kg	4.32E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	1.47E-05	1.01E-04	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.070	mg/kg	8.10E-06	mg/kg-day	1.60E+01	(mg/kg-day)-1	1.30E-04	1.89E-05	mg/kg-day	5.00E-05	mg/kg-day	3.78E-01
				cis-Nonachlor	0.035	mg/kg	4.05E-06	mg/kg-day	-	(mg/kg-day)-1	-	9.45E-06	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.075	mg/kg	8.68E-06	mg/kg-day	-	(mg/kg-day)-1	-	2.03E-05	mg/kg-day	-	mg/kg-day	-
				Aluminum	25	mg/kg	2.93E-03	mg/kg-day	-	(mg/kg-day)-1	-	6.84E-03	mg/kg-day	1.00E+00	mg/kg-day	6.84E-03
				Chromium	1.19	mg/kg	1.37E-04	mg/kg-day	-	(mg/kg-day)-1	-	3.20E-04	mg/kg-day	1.00E-03	mg/kg-day	3.20E-01
				Copper	5.39	mg/kg	6.24E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.46E-03	mg/kg-day	4.00E-02	mg/kg-day	3.64E-02
				Iron	221	mg/kg	2.56E-02	mg/kg-day	-	(mg/kg-day)-1	-	5.97E-02	mg/kg-day	-	mg/kg-day	-
				Lead	2.70	mg/kg	3.12E-04	mg/kg-day	-	(mg/kg-day)-1	-	7.28E-04	mg/kg-day	-	mg/kg-day	-

TABLE 7.3 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 6	Fish	Carp Fillet	Ingestion	Selenium	2.70	mg/kg	3.12E-04	mg/kg-day	-	(mg/kg-day)-1	-	7.28E-04	mg/kg-day	5.00E-03	mg/kg-day	1.46E-01
				Zinc	216	mg/kg	2.50E-02	mg/kg-day	-	(mg/kg-day)-1	-	5.82E-02	mg/kg-day	3.00E-01	mg/kg-day	1.94E-01
				Dioxin TEQ	6.00E-05	mg/kg	6.95E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	1.04E-03	1.62E-08	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	2.98	mg/kg	3.44E-04	mg/kg-day	2.00E+00	(mg/kg-day)-1	6.89E-04	8.04E-04	mg/kg-day	2.00E-05	mg/kg-day	4.02E+01
			Exp. Route Total								1.90E-03					42
		Exposure Point Total									1.90E-03					42
	Exposure Medium Total - Weighted Sum of Risk Estimates										1.90E-03					42
Area Total											2.46E-03					42
Reach 7	Sediment	Surface Sediment	Incidental Ingestion	Benzene	25	mg/kg	4.36E-06	mg/kg-day	5.50E-02	(mg/kg-day)-1	2.40E-07	1.02E-05	mg/kg-day	4.00E-03	mg/kg-day	2.54E-03
10.98%				Benzo(a)anthracene	66	mg/kg	1.15E-05	mg/kg-day	7.30E-01	(mg/kg-day)-1	8.40E-06	2.69E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.91E-05	mg/kg-day	7.30E+00	(mg/kg-day)-1	1.39E-04	4.46E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	7.50	mg/kg	1.31E-06	mg/kg-day	7.30E-01	(mg/kg-day)-1	9.55E-07	3.05E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.50	mg/kg	1.13E-06	mg/kg-day	-	(mg/kg-day)-1	-	2.65E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	14	mg/kg	2.44E-06	mg/kg-day	7.30E-02	(mg/kg-day)-1	1.78E-07	5.70E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	1.19E-05	mg/kg-day	7.30E-03	(mg/kg-day)-1	8.66E-08	2.77E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	2.20	mg/kg	3.84E-07	mg/kg-day	7.30E+00	(mg/kg-day)-1	2.80E-06	8.95E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.70	mg/kg	8.20E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	5.99E-07	1.91E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	630	mg/kg	1.10E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.56E-04	mg/kg-day	4.00E-03	mg/kg-day	6.41E-02
				Naphthalene	820	mg/kg	1.43E-04	mg/kg-day	-	(mg/kg-day)-1	-	3.34E-04	mg/kg-day	2.00E-02	mg/kg-day	1.67E-02
				Phenanthrene	440	mg/kg	7.68E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.79E-04	mg/kg-day	-	mg/kg-day	-
				Total Chlordane	2.14	mg/kg	3.73E-07	mg/kg-day	-	(mg/kg-day)-1	-	8.71E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	6.80	mg/kg	1.19E-06	mg/kg-day	3.40E-01	(mg/kg-day)-1	4.03E-07	2.77E-06	mg/kg-day	-	mg/kg-day	-
				Total DDT	2.80	mg/kg	4.88E-07	mg/kg-day	3.40E-01	(mg/kg-day)-1	1.66E-07	1.14E-06	mg/kg-day	5.00E-04	mg/kg-day	2.28E-03
				Dieldrin	2.83	mg/kg	4.94E-07	mg/kg-day	1.60E+01	(mg/kg-day)-1	7.90E-06	1.15E-06	mg/kg-day	5.00E-05	mg/kg-day	2.30E-02
				Heptachlor	0.19	mg/kg	3.31E-08	mg/kg-day	4.50E+00	(mg/kg-day)-1	1.49E-07	7.73E-08	mg/kg-day	5.00E-04	mg/kg-day	1.55E-04
				Toxaphene	2.05	mg/kg	3.58E-07	mg/kg-day	1.10E+00	(mg/kg-day)-1	3.93E-07	8.34E-07	mg/kg-day	-	mg/kg-day	-
				Arsenic	24	mg/kg	4.19E-06	mg/kg-day	1.50E+00	(mg/kg-day)-1	6.28E-06	9.77E-06	mg/kg-day	3.00E-04	mg/kg-day	3.26E-02
				Cadmium	18	mg/kg	3.14E-06	mg/kg-day	-	(mg/kg-day)-1	-	7.33E-06	mg/kg-day	1.00E-03	mg/kg-day	7.33E-03
				Lead	1,306	mg/kg	2.28E-04	mg/kg-day	-	(mg/kg-day)-1	-	5.32E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	614	mg/kg	1.07E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.50E-04	mg/kg-day	1.40E-01	mg/kg-day	1.79E-03
				Mercury	6.30	mg/kg	1.10E-06	mg/kg-day	-	(mg/kg-day)-1	-	2.56E-06	mg/kg-day	4.00E-02	mg/kg-day	6.41E-05
				Aroclor 1248	14	mg/kg	2.38E-06	mg/kg-day	2.00E+00	(mg/kg-day)-1	4.76E-06	5.56E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.36	mg/kg	6.28E-08	mg/kg-day	2.00E+00	(mg/kg-day)-1	1.26E-07	1.47E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.73E-04					0.15
			Dermal Absorption	Benzene	25	mg/kg		mg/kg-day	5.67E-02	(mg/kg-day)-1			mg/kg-day	3.88E-03	mg/kg-day	
				Benzo(a)anthracene	66	mg/kg	5.97E-06	mg/kg-day	2.35E+00	(mg/kg-day)-1	1.41E-05	1.39E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	9.91E-06	mg/kg-day	2.35E+01	(mg/kg-day)-1	2.33E-04	2.31E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	7.50	mg/kg	6.79E-07	mg/kg-day	2.35E+00	(mg/kg-day)-1	1.60E-06	1.58E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.50	mg/kg	5.88E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.37E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	14	mg/kg	1.27E-06	mg/kg-day	2.35E-01	(mg/kg-day)-1	2.98E-07	2.96E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	6.15E-06	mg/kg-day	2.35E-02	(mg/kg-day)-1	1.45E-07	1.44E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	2.20	mg/kg	1.99E-07	mg/kg-day	2.35E+01	(mg/kg-day)-1	4.69E-06	4.64E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.70	mg/kg	4.25E-07	mg/kg-day	2.35E+00	(mg/kg-day)-1	1.00E-06	9.92E-07	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	630	mg/kg	5.70E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.33E-04	mg/kg-day	3.20E-03	mg/kg-day	4.16E-02
				Naphthalene	820	mg/kg	7.42E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.73E-04	mg/kg-day	1.60E-02	mg/kg-day	1.08E-02
				Phenanthrene	440	mg/kg	3.98E-05	mg/kg-day	-	(mg/kg-day)-1	-	9.29E-05	mg/kg-day	-	mg/kg-day	-
				Total Chlordane	2.14	mg/kg	5.96E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.39E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	6.80	mg/kg	1.42E-07	mg/kg-day	4.86E-01	(mg/kg-day)-1	6.90E-08	3.31E-07	mg/kg-day	-	mg/kg-day	-
				Total DDT	2.80	mg/kg	5.85E-08	mg/kg-day	4.86E-01	(mg/kg-day)-1	2.84E-08	1.36E-07	mg/kg-day	-	mg/kg-day	-

TABLE 7.3 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 7	Sediment	Surface Sediment	Dermal Absorption	Dieldrin	2.83	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Heptachlor	0.19	mg/kg	1.32E-09	mg/kg-day	6.25E+00	(mg/kg-day)$^{-1}$	8.27E-09	3.09E-09	mg/kg-day	3.60E-04	mg/kg-day	8.57E-06
				Toxaphene	2.05	mg/kg		mg/kg-day	2.20E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Arsenic	24	mg/kg	5.01E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.83E-06	1.17E-06	mg/kg-day	1.23E-04	mg/kg-day	9.51E-03
				Cadmium	18	mg/kg	1.25E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.92E-08	mg/kg-day	1.00E-05	mg/kg-day	2.92E-03
				Lead	1,306	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	614	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	6.30	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1248	14	mg/kg	1.33E-06	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	2.96E-06	3.10E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.36	mg/kg	3.51E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	7.80E-08	8.19E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.60E-04					0.06
		Exposure Point Total									4.33E-04					0.22
	Exposure Medium Total										4.33E-04					0.22
	Fish	Carp Fillet 50.0%	Ingestion	Acenaphthene	1.73	mg/kg	2.00E-04	mg/kg-day	-	(mg/kg-day)-1	-	4.67E-04	mg/kg-day	6.00E-02	mg/kg-day	7.78E-03
				Benzoic acid	6.39	mg/kg	7.40E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.73E-03	mg/kg-day	4.00E+00	mg/kg-day	4.31E-04
				Fluoranthene	0.41	mg/kg	4.79E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.12E-04	mg/kg-day	4.00E-02	mg/kg-day	2.79E-03
				Fluorene	0.64	mg/kg	7.39E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.73E-04	mg/kg-day	4.00E-02	mg/kg-day	4.31E-03
				2-Methylnaphthalene	0.60	mg/kg	6.97E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.63E-04	mg/kg-day	4.00E-03	mg/kg-day	4.06E-02
				Naphthalene	0.56	mg/kg	6.53E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.52E-04	mg/kg-day	2.00E-02	mg/kg-day	7.61E-03
				Phenanthrene	0.79	mg/kg	9.13E-05	mg/kg-day	-	(mg/kg-day)-1	-	2.13E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	0.87	mg/kg	1.00E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.34E-04	mg/kg-day	3.00E-02	mg/kg-day	7.79E-03
				Chlordane - alpha	0.08	mg/kg	9.60E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	3.36E-06	2.24E-05	mg/kg-day	5.00E-04	mg/kg-day	4.48E-02
				Chlordane - gamma	0.13	mg/kg	1.50E-05	mg/kg-day	3.50E-01	(mg/kg-day)-1	5.27E-06	3.51E-05	mg/kg-day	5.00E-04	mg/kg-day	7.02E-02
				o,p'-DDD	0.11	mg/kg	1.22E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	2.92E-06	2.84E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.38	mg/kg	4.35E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	1.04E-05	1.02E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.23	mg/kg	2.70E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	9.17E-06	6.29E-05	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.031	mg/kg	3.59E-06	mg/kg-day	1.60E+01	(mg/kg-day)-1	5.74E-05	8.37E-06	mg/kg-day	5.00E-05	mg/kg-day	1.67E-01
				cis-Nonachlor	0.024	mg/kg	2.78E-06	mg/kg-day	-	(mg/kg-day)-1	-	6.48E-06	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.056	mg/kg	6.48E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.51E-05	mg/kg-day	-	mg/kg-day	-
				Aluminum	34	mg/kg	3.92E-03	mg/kg-day	-	(mg/kg-day)-1	-	9.14E-03	mg/kg-day	1.00E+00	mg/kg-day	9.14E-03
				Chromium	1.65	mg/kg	1.91E-04	mg/kg-day	-	(mg/kg-day)-1	-	4.47E-04	mg/kg-day	1.00E-03	mg/kg-day	4.47E-01
				Copper	10.90	mg/kg	1.26E-03	mg/kg-day	-	(mg/kg-day)-1	-	2.94E-03	mg/kg-day	4.00E-02	mg/kg-day	7.36E-02
				Iron	271	mg/kg	3.13E-02	mg/kg-day	-	(mg/kg-day)-1	-	7.31E-02	mg/kg-day	-	mg/kg-day	-
				Lead	4.51	mg/kg	5.22E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.22E-03	mg/kg-day	-	mg/kg-day	-
				Selenium	2.90	mg/kg	3.35E-04	mg/kg-day	-	(mg/kg-day)-1	-	7.82E-04	mg/kg-day	5.00E-03	mg/kg-day	1.56E-01
				Zinc	271	mg/kg	3.13E-02	mg/kg-day	-	(mg/kg-day)-1	-	7.31E-02	mg/kg-day	3.00E-01	mg/kg-day	2.44E-01
				Dioxin TEQ	2.91E-05	mg/kg	3.37E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	5.05E-04	7.86E-09	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	1.30	mg/kg	1.50E-04	mg/kg-day	2.00E+00	(mg/kg-day)-1	3.01E-04	3.51E-04	mg/kg-day	2.00E-05	mg/kg-day	1.76E+01
			Exp. Route Total								8.95E-04					19
		Exposure Point Total									8.95E-04					19
		Goldfish Fillet 50.0%	Ingestion	Acenaphthene	3.24	mg/kg	3.74E-04	mg/kg-day	-	(mg/kg-day)-1	-	8.74E-04	mg/kg-day	6.00E-02	mg/kg-day	1.46E-02
				Acenaphthylene	0.23	mg/kg	2.66E-05	mg/kg-day	-	(mg/kg-day)-1	-	6.21E-05	mg/kg-day	-	mg/kg-day	-
				Anthracene	0.24	mg/kg	2.77E-05	mg/kg-day	-	(mg/kg-day)-1	-	6.45E-05	mg/kg-day	3.00E-01	mg/kg-day	2.15E-04
				Benzo(a)anthracene	0.007	mg/kg	8.10E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	5.91E-07	1.89E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	0.008	mg/kg	9.26E-07	mg/kg-day	7.30E-03	(mg/kg-day)-1	6.76E-09	2.16E-06	mg/kg-day	-	mg/kg-day	-
				Dibenzofuran	0.28	mg/kg	3.26E-05	mg/kg-day	-	(mg/kg-day)-1	-	7.61E-05	mg/kg-day	4.00E-03	mg/kg-day	1.90E-02
				Fluoranthene	0.36	mg/kg	4.12E-05	mg/kg-day	-	(mg/kg-day)-1	-	9.61E-05	mg/kg-day	4.00E-02	mg/kg-day	2.40E-03
				Fluorene	1.04	mg/kg	1.20E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.80E-04	mg/kg-day	4.00E-02	mg/kg-day	6.99E-03
				1-Methylnaphthalene	0.58	mg/kg	6.71E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.57E-04	mg/kg-day	-	mg/kg-day	-

TABLE 7.3 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 7	Fish	Goldfish Fillet	Ingestion	2-Methylnaphthalene	0.91	mg/kg	1.05E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.45E-04	mg/kg-day	4.00E-03	mg/kg-day	6.12E-02
				Naphthalene	0.91	mg/kg	1.05E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.45E-04	mg/kg-day	2.00E-02	mg/kg-day	1.22E-02
				Phenanthrene	0.68	mg/kg	7.87E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.84E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	0.55	mg/kg	6.36E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.49E-04	mg/kg-day	3.00E-02	mg/kg-day	4.95E-03
				Chlordane - alpha	0.30	mg/kg	3.45E-05	mg/kg-day	3.50E-01	(mg/kg-day)-1	1.21E-05	8.05E-05	mg/kg-day	5.00E-04	mg/kg-day	1.61E-01
				Chlordane - gamma	0.22	mg/kg	2.55E-05	mg/kg-day	3.50E-01	(mg/kg-day)-1	8.91E-06	5.94E-05	mg/kg-day	5.00E-04	mg/kg-day	1.19E-01
				o,p'-DDD	0.18	mg/kg	2.03E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	4.86E-06	4.73E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	1.10	mg/kg	1.27E-04	mg/kg-day	2.40E-01	(mg/kg-day)-1	3.05E-05	2.97E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.68	mg/kg	7.87E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	2.68E-05	1.84E-04	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.074	mg/kg	8.56E-06	mg/kg-day	1.60E+01	(mg/kg-day)-1	1.37E-04	2.00E-05	mg/kg-day	5.00E-05	mg/kg-day	4.00E-01
				cis-Nonachlor	0.065	mg/kg	7.52E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.76E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.13	mg/kg	1.49E-05	mg/kg-day	-	(mg/kg-day)-1	-	3.48E-05	mg/kg-day	-	mg/kg-day	-
				Iron	22	mg/kg	2.58E-03	mg/kg-day	-	(mg/kg-day)-1	-	6.03E-03	mg/kg-day	-	mg/kg-day	-
				Chromium	0.39	mg/kg	4.49E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.05E-04	mg/kg-day	1.00E-03	mg/kg-day	1.05E-01
				Copper	3.88	mg/kg	4.49E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.05E-03	mg/kg-day	4.00E-02	mg/kg-day	2.62E-02
				Selenium	2.98	mg/kg	3.44E-04	mg/kg-day	-	(mg/kg-day)-1	-	8.04E-04	mg/kg-day	5.00E-03	mg/kg-day	1.61E-01
				Zinc	84	mg/kg	9.74E-03	mg/kg-day	-	(mg/kg-day)-1	-	2.27E-02	mg/kg-day	3.00E-01	mg/kg-day	7.57E-02
				Dioxin TEQ	9.15E-05	mg/kg	1.06E-08	mg/kg-day	1.50E+05	(mg/kg-day)-1	1.59E-03	2.47E-08	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	4.09	mg/kg	4.73E-04	mg/kg-day	2.00E+00	(mg/kg-day)-1	9.46E-04	1.10E-03	mg/kg-day	2.00E-05	mg/kg-day	5.52E+01
			Exp. Route Total								2.75E-03					56
		Exposure Point Total									2.75E-03					56
	Exposure Medium Total - Weighted Sum of Risk Estimates										1.82E-03					38
Area Total											2.26E-03					37.8
Surface Water	Surface Water	Surface Water	Incidental Ingestion	Chlorodibromomethane	0.0015	mg/L	2.62E-07	mg/kg-day	8.40E-02	$(mg/kg\text{-}day)^{-1}$	2.20E-08	6.11E-07	mg/kg-day	3.00E-03	mg/kg-day	2.04E-04
				Naphthalene	0.0012	mg/L	2.01E-07	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	4.68E-07	mg/kg-day	2.00E-02	mg/kg-day	2.34E-05
				Aluminum (Total)	1.38	mg/L	2.41E-04	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	5.62E-04	mg/kg-day	1.00E+00	mg/kg-day	5.62E-04
				Arsenic (Total)	0.004	mg/L	6.98E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	1.05E-06	1.63E-06	mg/kg-day	3.00E-04	mg/kg-day	5.43E-03
				Chromium (Total)	0.0051	mg/L	8.90E-07	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	2.08E-06	mg/kg-day	3.00E-03	mg/kg-day	6.92E-04
				Lead (Total)	0.013	mg/L	2.27E-06	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	5.29E-06	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.07E-06					0.0069
			Dermal Absorption	Chlorodibromomethane	0.0015	mg/L	2.34E-07	mg/kg-day	8.40E-02	$(mg/kg\text{-}day)^{-1}$	1.96E-08	5.45E-07	mg/kg-day	2.40E-03	mg/kg-day	2.27E-04
				Naphthalene	0.0012	mg/L	1.57E-06	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	3.67E-06	mg/kg-day	1.60E-02	mg/kg-day	2.29E-04
				Aluminum (Total)	1.38	mg/L	2.74E-05	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	6.40E-05	mg/kg-day	1.00E-01	mg/kg-day	6.40E-04
				Arsenic (Total)	0.004	mg/L	7.95E-08	mg/kg-day	3.66E+00	$(mg/kg\text{-}day)^{-1}$	2.91E-07	1.86E-07	mg/kg-day	1.23E-04	mg/kg-day	1.51E-03
				Chromium (Total)	0.0051	mg/L	2.03E-07	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	4.73E-07	mg/kg-day	6.00E-05	mg/kg-day	7.89E-03
				Lead (Total)	0.013	mg/L	2.59E-08	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	6.03E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.11E-07					0.010
		Exposure Point Total									3.11E-07					0.010
	Exposure Medium Total										3.11E-07					0.010
Medium Total											3.11E-07					0.010
Weighted Sums of Risk Estimates									Total of Receptor Risks Across All Media		1.74E-03			Total of Receptor Hazards Across All Media		18

TABLE 7.4 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Sediment	Surface Sediment	Incidental Ingestion	bis(2-Ethylhexyl)phthalate	81	mg/kg	1.19E-05	mg/kg-day	1.40E-02	(mg/kg-day)$^{-1}$	1.67E-07	1.67E-04	mg/kg-day	2.00E-02	mg/kg-day	8.33E-03
33.42%				Benzo(a)anthracene	280	mg/kg	4.11E-05	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.00E-05	5.76E-04	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.62E-05	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.18E-04	2.26E-04	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	99	mg/kg	1.45E-05	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.06E-05	2.04E-04	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	89	mg/kg	1.31E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.83E-04	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	42	mg/kg	6.17E-06	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	4.51E-07	8.64E-05	mg/kg-day	-	mg/kg-day	-
				Carbazole	47	mg/kg	6.91E-06	mg/kg-day	2.00E-02	(mg/kg-day)$^{-1}$	1.38E-07	9.67E-05	mg/kg-day	-	mg/kg-day	-
				Chrysene	600	mg/kg	8.82E-05	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	6.44E-07	1.23E-03	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	41	mg/kg	6.02E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	4.40E-05	8.43E-05	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	50	mg/kg	7.35E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	5.36E-06	1.03E-04	mg/kg-day	-	mg/kg-day	-
				Naphthalene	896	mg/kg	1.32E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.84E-03	mg/kg-day	2.00E-02	mg/kg-day	9.22E-02
				Phenanthrene	1,900	mg/kg	2.79E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.91E-03	mg/kg-day	-	mg/kg-day	-
				Pyrene	720	mg/kg	1.06E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.48E-03	mg/kg-day	3.00E-02	mg/kg-day	4.94E-02
				Dieldrin	0.12	mg/kg	1.76E-08	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	2.82E-07	2.47E-07	mg/kg-day	5.00E-05	mg/kg-day	4.94E-03
				Aluminum	25,100	mg/kg	3.69E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.16E-02	mg/kg-day	1.00E+00	mg/kg-day	5.16E-02
				Antimony	72	mg/kg	1.06E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.48E-04	mg/kg-day	4.00E-04	mg/kg-day	3.69E-01
				Arsenic	165	mg/kg	2.42E-05	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	3.63E-05	3.39E-04	mg/kg-day	3.00E-04	mg/kg-day	1.13E+00
				Cadmium	52	mg/kg	7.67E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.07E-04	mg/kg-day	1.00E-03	mg/kg-day	1.07E-01
				Chromium	622	mg/kg	9.14E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.28E-03	mg/kg-day	3.00E-03	mg/kg-day	4.27E-01
				Iron	85,000	mg/kg	1.25E-02	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.75E-01	mg/kg-day	-	mg/kg-day	-
				Lead	4,195	mg/kg	6.16E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.63E-03	mg/kg-day	-	mg/kg-day	-
				Manganese	907	mg/kg	1.33E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.87E-03	mg/kg-day	1.40E-01	mg/kg-day	1.33E-02
				Nickel	1,140	mg/kg	1.68E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.35E-03	mg/kg-day	2.00E-02	mg/kg-day	1.17E-01
				Zinc	3,305	mg/kg	4.86E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.80E-03	mg/kg-day	3.00E-01	mg/kg-day	2.27E-02
				Aroclor 1242	6.80	mg/kg	9.99E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.00E-06	1.40E-05	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	7.94	mg/kg	1.17E-06	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.33E-06	1.63E-05	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	1.32	mg/kg	1.94E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	3.88E-07	2.72E-06	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.51E-04					2.4
			Dermal Absorption	bis(2-Ethylhexyl)phthalate	81	mg/kg	1.34E-06	mg/kg-day	7.37E-02	(mg/kg-day)$^{-1}$	9.85E-08	1.87E-05	mg/kg-day	3.80E-03	mg/kg-day	4.92E-03
				Benzo(a)anthracene	280	mg/kg	6.01E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.41E-05	8.41E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	2.36E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	5.56E-05	3.30E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	99	mg/kg	2.12E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	5.00E-06	2.97E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	89	mg/kg	1.91E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.67E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	42	mg/kg	9.01E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	2.12E-07	1.26E-05	mg/kg-day	-	mg/kg-day	-
				Carbazole	47	mg/kg	7.76E-07	mg/kg-day	2.86E-02	(mg/kg-day)$^{-1}$	2.22E-08	1.09E-05	mg/kg-day	-	mg/kg-day	-
				Chrysene	600	mg/kg	1.29E-05	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	3.03E-07	1.80E-04	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	41	mg/kg	8.80E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.07E-05	1.23E-05	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	50	mg/kg	1.07E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	2.53E-06	1.50E-05	mg/kg-day	-	mg/kg-day	-
				Naphthalene	896	mg/kg	1.92E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.69E-04	mg/kg-day	1.60E-02	mg/kg-day	1.68E-02
				Phenanthrene	1,900	mg/kg	4.08E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.71E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	720	mg/kg	1.54E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.16E-04	mg/kg-day	9.30E-03	mg/kg-day	2.33E-02
				Dieldrin	0.12	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Aluminum	25,100	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	72	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	165	mg/kg	8.16E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	2.99E-06	1.14E-05	mg/kg-day	1.23E-04	mg/kg-day	9.29E-02
				Cadmium	52	mg/kg	8.62E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.21E-07	mg/kg-day	1.00E-05	mg/kg-day	1.21E-02
				Chromium	622	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	85,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	4,195	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-

TABLE 7.4 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Sediment	Surface Sediment	Dermal Absorption	Manganese	907	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Nickel	1,140	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.40E-03	mg/kg-day	
				Zinc	3,305	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-02	mg/kg-day	
				Aroclor 1242	6.80	mg/kg	1.57E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	3.49E-07	2.20E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	7.94	mg/kg	1.83E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	4.07E-07	2.57E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	1.32	mg/kg	3.05E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	6.78E-08	4.27E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.02E-04					0.15
		Exposure Point Total									3.53E-04					2.5
	Exposure Medium Total										3.53E-04					2.5
	Fish	Carp Fillet 25.0%	Ingestion	Acenaphthene	0.013	mg/kg	2.51E-07	mg/kg-day	-	(mg/kg-day)-1	-	3.51E-06	mg/kg-day	6.00E-02	mg/kg-day	5.86E-05
				Acenaphthylene	0.005	mg/kg	9.65E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.35E-06	mg/kg-day	-	mg/kg-day	-
				Anthracene	0.007	mg/kg	1.35E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	3.00E-01	mg/kg-day	6.31E-06
				Fluoranthene	0.004	mg/kg	7.72E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	4.00E-02	mg/kg-day	2.70E-05
				Fluorene	0.023	mg/kg	4.44E-07	mg/kg-day	-	(mg/kg-day)-1	-	6.22E-06	mg/kg-day	4.00E-02	mg/kg-day	1.55E-04
				1-Methylnaphthalene	0.007	mg/kg	1.35E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	0.008	mg/kg	1.54E-07	mg/kg-day	-	(mg/kg-day)-1	-	2.16E-06	mg/kg-day	4.00E-03	mg/kg-day	5.41E-04
				Phenanthrene	0.007	mg/kg	1.35E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	-	mg/kg-day	-
				Pyrene	0.006	mg/kg	1.16E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.62E-06	mg/kg-day	3.00E-02	mg/kg-day	5.41E-05
				Chlordane - alpha	0.024	mg/kg	4.63E-07	mg/kg-day	3.50E-01	(mg/kg-day)-1	1.62E-07	6.49E-06	mg/kg-day	5.00E-04	mg/kg-day	1.30E-02
				Chlordane - gamma	0.018	mg/kg	3.47E-07	mg/kg-day	3.50E-01	(mg/kg-day)-1	1.22E-07	4.86E-06	mg/kg-day	5.00E-04	mg/kg-day	9.73E-03
				o,p'-DDD	0.047	mg/kg	9.07E-07	mg/kg-day	2.40E-01	(mg/kg-day)-1	2.18E-07	1.27E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.20	mg/kg	3.80E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	9.13E-07	5.32E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.15	mg/kg	2.90E-06	mg/kg-day	3.40E-01	(mg/kg-day)-1	9.85E-07	4.05E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.035	mg/kg	6.76E-07	mg/kg-day	-	(mg/kg-day)-1	-	9.46E-06	mg/kg-day	-	mg/kg-day	-
				Chromium	0.52	mg/kg	9.96E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.39E-04	mg/kg-day	1.00E-03	mg/kg-day	1.39E-01
				Copper	3.19	mg/kg	6.16E-05	mg/kg-day	-	(mg/kg-day)-1	-	8.63E-04	mg/kg-day	4.00E-02	mg/kg-day	2.16E-02
				Iron	33	mg/kg	6.34E-04	mg/kg-day	-	(mg/kg-day)-1	-	8.88E-03	mg/kg-day	-	mg/kg-day	-
				Selenium	7.98	mg/kg	1.54E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.16E-03	mg/kg-day	5.00E-03	mg/kg-day	4.31E-01
				Zinc	122	mg/kg	2.36E-03	mg/kg-day	-	(mg/kg-day)-1	-	3.30E-02	mg/kg-day	3.00E-01	mg/kg-day	1.10E-01
				Dioxin TEQ	2.03E-05	mg/kg	3.92E-10	mg/kg-day	1.50E+05	(mg/kg-day)-1	5.88E-05	5.49E-09	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	0.68	mg/kg	1.31E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	2.62E-05	1.83E-04	mg/kg-day	2.00E-05	mg/kg-day	9.16E+00
			Exp. Route Total								8.74E-05					9.9
		Exposure Point Total									8.74E-05					9.9
		Chinook Fillet 25.0%	Ingestion	Acenaphthene	0.008	mg/kg	1.54E-07	mg/kg-day	-	(mg/kg-day)-1	-	2.16E-06	mg/kg-day	6.00E-02	mg/kg-day	3.60E-05
				Acenaphthylene	0.004	mg/kg	7.72E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	-	mg/kg-day	-
				Anthracene	0.004	mg/kg	7.72E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	3.00E-01	mg/kg-day	3.60E-06
				Fluoranthene	0.005	mg/kg	9.65E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.35E-06	mg/kg-day	4.00E-02	mg/kg-day	3.38E-05
				Fluorene	0.024	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)-1	-	6.49E-06	mg/kg-day	4.00E-02	mg/kg-day	1.62E-04
				1-Methylnaphthalene	0.005	mg/kg	9.65E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.35E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	0.004	mg/kg	7.72E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	4.00E-03	mg/kg-day	2.70E-04
				Phenanthrene	0.017	mg/kg	3.28E-07	mg/kg-day	-	(mg/kg-day)-1	-	4.59E-06	mg/kg-day	-	mg/kg-day	-
				Chlordane - alpha	0.056	mg/kg	1.08E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	3.78E-07	1.51E-05	mg/kg-day	5.00E-04	mg/kg-day	3.03E-02
				Chlordane - gamma	0.041	mg/kg	7.92E-07	mg/kg-day	3.50E-01	(mg/kg-day)-1	2.77E-07	1.11E-05	mg/kg-day	5.00E-04	mg/kg-day	2.22E-02
				p,p'-DDD	0.13	mg/kg	2.59E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	6.21E-07	3.62E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	2.82	mg/kg	5.45E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	1.85E-05	7.63E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDT	0.17	mg/kg	3.30E-06	mg/kg-day	3.40E-01	(mg/kg-day)-1	1.12E-06	4.62E-05	mg/kg-day	5.00E-04	mg/kg-day	9.24E-02
				Dieldrin	0.027	mg/kg	5.21E-07	mg/kg-day	1.60E+01	(mg/kg-day)-1	8.34E-06	7.30E-06	mg/kg-day	5.00E-05	mg/kg-day	1.46E-01
				cis-Nonachlor	0.16	mg/kg	3.03E-06	mg/kg-day	-	(mg/kg-day)-1	-	4.24E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.25	mg/kg	4.83E-06	mg/kg-day	-	(mg/kg-day)-1	-	6.76E-05	mg/kg-day	-	mg/kg-day	-

TABLE 7.4 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Fish	Chinook Fillet	Ingestion	Chromium	0.60	mg/kg	1.16E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.63E-04	mg/kg-day	1.00E-03	mg/kg-day	1.63E-01
				Copper	3.52	mg/kg	6.79E-05	mg/kg-day	-	(mg/kg-day)-1	-	9.51E-04	mg/kg-day	4.00E-02	mg/kg-day	2.38E-02
				Iron	34	mg/kg	6.61E-04	mg/kg-day	-	(mg/kg-day)-1	-	9.26E-03	mg/kg-day	-	mg/kg-day	-
				Mercury	1.11	mg/kg	2.14E-05	mg/kg-day	-	(mg/kg-day)-1	-	3.00E-04	mg/kg-day	4.00E-02	mg/kg-day	7.51E-03
				Selenium	3.10	mg/kg	5.99E-05	mg/kg-day	-	(mg/kg-day)-1	-	8.38E-04	mg/kg-day	5.00E-03	mg/kg-day	1.68E-01
				Zinc	25.46	mg/kg	4.92E-04	mg/kg-day	-	(mg/kg-day)-1	-	6.88E-03	mg/kg-day	3.00E-01	mg/kg-day	2.29E-02
				Dioxin TEQ	5.98E-05	mg/kg	1.16E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	1.73E-04	1.62E-08	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	0.90	mg/kg	1.73E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	3.46E-05	2.42E-04	mg/kg-day	2.00E-05	mg/kg-day	1.21E+01
			Exp. Route Total								2.37E-04					12.8
		Exposure Point Total									2.37E-04					12.8
		Goldfish Fillet 25.0%	Ingestion	Bis(2-ethylhexyl)phthalate	5.61	mg/kg	1.08E-04	mg/kg-day	1.40E-02	(mg/kg-day)-1	1.52E-06	1.52E-03	mg/kg-day	2.00E-02	mg/kg-day	7.58E-02
				Fluorene	0.007	mg/kg	1.35E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	4.00E-02	mg/kg-day	4.73E-05
				1-Methylnaphthalene	0.006	mg/kg	1.16E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.62E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	0.007	mg/kg	1.35E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	4.00E-03	mg/kg-day	4.73E-04
				Naphthalene	0.006	mg/kg	1.16E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.62E-06	mg/kg-day	2.00E-02	mg/kg-day	8.11E-05
				Chlordane - alpha	0.032	mg/kg	6.18E-07	mg/kg-day	3.50E-01	(mg/kg-day)-1	2.16E-07	8.65E-06	mg/kg-day	5.00E-04	mg/kg-day	1.73E-02
				Chlordane - gamma	0.019	mg/kg	3.67E-07	mg/kg-day	3.50E-01	(mg/kg-day)-1	1.28E-07	5.14E-06	mg/kg-day	5.00E-04	mg/kg-day	1.03E-02
				o,p'-DDD	0.031	mg/kg	5.98E-07	mg/kg-day	2.40E-01	(mg/kg-day)-1	1.44E-07	8.38E-06	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.15	mg/kg	2.95E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	7.09E-07	4.14E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.18	mg/kg	3.46E-06	mg/kg-day	3.40E-01	(mg/kg-day)-1	1.17E-06	4.84E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.04	mg/kg	7.14E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.00E-05	mg/kg-day	-	mg/kg-day	-
				Chromium	0.51	mg/kg	9.85E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.38E-04	mg/kg-day	1.00E-03	mg/kg-day	1.38E-01
				Copper	2.55	mg/kg	4.92E-05	mg/kg-day	-	(mg/kg-day)-1	-	6.89E-04	mg/kg-day	4.00E-02	mg/kg-day	1.72E-02
				Iron	56	mg/kg	1.08E-03	mg/kg-day	-	(mg/kg-day)-1	-	1.52E-02	mg/kg-day	-	mg/kg-day	-
				Lead	0.61	mg/kg	1.18E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.65E-04	mg/kg-day	-	mg/kg-day	-
				Selenium	5.61	mg/kg	1.08E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.52E-03	mg/kg-day	5.00E-03	mg/kg-day	3.03E-01
				Zinc	133	mg/kg	2.56E-03	mg/kg-day	-	(mg/kg-day)-1	-	3.59E-02	mg/kg-day	3.00E-01	mg/kg-day	1.20E-01
				Dioxin TEQ	2.15E-05	mg/kg	4.14E-10	mg/kg-day	1.50E+05	(mg/kg-day)-1	6.21E-05	5.80E-09	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	0.79	mg/kg	1.53E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	3.05E-05	2.14E-04	mg/kg-day	2.00E-05	mg/kg-day	1.07E+01
			Exp. Route Total								9.65E-05					11.4
		Exposure Point Total									9.65E-05					11.4
		Steelhead Fillet 25.0%	Ingestion	Acenaphthene	0.006	mg/kg	1.16E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.62E-06	mg/kg-day	6.00E-02	mg/kg-day	2.70E-05
				Anthracene	0.004	mg/kg	7.72E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	3.00E-01	mg/kg-day	3.60E-06
				Fluoranthene	0.004	mg/kg	7.72E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	4.00E-02	mg/kg-day	2.70E-05
				Fluorene	0.014	mg/kg	2.70E-07	mg/kg-day	-	(mg/kg-day)-1	-	3.78E-06	mg/kg-day	4.00E-02	mg/kg-day	9.46E-05
				1-Methylnaphthalene	0.004	mg/kg	7.72E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	0.013	mg/kg	2.51E-07	mg/kg-day	-	(mg/kg-day)-1	-	3.51E-06	mg/kg-day	-	mg/kg-day	-
				Chlordane - alpha	0.033	mg/kg	6.37E-07	mg/kg-day	3.50E-01	(mg/kg-day)-1	2.23E-07	8.92E-06	mg/kg-day	5.00E-04	mg/kg-day	1.78E-02
				Chlordane - gamma	0.020	mg/kg	3.86E-07	mg/kg-day	3.50E-01	(mg/kg-day)-1	1.35E-07	5.41E-06	mg/kg-day	5.00E-04	mg/kg-day	1.08E-02
				p,p'-DDD	0.082	mg/kg	1.58E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	3.80E-07	2.22E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	2.36	mg/kg	4.55E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	1.55E-05	6.38E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDT	0.13	mg/kg	2.47E-06	mg/kg-day	3.40E-01	(mg/kg-day)-1	8.40E-07	3.46E-05	mg/kg-day	5.00E-04	mg/kg-day	6.92E-02
				cis-Nonachlor	0.12	mg/kg	2.37E-06	mg/kg-day	-	(mg/kg-day)-1	-	3.32E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.17	mg/kg	3.26E-06	mg/kg-day	-	(mg/kg-day)-1	-	4.57E-05	mg/kg-day	-	mg/kg-day	-
				Chromium	0.77	mg/kg	1.48E-05	mg/kg-day	-	(mg/kg-day)-1	-	2.08E-04	mg/kg-day	1.00E-03	mg/kg-day	2.08E-01
				Copper	6.15	mg/kg	1.19E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.66E-03	mg/kg-day	4.00E-02	mg/kg-day	4.16E-02
				Iron	72	mg/kg	1.39E-03	mg/kg-day	-	(mg/kg-day)-1	-	1.94E-02	mg/kg-day	-	mg/kg-day	-
				Lead	0.49	mg/kg	9.40E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.32E-04	mg/kg-day	-	mg/kg-day	-
				Mercury	1.90	mg/kg	3.66E-05	mg/kg-day	-	(mg/kg-day)-1	-	5.13E-04	mg/kg-day	4.00E-02	mg/kg-day	1.28E-02

TABLE 7.4 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Fish	Steelhead Fillet	Ingestion	Selenium	3.18	mg/kg	6.14E-05	mg/kg-day	-	(mg/kg-day)-1	-	8.59E-04	mg/kg-day	5.00E-03	mg/kg-day	1.72E-01
				Zinc	35	mg/kg	6.83E-04	mg/kg-day	-	(mg/kg-day)-1	-	9.56E-03	mg/kg-day	3.00E-01	mg/kg-day	3.19E-02
				Dioxin TEQ	5.50E-05	mg/kg	1.06E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	1.59E-04	1.49E-08	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	0.67	mg/kg	1.30E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	2.59E-05	1.81E-04	mg/kg-day	2.00E-05	mg/kg-day	9.07E+00
			Exp. Route Total								2.02E-04					9.6
		Exposure Point Total									2.02E-04					9.6
	Exposure Medium Total - Weighted Sum of Risk Estimates										1.56E-04					10.9
Area Total											5.09E-04					13
Reach 2	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	172	mg/kg	2.53E-05	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.85E-05	3.54E-04	mg/kg-day	-	mg/kg-day	-
47.22%				Benzo(a)pyrene	120	mg/kg	1.76E-05	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.29E-04	2.47E-04	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	34	mg/kg	5.00E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.65E-06	6.99E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	29	mg/kg	4.26E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.97E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11.16	mg/kg	1.64E-06	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	1.20E-07	2.30E-05	mg/kg-day	-	mg/kg-day	-
				Carbazole	33	mg/kg	4.85E-06	mg/kg-day	2.00E-02	(mg/kg-day)$^{-1}$	9.70E-08	6.79E-05	mg/kg-day	-	mg/kg-day	-
				Chrysene	326	mg/kg	4.79E-05	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	3.50E-07	6.71E-04	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	15.77	mg/kg	2.32E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.69E-05	3.24E-05	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	17.59	mg/kg	2.58E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.89E-06	3.62E-05	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	372	mg/kg	5.47E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.65E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	254	mg/kg	3.74E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.24E-04	mg/kg-day	3.00E-02	mg/kg-day	1.75E-02
				Total Chlordane	2.35	mg/kg	3.45E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.83E-06	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	8.84	mg/kg	1.30E-06	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	4.42E-07	1.82E-05	mg/kg-day	-	mg/kg-day	-
				Total DDT	10.30	mg/kg	1.51E-06	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	5.15E-07	2.12E-05	mg/kg-day	5.00E-04	mg/kg-day	4.24E-02
				Dieldrin	4.25	mg/kg	6.25E-07	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	9.99E-06	8.74E-06	mg/kg-day	5.00E-05	mg/kg-day	1.75E-01
				gamma-BHC (Lindane)	3.16	mg/kg	4.64E-07	mg/kg-day	1.30E+00	(mg/kg-day)$^{-1}$	6.04E-07	6.50E-06	mg/kg-day	3.00E-04	mg/kg-day	2.17E-02
				Heptachlor	4.61	mg/kg	6.77E-07	mg/kg-day	4.50E+00	(mg/kg-day)$^{-1}$	3.05E-06	9.48E-06	mg/kg-day	5.00E-04	mg/kg-day	1.90E-02
				Hexachlorocyclohexane-all isomers	3.16	mg/kg	4.64E-07	mg/kg-day	1.80E+00	(mg/kg-day)$^{-1}$	8.36E-07	6.50E-06	mg/kg-day	-	mg/kg-day	-
				Toxaphene		mg/kg		mg/kg-day	1.10E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Aluminum	10,507	mg/kg	1.54E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.16E-02	mg/kg-day	1.00E+00	mg/kg-day	2.16E-02
				Antimony	47	mg/kg	6.96E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.75E-05	mg/kg-day	4.00E-04	mg/kg-day	2.44E-01
				Arsenic	180	mg/kg	2.65E-05	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	3.97E-05	3.70E-04	mg/kg-day	3.00E-04	mg/kg-day	1.23E+00
				Cadmium	74	mg/kg	1.09E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.52E-04	mg/kg-day	1.00E-03	mg/kg-day	1.52E-01
				Chromium	620	mg/kg	9.11E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.28E-03	mg/kg-day	3.00E-03	mg/kg-day	4.25E-01
				Iron	186,911	mg/kg	2.75E-02	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.85E-01	mg/kg-day	-	mg/kg-day	-
				Lead	3,201	mg/kg	4.70E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.59E-03	mg/kg-day	-	mg/kg-day	-
				Manganese	1,113	mg/kg	1.64E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.29E-03	mg/kg-day	1.40E-01	mg/kg-day	1.64E-02
				Mercury	7.20	mg/kg	1.06E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.48E-05	mg/kg-day	4.00E-02	mg/kg-day	3.70E-04
				Zinc	8,436	mg/kg	1.24E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.74E-02	mg/kg-day	3.00E-01	mg/kg-day	5.78E-02
				2,3,7,8-Dibenzo-p-dioxin	6.00E-06	mg/kg	8.82E-13	mg/kg-day	1.50E+05	(mg/kg-day)$^{-1}$	1.32E-07	1.23E-11	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	10.40	mg/kg	1.53E-06	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	3.06E-06	2.14E-05	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.28E-04					2.4
			Dermal Absorption	Benzo(a)anthracene	172	mg/kg	3.69E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	8.69E-06	5.17E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	120	mg/kg	2.57E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	6.05E-05	3.60E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	34	mg/kg	7.29E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.72E-06	1.02E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	29	mg/kg	6.22E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.71E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11.16	mg/kg	2.39E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	5.64E-08	3.35E-06	mg/kg-day	-	mg/kg-day	-
				Carbazole	33	mg/kg	5.45E-07	mg/kg-day	2.86E-02	(mg/kg-day)$^{-1}$	1.56E-08	7.62E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	326	mg/kg	6.99E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	1.65E-07	9.79E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	15.77	mg/kg	3.38E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	7.97E-06	4.74E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	17.59	mg/kg	3.77E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	8.89E-07	5.28E-06	mg/kg-day	-	mg/kg-day	-

TABLE 7.4 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 2	Sediment	Surface Sediment	Dermal Absorption	Phenanthrene	372	mg/kg	7.98E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.12E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	254	mg/kg	5.46E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.64E-05	mg/kg-day	9.30E-03	mg/kg-day	8.22E-03
				Total Chlordane	2.35	mg/kg	1.55E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.17E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	8.84	mg/kg	4.38E-08	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	2.13E-08	6.13E-07	mg/kg-day	-	mg/kg-day	-
				Total DDT	10.30	mg/kg	5.10E-08	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	2.48E-08	7.14E-07	mg/kg-day	3.50E-04	mg/kg-day	2.04E-03
				Dieldrin	4.25	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				gamma-BHC (Lindane)	3.16	mg/kg	2.09E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.92E-07	mg/kg-day	2.91E-04	mg/kg-day	1.00E-03
				Heptachlor	4.61	mg/kg	7.61E-09	mg/kg-day	6.25E+00	(mg/kg-day)$^{-1}$	4.75E-08	1.07E-07	mg/kg-day	3.60E-04	mg/kg-day	2.96E-04
				Hexachlorocyclohexane-all isomers	3.16	mg/kg	2.09E-08	mg/kg-day	1.86E+00	(mg/kg-day)$^{-1}$	3.87E-08	2.92E-07	mg/kg-day	-	mg/kg-day	-
				Toxaphene		mg/kg		mg/kg-day	2.20E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Aluminum	10,507	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	47	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	180	mg/kg	8.91E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	3.26E-06	1.25E-05	mg/kg-day	1.23E-04	mg/kg-day	1.01E-01
				Cadmium	74	mg/kg	1.22E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.71E-07	mg/kg-day	1.00E-05	mg/kg-day	1.71E-02
				Chromium	620	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	186,911	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	3,201	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	1,113	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	7.20	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Zinc	8,436	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-02	mg/kg-day	
				2,3,7,8-Dibenzo-p-dioxin	6.00E-06	mg/kg	9.90E-16	mg/kg-day	3.00E+05	(mg/kg-day)$^{-1}$	2.97E-10	1.39E-14	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	10.40	mg/kg	2.40E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	5.34E-07	3.36E-06	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								8.40E-05					0.1
		Exposure Point Total									3.12E-04					2.6
	Exposure Medium Total										3.12E-04					2.6
	Fish	Chinook Fillet 50.0%	Ingestion	Acenaphthene	0.012	mg/kg	2.32E-07	mg/kg-day	-	(mg/kg-day)-1	-	3.24E-06	mg/kg-day	6.00E-02	mg/kg-day	5.41E-05
				Anthracene	0.004	mg/kg	7.72E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	3.00E-01	mg/kg-day	3.60E-06
				Fluoranthene	0.005	mg/kg	9.65E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.35E-06	mg/kg-day	4.00E-02	mg/kg-day	3.38E-05
				Fluorene	0.016	mg/kg	3.09E-07	mg/kg-day	-	(mg/kg-day)-1	-	4.32E-06	mg/kg-day	4.00E-02	mg/kg-day	1.08E-04
				1-Methylnaphthalene	0.004	mg/kg	7.72E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.08E-06	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	0.015	mg/kg	2.90E-07	mg/kg-day	-	(mg/kg-day)-1	-	4.05E-06	mg/kg-day	-	mg/kg-day	-
				Chlordane - alpha	0.057	mg/kg	1.10E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	3.85E-07	1.54E-05	mg/kg-day	5.00E-04	mg/kg-day	3.08E-02
				o,p'-DDD	0.050	mg/kg	9.65E-07	mg/kg-day	2.40E-01	(mg/kg-day)-1	2.32E-07	1.35E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.20	mg/kg	3.94E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	9.45E-07	5.51E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	2.09	mg/kg	4.03E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	1.37E-05	5.64E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDT	0.13	mg/kg	2.53E-06	mg/kg-day	3.40E-01	(mg/kg-day)-1	8.60E-07	3.54E-05	mg/kg-day	5.00E-04	mg/kg-day	7.08E-02
				Dieldrin	0.02	mg/kg	3.86E-07	mg/kg-day	1.60E+01	(mg/kg-day)-1	6.18E-06	5.41E-06	mg/kg-day	5.00E-05	mg/kg-day	1.08E-01
				cis-Nonachlor	0.12	mg/kg	2.26E-06	mg/kg-day	-	(mg/kg-day)-1	-	3.16E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.19	mg/kg	3.75E-06	mg/kg-day	-	(mg/kg-day)-1	-	5.24E-05	mg/kg-day	-	mg/kg-day	-
				Aluminum	61	mg/kg	1.18E-03	mg/kg-day	-	(mg/kg-day)-1	-	1.66E-02	mg/kg-day	1.00E+00	mg/kg-day	1.66E-02
				Chromium	1.51	mg/kg	2.91E-05	mg/kg-day	-	(mg/kg-day)-1	-	4.08E-04	mg/kg-day	1.00E-03	mg/kg-day	4.08E-01
				Copper	10.61	mg/kg	2.05E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.87E-03	mg/kg-day	4.00E-02	mg/kg-day	7.17E-02
				Iron	236	mg/kg	4.57E-03	mg/kg-day	-	(mg/kg-day)-1	-	6.39E-02	mg/kg-day	-	mg/kg-day	-
				Lead	3.28	mg/kg	6.33E-05	mg/kg-day	-	(mg/kg-day)-1	-	8.86E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	5.79	mg/kg	1.12E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.56E-03	mg/kg-day	1.40E-01	mg/kg-day	1.12E-02
				Mercury	1.12	mg/kg	2.16E-05	mg/kg-day	-	(mg/kg-day)-1	-	3.02E-04	mg/kg-day	4.00E-02	mg/kg-day	7.55E-03
				Selenium	3.84	mg/kg	7.40E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.04E-03	mg/kg-day	5.00E-03	mg/kg-day	2.07E-01
				Zinc	180	mg/kg	3.47E-03	mg/kg-day	-	(mg/kg-day)-1	-	4.86E-02	mg/kg-day	3.00E-01	mg/kg-day	1.62E-01
				Dioxin TEQ	4.95E-05	mg/kg	9.55E-10	mg/kg-day	1.50E+05	(mg/kg-day)-1	1.43E-04	1.34E-08	mg/kg-day	-	mg/kg-day	-

TABLE 7.4 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 2	Fish	Chinook Fillet	Incidental Ingestion	Nondioxin-like PCBs	0.84	mg/kg	1.63E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	3.26E-05	2.28E-04	mg/kg-day	2.00E-05	mg/kg-day	1.14E+01
			Exp. Route Total								1.98E-04					12.5
		Exposure Point Total									1.98E-04					12.5
		Goldfish Fillet 50.0%	Ingestion	Acenaphthene	0.005	mg/kg	9.65E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.35E-06	mg/kg-day	6.00E-02	mg/kg-day	2.25E-05
				Anthracene	0.007	mg/kg	1.35E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-06	mg/kg-day	3.00E-01	mg/kg-day	6.31E-06
				Fluorene	0.018	mg/kg	3.47E-07	mg/kg-day	-	(mg/kg-day)-1	-	4.86E-06	mg/kg-day	4.00E-02	mg/kg-day	1.22E-04
				1-Methylnaphthalene	0.008	mg/kg	1.54E-07	mg/kg-day	-	(mg/kg-day)-1	-	2.16E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	0.011	mg/kg	2.12E-07	mg/kg-day	-	(mg/kg-day)-1	-	2.97E-06	mg/kg-day	4.00E-03	mg/kg-day	7.43E-04
				Chlordane - alpha	0.030	mg/kg	5.79E-07	mg/kg-day	3.50E-01	(mg/kg-day)-1	2.03E-07	8.11E-06	mg/kg-day	5.00E-04	mg/kg-day	1.62E-02
				Chlordane - gamma	0.024	mg/kg	4.63E-07	mg/kg-day	3.50E-01	(mg/kg-day)-1	1.62E-07	6.49E-06	mg/kg-day	5.00E-04	mg/kg-day	1.30E-02
				o,p'-DDD	0.11	mg/kg	2.05E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	4.91E-07	2.86E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.53	mg/kg	1.02E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	2.45E-06	1.43E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.14	mg/kg	2.72E-06	mg/kg-day	3.40E-01	(mg/kg-day)-1	9.25E-07	3.81E-05	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.018	mg/kg	3.47E-07	mg/kg-day	1.60E+01	(mg/kg-day)-1	5.56E-06	4.86E-06	mg/kg-day	5.00E-05	mg/kg-day	9.73E-02
				gamma-BHC (Lindane)	0.013	mg/kg	2.51E-07	mg/kg-day	1.30E+00	(mg/kg-day)-1	3.26E-07	3.51E-06	mg/kg-day	3.00E-04	mg/kg-day	1.17E-02
				Trans nonachlor	0.035	mg/kg	6.76E-07	mg/kg-day	-	(mg/kg-day)-1	-	9.46E-06	mg/kg-day	-	mg/kg-day	-
				Iron	35	mg/kg	6.80E-04	mg/kg-day	-	(mg/kg-day)-1	-	9.52E-03	mg/kg-day	-	mg/kg-day	-
				Chromium	0.39	mg/kg	7.47E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.05E-04	mg/kg-day	1.00E-03	mg/kg-day	1.05E-01
				Copper	2.01	mg/kg	3.87E-05	mg/kg-day	-	(mg/kg-day)-1	-	5.42E-04	mg/kg-day	4.00E-02	mg/kg-day	1.36E-02
				Selenium	4.23	mg/kg	8.16E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.14E-03	mg/kg-day	5.00E-03	mg/kg-day	2.28E-01
				Zinc	106	mg/kg	2.04E-03	mg/kg-day	-	(mg/kg-day)-1	-	2.85E-02	mg/kg-day	3.00E-01	mg/kg-day	9.52E-02
				Dioxin TEQ	2.20E-05	mg/kg	4.25E-10	mg/kg-day	1.50E+05	(mg/kg-day)-1	6.37E-05	5.94E-09	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	0.84	mg/kg	1.63E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	3.25E-05	2.28E-04	mg/kg-day	2.00E-05	mg/kg-day	1.14E+01
			Exp. Route Total								1.06E-04					12.
		Exposure Point Total									1.06E-04					12.
	Exposure Medium Total - Weighted Sum of Risk Estimates										1.52E-04					12.2
Area Total											4.65E-04					14.8
Reach 6 8.39%	Sediment	Surface Sediment	Incidental Ingestion	Benzene	44	mg/kg	6.47E-06	mg/kg-day	5.50E-02	(mg/kg-day)$^{-1}$	3.56E-07	9.05E-05	mg/kg-day	4.00E-03	mg/kg-day	2.26E-02
				Acenaphthene	1,400	mg/kg	2.06E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.88E-03	mg/kg-day	6.00E-02	mg/kg-day	4.80E-02
				Benzo(a)anthracene	197	mg/kg	2.89E-05	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.11E-05	4.05E-04	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	128	mg/kg	1.88E-05	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.37E-04	2.63E-04	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	22	mg/kg	3.23E-06	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	2.36E-07	4.53E-05	mg/kg-day	-	mg/kg-day	-
				Chrysene	195	mg/kg	2.86E-05	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	2.09E-07	4.01E-04	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	7.20	mg/kg	1.06E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	7.72E-06	1.48E-05	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	23	mg/kg	3.38E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.47E-06	4.73E-05	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	3,400	mg/kg	5.00E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.99E-03	mg/kg-day	4.00E-03	mg/kg-day	1.75E+00
				Naphthalene	3,800	mg/kg	5.58E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.82E-03	mg/kg-day	2.00E-02	mg/kg-day	3.91E-01
				Phenanthrene	1,900	mg/kg	2.79E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.91E-03	mg/kg-day	-	mg/kg-day	-
				Pyrene	638	mg/kg	9.37E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.31E-03	mg/kg-day	3.00E-02	mg/kg-day	4.37E-02
				Aluminum	13,000	mg/kg	1.91E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.67E-02	mg/kg-day	1.00E+00	mg/kg-day	2.67E-02
				Antimony	69	mg/kg	1.01E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.42E-04	mg/kg-day	4.00E-04	mg/kg-day	3.55E-01
				Arsenic	40	mg/kg	5.92E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	8.88E-06	8.29E-05	mg/kg-day	3.00E-04	mg/kg-day	2.76E-01
				Cadmium	34	mg/kg	5.00E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.01E-05	mg/kg-day	1.00E-03	mg/kg-day	7.01E-02
				Chromium	228	mg/kg	3.35E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.68E-04	mg/kg-day	3.00E-03	mg/kg-day	1.56E-01
				Iron	160,000	mg/kg	2.35E-02	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.29E-01	mg/kg-day	-	mg/kg-day	-
				Lead	1,523	mg/kg	2.24E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.13E-03	mg/kg-day	-	mg/kg-day	-
				Manganese	980	mg/kg	1.44E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.02E-03	mg/kg-day	1.40E-01	mg/kg-day	1.44E-02
			Exp. Route Total								1.78E-04					3.2

TABLE 7.4 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 6	Sediment	Surface Sediment	Dermal Absorption	Benzene	44	mg/kg		mg/kg-day	5.67E-02	(mg/kg-day)$^{-1}$			mg/kg-day	3.88E-03	mg/kg-day	
				Acenaphthene	1,400	mg/kg	3.00E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.20E-04	mg/kg-day	1.86E-02	mg/kg-day	2.26E-02
				Benzo(a)anthracene	197	mg/kg	4.22E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	9.94E-06	5.91E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	128	mg/kg	2.74E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	6.46E-05	3.84E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	22	mg/kg	4.72E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	1.11E-07	6.61E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	195	mg/kg	4.18E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	9.85E-08	5.85E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	7.20	mg/kg	1.54E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	3.64E-06	2.16E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	23	mg/kg	4.93E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.16E-06	6.91E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	3,400	mg/kg	7.29E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.02E-03	mg/kg-day	3.20E-03	mg/kg-day	3.19E-01
				Naphthalene	3,800	mg/kg	8.15E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.14E-03	mg/kg-day	1.60E-02	mg/kg-day	7.13E-02
				Phenanthrene	1,900	mg/kg	4.08E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.71E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	638	mg/kg	1.37E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.92E-04	mg/kg-day	9.30E-03	mg/kg-day	2.06E-02
				Aluminum	13,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	69	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	40	mg/kg	1.99E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	7.30E-07	2.79E-06	mg/kg-day	1.23E-04	mg/kg-day	2.27E-02
				Cadmium	34	mg/kg	5.62E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.87E-08	mg/kg-day	1.00E-05	mg/kg-day	7.87E-03
				Chromium	228	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	160,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	1,523	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	980	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
			Exp. Route Total								8.03E-05					0.5
		Exposure Point Total									2.59E-04					3.6
	Exposure Medium Total										2.59E-04					3.6
	Fish	Carp Fillet 100.0%	Ingestion	Acenaphthene	1.59	mg/kg	3.06E-05	mg/kg-day	-	(mg/kg-day)-1	-	4.28E-04	mg/kg-day	6.00E-02	mg/kg-day	7.14E-03
				Acenaphthylene	0.042	mg/kg	8.11E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.14E-05	mg/kg-day	-	mg/kg-day	-
				Anthracene	0.062	mg/kg	1.20E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.68E-05	mg/kg-day	3.00E-01	mg/kg-day	5.59E-05
				Benzo(a)anthracene	0.006	mg/kg	1.16E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	8.46E-08	1.62E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	0.004	mg/kg	7.72E-08	mg/kg-day	7.30E-01	(mg/kg-day)-1	5.64E-08	1.08E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	0.009	mg/kg	1.74E-07	mg/kg-day	7.30E-03	(mg/kg-day)-1	1.27E-09	2.43E-06	mg/kg-day	-	mg/kg-day	-
				Fluoranthene	0.21	mg/kg	4.09E-06	mg/kg-day	-	(mg/kg-day)-1	-	5.73E-05	mg/kg-day	4.00E-02	mg/kg-day	1.43E-03
				Fluorene	0.47	mg/kg	9.00E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.26E-04	mg/kg-day	4.00E-02	mg/kg-day	3.15E-03
				1-Methylnaphthalene	0.72	mg/kg	1.39E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.95E-04	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	1.00	mg/kg	1.93E-05	mg/kg-day	-	(mg/kg-day)-1	-	2.71E-04	mg/kg-day	4.00E-03	mg/kg-day	6.77E-02
				Naphthalene	1.12	mg/kg	2.16E-05	mg/kg-day	-	(mg/kg-day)-1	-	3.02E-04	mg/kg-day	2.00E-02	mg/kg-day	1.51E-02
				Phenanthrene	0.42	mg/kg	8.11E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.14E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	0.35	mg/kg	6.76E-06	mg/kg-day	-	(mg/kg-day)-1	-	9.46E-05	mg/kg-day	3.00E-02	mg/kg-day	3.15E-03
				Chlordane - alpha	0.15	mg/kg	2.84E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	9.93E-07	3.97E-05	mg/kg-day	5.00E-04	mg/kg-day	7.95E-02
				Chlordane - gamma	0.12	mg/kg	2.26E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	7.91E-07	3.16E-05	mg/kg-day	5.00E-04	mg/kg-day	6.32E-02
				o,p'-DDD	0.14	mg/kg	2.61E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	6.25E-07	3.65E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.51	mg/kg	9.88E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	2.37E-06	1.38E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.37	mg/kg	7.20E-06	mg/kg-day	3.40E-01	(mg/kg-day)-1	2.45E-06	1.01E-04	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.070	mg/kg	1.35E-06	mg/kg-day	1.60E+01	(mg/kg-day)-1	2.16E-05	1.89E-05	mg/kg-day	5.00E-05	mg/kg-day	3.78E-01
				cis-Nonachlor	0.035	mg/kg	6.76E-07	mg/kg-day	-	(mg/kg-day)-1	-	9.46E-06	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.075	mg/kg	1.45E-06	mg/kg-day	-	(mg/kg-day)-1	-	2.03E-05	mg/kg-day	-	mg/kg-day	-
				Aluminum	25	mg/kg	4.89E-04	mg/kg-day	-	(mg/kg-day)-1	-	6.85E-03	mg/kg-day	1.00E+00	mg/kg-day	6.85E-03
				Chromium	1.19	mg/kg	2.29E-05	mg/kg-day	-	(mg/kg-day)-1	-	3.21E-04	mg/kg-day	1.00E-03	mg/kg-day	3.21E-01
				Copper	5.39	mg/kg	1.04E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.46E-03	mg/kg-day	4.00E-02	mg/kg-day	3.64E-02
				Iron	221	mg/kg	4.27E-03	mg/kg-day	-	(mg/kg-day)-1	-	5.97E-02	mg/kg-day	-	mg/kg-day	-
				Lead	2.70	mg/kg	5.20E-05	mg/kg-day	-	(mg/kg-day)-1	-	7.28E-04	mg/kg-day	-	mg/kg-day	-

TABLE 7.4 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 6	Fish	Carp Fillet	Ingestion	Selenium	2.70	mg/kg	5.20E-05	mg/kg-day	-	(mg/kg-day)-1	-	7.28E-04	mg/kg-day	5.00E-03	mg/kg-day	1.46E-01
				Zinc	216	mg/kg	4.16E-03	mg/kg-day	-	(mg/kg-day)-1	-	5.83E-02	mg/kg-day	3.00E-01	mg/kg-day	1.94E-01
				Dioxin TEQ	6.00E-05	mg/kg	1.16E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	1.74E-04	1.62E-08	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	2.98	mg/kg	5.75E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	1.15E-04	8.05E-04	mg/kg-day	2.00E-05	mg/kg-day	4.02E+01
			Exp. Route Total								3.18E-04					42
		Exposure Point Total									3.18E-04					42
	Exposure Medium Total - Weighted Sum of Risk Estimates										3.18E-04					42
Area Total											5.76E-04					45
Reach 7	Sediment	Surface Sediment	Incidental Ingestion	Benzene	25	mg/kg	3.67E-06	mg/kg-day	5.50E-02	(mg/kg-day)-1	2.02E-07	5.14E-05	mg/kg-day	4.00E-03	mg/kg-day	1.29E-02
10.98%				Benzo(a)anthracene	66	mg/kg	9.70E-06	mg/kg-day	7.30E-01	(mg/kg-day)-1	7.08E-06	1.36E-04	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.61E-05	mg/kg-day	7.30E+00	(mg/kg-day)-1	1.17E-04	2.25E-04	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	7.50	mg/kg	1.10E-06	mg/kg-day	7.30E-01	(mg/kg-day)-1	8.05E-07	1.54E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.50	mg/kg	9.55E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.34E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	14	mg/kg	2.06E-06	mg/kg-day	7.30E-02	(mg/kg-day)-1	1.50E-07	2.88E-05	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	9.99E-06	mg/kg-day	7.30E-03	(mg/kg-day)-1	7.29E-08	1.40E-04	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	2.20	mg/kg	3.23E-07	mg/kg-day	7.30E+00	(mg/kg-day)-1	2.36E-06	4.53E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.70	mg/kg	6.91E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	5.04E-07	9.67E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	630	mg/kg	9.26E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.30E-03	mg/kg-day	4.00E-03	mg/kg-day	3.24E-01
				Naphthalene	820	mg/kg	1.20E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.69E-03	mg/kg-day	2.00E-02	mg/kg-day	8.43E-02
				Phenanthrene	440	mg/kg	6.47E-05	mg/kg-day	-	(mg/kg-day)-1	-	9.05E-04	mg/kg-day	-	mg/kg-day	-
				Total Chlordane	2.14	mg/kg	3.14E-07	mg/kg-day	-	(mg/kg-day)-1	-	4.40E-06	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	6.80	mg/kg	9.99E-07	mg/kg-day	3.40E-01	(mg/kg-day)-1	3.40E-07	1.40E-05	mg/kg-day	-	mg/kg-day	-
				Total DDT	2.80	mg/kg	4.11E-07	mg/kg-day	3.40E-01	(mg/kg-day)-1	1.40E-07	5.76E-06	mg/kg-day	5.00E-04	mg/kg-day	1.15E-02
				Dieldrin	2.83	mg/kg	4.16E-07	mg/kg-day	1.60E+01	(mg/kg-day)-1	6.65E-06	5.82E-06	mg/kg-day	5.00E-05	mg/kg-day	1.16E-01
				Heptachlor	0.19	mg/kg	2.79E-08	mg/kg-day	4.50E+00	(mg/kg-day)-1	1.26E-07	3.91E-07	mg/kg-day	5.00E-04	mg/kg-day	7.82E-04
				Toxaphene	2.05	mg/kg	3.01E-07	mg/kg-day	1.10E+00	(mg/kg-day)-1	3.31E-07	4.22E-06	mg/kg-day	-	mg/kg-day	-
				Arsenic	24	mg/kg	3.53E-06	mg/kg-day	1.50E+00	(mg/kg-day)-1	5.29E-06	4.94E-05	mg/kg-day	3.00E-04	mg/kg-day	1.65E-01
				Cadmium	18	mg/kg	2.65E-06	mg/kg-day	-	(mg/kg-day)-1	-	3.70E-05	mg/kg-day	1.00E-03	mg/kg-day	3.70E-02
				Lead	1,306	mg/kg	1.92E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.69E-03	mg/kg-day	-	mg/kg-day	-
				Manganese	614	mg/kg	9.02E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.26E-03	mg/kg-day	1.40E-01	mg/kg-day	9.02E-03
				Mercury	6.30	mg/kg	9.26E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.30E-05	mg/kg-day	4.00E-02	mg/kg-day	3.24E-04
				Aroclor 1248	14	mg/kg	2.01E-06	mg/kg-day	2.00E+00	(mg/kg-day)-1	4.01E-06	2.81E-05	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.36	mg/kg	5.29E-08	mg/kg-day	2.00E+00	(mg/kg-day)-1	1.06E-07	7.41E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.46E-04					0.8
			Dermal Absorption	Benzene	25	mg/kg		mg/kg-day	5.67E-02	(mg/kg-day)-1			mg/kg-day	3.88E-03	mg/kg-day	
				Benzo(a)anthracene	66	mg/kg	1.42E-06	mg/kg-day	2.35E+00	(mg/kg-day)-1	3.33E-06	1.98E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	2.35E-06	mg/kg-day	2.35E+01	(mg/kg-day)-1	5.53E-05	3.29E-05	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	7.50	mg/kg	1.61E-07	mg/kg-day	2.35E+00	(mg/kg-day)-1	3.79E-07	2.25E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.50	mg/kg	1.39E-07	mg/kg-day	-	(mg/kg-day)-1	-	1.95E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	14	mg/kg	3.00E-07	mg/kg-day	2.35E-01	(mg/kg-day)-1	7.07E-08	4.20E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	1.46E-06	mg/kg-day	2.35E-02	(mg/kg-day)-1	3.44E-08	2.04E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	2.20	mg/kg	4.72E-08	mg/kg-day	2.35E+01	(mg/kg-day)-1	1.11E-06	6.61E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.70	mg/kg	1.01E-07	mg/kg-day	2.35E+00	(mg/kg-day)-1	2.37E-07	1.41E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	630	mg/kg	1.35E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.89E-04	mg/kg-day	3.20E-03	mg/kg-day	5.91E-02
				Naphthalene	820	mg/kg	1.76E-05	mg/kg-day	-	(mg/kg-day)-1	-	2.46E-04	mg/kg-day	1.60E-02	mg/kg-day	1.54E-02
				Phenanthrene	440	mg/kg	9.44E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.32E-04	mg/kg-day	-	mg/kg-day	-
				Total Chlordane	2.14	mg/kg	1.41E-08	mg/kg-day	-	(mg/kg-day)-1	-	1.98E-07	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	6.80	mg/kg	3.37E-08	mg/kg-day	4.86E-01	(mg/kg-day)-1	1.64E-08	4.71E-07	mg/kg-day	-	mg/kg-day	-
				Total DDT	2.80	mg/kg	1.39E-08	mg/kg-day	4.86E-01	(mg/kg-day)-1	6.73E-09	1.94E-07	mg/kg-day	-	mg/kg-day	-

TABLE 7.4 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 7	Sediment	Surface Sediment	Dermal Absorption	Dieldrin	2.83	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Heptachlor	0.19	mg/kg	3.14E-10	mg/kg-day	6.25E+00	(mg/kg-day)$^{-1}$	1.96E-09	4.39E-09	mg/kg-day	3.60E-04	mg/kg-day	1.22E-05
				Toxaphene	2.05	mg/kg		mg/kg-day	2.20E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Arsenic	24	mg/kg	1.19E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	4.35E-07	1.66E-06	mg/kg-day	1.23E-04	mg/kg-day	1.35E-02
				Cadmium	18	mg/kg	2.97E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.16E-08	mg/kg-day	1.00E-05	mg/kg-day	4.16E-03
				Lead	1,306	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	614	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	6.30	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1248	14	mg/kg	3.15E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	7.01E-07	4.41E-06	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.36	mg/kg	8.32E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.85E-08	1.16E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								6.17E-05					0.09
		Exposure Point Total									2.07E-04					0.85
	Exposure Medium Total										2.07E-04					0.85
	Fish	Carp Fillet 50.0%	Ingestion	Acenaphthene	1.73	mg/kg	3.34E-05	mg/kg-day	-	(mg/kg-day)-1	-	4.67E-04	mg/kg-day	6.00E-02	mg/kg-day	7.79E-03
				Benzoic acid	6.39	mg/kg	1.23E-04	mg/kg-day	-	(mg/kg-day)-1	-	1.73E-03	mg/kg-day	4.00E+00	mg/kg-day	4.32E-04
				Fluoranthene	0.41	mg/kg	7.99E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.12E-04	mg/kg-day	4.00E-02	mg/kg-day	2.80E-03
				Fluorene	0.64	mg/kg	1.23E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.73E-04	mg/kg-day	4.00E-02	mg/kg-day	4.32E-03
				2-Methylnaphthalene	0.60	mg/kg	1.16E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.63E-04	mg/kg-day	4.00E-03	mg/kg-day	4.07E-02
				Naphthalene	0.56	mg/kg	1.09E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.52E-04	mg/kg-day	2.00E-02	mg/kg-day	7.62E-03
				Phenanthrene	0.79	mg/kg	1.52E-05	mg/kg-day	-	(mg/kg-day)-1	-	2.13E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	0.87	mg/kg	1.67E-05	mg/kg-day	-	(mg/kg-day)-1	-	2.34E-04	mg/kg-day	3.00E-02	mg/kg-day	7.79E-03
				Chlordane - alpha	0.08	mg/kg	1.60E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	5.61E-07	2.24E-05	mg/kg-day	5.00E-04	mg/kg-day	4.49E-02
				Chlordane - gamma	0.13	mg/kg	2.51E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	8.78E-07	3.51E-05	mg/kg-day	5.00E-04	mg/kg-day	7.03E-02
				o,p'-DDD	0.11	mg/kg	2.03E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	4.86E-07	2.84E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	0.38	mg/kg	7.26E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	1.74E-06	1.02E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.23	mg/kg	4.50E-06	mg/kg-day	3.40E-01	(mg/kg-day)-1	1.53E-06	6.30E-05	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.031	mg/kg	5.98E-07	mg/kg-day	1.60E+01	(mg/kg-day)-1	9.58E-06	8.38E-06	mg/kg-day	5.00E-05	mg/kg-day	1.68E-01
				cis-Nonachlor	0.024	mg/kg	4.63E-07	mg/kg-day	-	(mg/kg-day)-1	-	6.49E-06	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.056	mg/kg	1.08E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.51E-05	mg/kg-day	-	mg/kg-day	-
				Aluminum	34	mg/kg	6.53E-04	mg/kg-day	-	(mg/kg-day)-1	-	9.14E-03	mg/kg-day	1.00E+00	mg/kg-day	9.14E-03
				Chromium	1.65	mg/kg	3.19E-05	mg/kg-day	-	(mg/kg-day)-1	-	4.47E-04	mg/kg-day	1.00E-03	mg/kg-day	4.47E-01
				Copper	10.90	mg/kg	2.10E-04	mg/kg-day	-	(mg/kg-day)-1	-	2.95E-03	mg/kg-day	4.00E-02	mg/kg-day	7.37E-02
				Iron	271	mg/kg	5.23E-03	mg/kg-day	-	(mg/kg-day)-1	-	7.32E-02	mg/kg-day	-	mg/kg-day	-
				Lead	4.51	mg/kg	8.71E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.22E-03	mg/kg-day	-	mg/kg-day	-
				Selenium	2.90	mg/kg	5.59E-05	mg/kg-day	-	(mg/kg-day)-1	-	7.82E-04	mg/kg-day	5.00E-03	mg/kg-day	1.56E-01
				Zinc	271	mg/kg	5.23E-03	mg/kg-day	-	(mg/kg-day)-1	-	7.32E-02	mg/kg-day	3.00E-01	mg/kg-day	2.44E-01
				Dioxin TEQ	2.91E-05	mg/kg	5.62E-10	mg/kg-day	1.50E+05	(mg/kg-day)-1	8.43E-05	7.87E-09	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	1.30	mg/kg	2.51E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	5.02E-05	3.51E-04	mg/kg-day	2.00E-05	mg/kg-day	1.76E+01
			Exp. Route Total								1.49E-04					18.9
		Exposure Point Total									1.49E-04					18.9
		Goldfish Fillet 50.0%	Ingestion	Acenaphthene	3.24	mg/kg	6.25E-05	mg/kg-day	-	(mg/kg-day)-1	-	8.75E-04	mg/kg-day	6.00E-02	mg/kg-day	1.46E-02
				Acenaphthylene	0.23	mg/kg	4.44E-06	mg/kg-day	-	(mg/kg-day)-1	-	6.22E-05	mg/kg-day	-	mg/kg-day	-
				Anthracene	0.24	mg/kg	4.61E-06	mg/kg-day	-	(mg/kg-day)-1	-	6.46E-05	mg/kg-day	3.00E-01	mg/kg-day	2.15E-04
				Benzo(a)anthracene	0.007	mg/kg	1.35E-07	mg/kg-day	7.30E-01	(mg/kg-day)-1	9.86E-08	1.89E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	0.008	mg/kg	1.54E-07	mg/kg-day	7.30E-03	(mg/kg-day)-1	1.13E-09	2.16E-06	mg/kg-day	-	mg/kg-day	-
				Dibenzofuran	0.28	mg/kg	5.44E-06	mg/kg-day	-	(mg/kg-day)-1	-	7.62E-05	mg/kg-day	4.00E-03	mg/kg-day	1.91E-02
				Fluoranthene	0.36	mg/kg	6.87E-06	mg/kg-day	-	(mg/kg-day)-1	-	9.62E-05	mg/kg-day	4.00E-02	mg/kg-day	2.41E-03
				Fluorene	1.04	mg/kg	2.00E-05	mg/kg-day	-	(mg/kg-day)-1	-	2.80E-04	mg/kg-day	4.00E-02	mg/kg-day	7.00E-03
				1-Methylnaphthalene	0.58	mg/kg	1.12E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.57E-04	mg/kg-day	-	mg/kg-day	-

TABLE 7.4 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area		% of Total Fish					Value	Units	Value	Units		Value	Units	Value	Units	
Reach 7	Fish	Goldfish Fillet	Ingestion	2-Methylnaphthalene	0.91	mg/kg	1.75E-05	mg/kg-day	-	(mg/kg-day)-1	-	2.45E-04	mg/kg-day	4.00E-03	mg/kg-day	6.12E-02
				Naphthalene	0.91	mg/kg	1.75E-05	mg/kg-day	-	(mg/kg-day)-1	-	2.45E-04	mg/kg-day	2.00E-02	mg/kg-day	1.22E-02
				Phenanthrene	0.68	mg/kg	1.31E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.84E-04	mg/kg-day	-	mg/kg-day	-
				Pyrene	0.55	mg/kg	1.06E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.49E-04	mg/kg-day	3.00E-02	mg/kg-day	4.95E-03
				Chlordane - alpha	0.30	mg/kg	5.75E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	2.01E-06	8.05E-05	mg/kg-day	5.00E-04	mg/kg-day	1.61E-01
				Chlordane - gamma	0.22	mg/kg	4.25E-06	mg/kg-day	3.50E-01	(mg/kg-day)-1	1.49E-06	5.95E-05	mg/kg-day	5.00E-04	mg/kg-day	1.19E-01
				o,p'-DDD	0.18	mg/kg	3.38E-06	mg/kg-day	2.40E-01	(mg/kg-day)-1	8.11E-07	4.73E-05	mg/kg-day	-	mg/kg-day	-
				p,p'-DDD	1.10	mg/kg	2.12E-05	mg/kg-day	2.40E-01	(mg/kg-day)-1	5.10E-06	2.97E-04	mg/kg-day	-	mg/kg-day	-
				p,p'-DDE	0.68	mg/kg	1.31E-05	mg/kg-day	3.40E-01	(mg/kg-day)-1	4.46E-06	1.84E-04	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.074	mg/kg	1.43E-06	mg/kg-day	1.60E+01	(mg/kg-day)-1	2.29E-05	2.00E-05	mg/kg-day	5.00E-05	mg/kg-day	4.00E-01
				cis-Nonachlor	0.065	mg/kg	1.25E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.76E-05	mg/kg-day	-	mg/kg-day	-
				Trans nonachlor	0.13	mg/kg	2.49E-06	mg/kg-day	-	(mg/kg-day)-1	-	3.49E-05	mg/kg-day	-	mg/kg-day	-
				Iron	22	mg/kg	4.31E-04	mg/kg-day	-	(mg/kg-day)-1	-	6.04E-03	mg/kg-day	-	mg/kg-day	-
				Chromium	0.39	mg/kg	7.49E-06	mg/kg-day	-	(mg/kg-day)-1	-	1.05E-04	mg/kg-day	1.00E-03	mg/kg-day	1.05E-01
				Copper	3.88	mg/kg	7.50E-05	mg/kg-day	-	(mg/kg-day)-1	-	1.05E-03	mg/kg-day	4.00E-02	mg/kg-day	2.62E-02
				Selenium	2.98	mg/kg	5.75E-05	mg/kg-day	-	(mg/kg-day)-1	-	8.05E-04	mg/kg-day	5.00E-03	mg/kg-day	1.61E-01
				Zinc	84	mg/kg	1.62E-03	mg/kg-day	-	(mg/kg-day)-1	-	2.27E-02	mg/kg-day	3.00E-01	mg/kg-day	7.58E-02
				Dioxin TEQ	9.15E-05	mg/kg	1.77E-09	mg/kg-day	1.50E+05	(mg/kg-day)-1	2.65E-04	2.47E-08	mg/kg-day	-	mg/kg-day	-
				Nondioxin-like PCBs	4.09	mg/kg	7.90E-05	mg/kg-day	2.00E+00	(mg/kg-day)-1	1.58E-04	1.11E-03	mg/kg-day	2.00E-05	mg/kg-day	5.53E+01
			Exp. Route Total								4.60E-04					56
		Exposure Point Total									4.60E-04					56
	Exposure Medium Total - Weighted Sum of Risk Estimates										3.04E-04					38
Area Total											5.12E-04					38
Surface Water	Surface Water	Surface Water	Incidental Ingestion	Chlorodibromomethane	0.0015	mg/L	1.18E-07	mg/kg-day	8.40E-02	$(mg/kg\text{-}day)^{-1}$	9.90E-09	1.65E-06	mg/kg-day	3.00E-03	mg/kg-day	5.50E-04
				Naphthalene	0.0012	mg/L	9.04E-08	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	1.27E-06	mg/kg-day	2.00E-02	mg/kg-day	6.33E-05
				Aluminum (Total)	1.38	mg/L	1.08E-04	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	1.52E-03	mg/kg-day	1.00E+00	mg/kg-day	1.52E-03
				Arsenic (Total)	0.004	mg/L	3.14E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	4.71E-07	4.40E-06	mg/kg-day	3.00E-04	mg/kg-day	1.47E-02
				Chromium (Total)	0.0051	mg/L	4.01E-07	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	5.61E-06	mg/kg-day	3.00E-03	mg/kg-day	1.87E-03
				Lead (Total)	0.013	mg/L	1.02E-06	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	1.43E-05	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								4.81E-07					0.019
			Dermal Absorption	Chlorodibromomethane	0.0015	mg/L	5.54E-08	mg/kg-day	8.40E-02	$(mg/kg\text{-}day)^{-1}$	4.66E-09	7.76E-07	mg/kg-day	2.40E-03	mg/kg-day	3.23E-04
				Naphthalene	0.0012	mg/L	3.73E-07	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	5.22E-06	mg/kg-day	1.60E-02	mg/kg-day	3.26E-04
				Aluminum (Total)	1.38	mg/L	6.51E-06	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	9.11E-05	mg/kg-day	1.00E-01	mg/kg-day	9.11E-04
				Arsenic (Total)	0.004	mg/L	1.89E-08	mg/kg-day	3.66E+00	$(mg/kg\text{-}day)^{-1}$	6.90E-08	2.64E-07	mg/kg-day	1.23E-04	mg/kg-day	2.15E-03
				Chromium (Total)	0.0051	mg/L	4.81E-08	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	6.73E-07	mg/kg-day	6.00E-05	mg/kg-day	1.12E-02
				Lead (Total)	0.013	mg/L	6.13E-09	mg/kg-day	-	$(mg/kg\text{-}day)^{-1}$	-	8.58E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								7.37E-08					0.01
		Exposure Point Total									5.55E-07					0.03
	Exposure Medium Total										5.55E-07					0.03
Medium Total											5.55E-07					0.03
Weighted Sums of Risk Estimates									Total of Receptor Risks Across All Media		4.94E-04			Total of Receptor Hazards Across All Media		1.95E+01

TABLE 7.5 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Sediment	Surface Sediment	Incidental Ingestion	bis(2-Ethylhexyl)phthalate	81	mg/kg	9.06E-07	mg/kg-day	1.40E-02	(mg/kg-day)$^{-1}$	1.27E-08	2.54E-06	mg/kg-day	2.00E-02	mg/kg-day	1.27E-04
13.56%				Benzo(a)anthracene	280	mg/kg	3.13E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.29E-06	8.77E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.23E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	8.98E-06	3.44E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	99	mg/kg	1.11E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	8.08E-07	3.10E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	89	mg/kg	9.95E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.79E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	42	mg/kg	4.70E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	3.43E-08	1.32E-06	mg/kg-day	-	mg/kg-day	-
				Carbazole	47	mg/kg	5.26E-07	mg/kg-day	2.00E-02	(mg/kg-day)$^{-1}$	1.05E-08	1.47E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	600	mg/kg	6.71E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	4.90E-08	1.88E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	41	mg/kg	4.58E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	3.35E-06	1.28E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	50	mg/kg	5.59E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	4.08E-07	1.57E-06	mg/kg-day	-	mg/kg-day	-
				Naphthalene	896	mg/kg	1.00E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.81E-05	mg/kg-day	2.00E-02	mg/kg-day	1.40E-03
				Phenanthrene	1,900	mg/kg	2.12E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.95E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	720	mg/kg	8.05E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.25E-05	mg/kg-day	3.00E-02	mg/kg-day	7.51E-04
				Dieldrin	0.12	mg/kg	1.34E-09	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	2.15E-08	3.76E-09	mg/kg-day	5.00E-05	mg/kg-day	7.51E-05
				Aluminum	25,100	mg/kg	2.81E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.86E-04	mg/kg-day	1.00E+00	mg/kg-day	7.86E-04
				Antimony	72	mg/kg	8.03E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.25E-06	mg/kg-day	4.00E-04	mg/kg-day	5.62E-03
				Arsenic	165	mg/kg	1.84E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	2.77E-06	5.16E-06	mg/kg-day	3.00E-04	mg/kg-day	1.72E-02
				Cadmium	52	mg/kg	5.84E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.63E-06	mg/kg-day	1.00E-03	mg/kg-day	1.63E-03
				Chromium	622	mg/kg	6.96E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.95E-05	mg/kg-day	3.00E-03	mg/kg-day	6.49E-03
				Iron	85,000	mg/kg	9.51E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.66E-03	mg/kg-day	-	mg/kg-day	-
				Lead	4,195	mg/kg	4.69E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.31E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	907	mg/kg	1.01E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.84E-05	mg/kg-day	1.40E-01	mg/kg-day	2.03E-04
				Nickel	1,140	mg/kg	1.27E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.57E-05	mg/kg-day	2.00E-02	mg/kg-day	1.78E-03
				Zinc	3,305	mg/kg	3.70E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.03E-04	mg/kg-day	3.00E-01	mg/kg-day	3.45E-04
				Aroclor 1242	6.80	mg/kg	7.60E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.52E-07	2.13E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	7.94	mg/kg	8.88E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.78E-07	2.49E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	1.32	mg/kg	1.48E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.95E-08	4.13E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.91E-05					0.036
			Dermal Absorption	bis(2-Ethylhexyl)phthalate	81	mg/kg	5.98E-07	mg/kg-day	7.37E-02	(mg/kg-day)$^{-1}$	4.40E-08	1.67E-06	mg/kg-day	3.80E-03	mg/kg-day	4.40E-04
				Benzo(a)anthracene	280	mg/kg	2.69E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	6.33E-06	7.52E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.06E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.49E-05	2.96E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	99	mg/kg	9.50E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	2.24E-06	2.66E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	89	mg/kg	8.54E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.39E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	42	mg/kg	4.03E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	9.49E-08	1.13E-06	mg/kg-day	-	mg/kg-day	-
				Carbazole	47	mg/kg	3.47E-07	mg/kg-day	2.86E-02	(mg/kg-day)$^{-1}$	9.91E-09	9.71E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	600	mg/kg	5.76E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	1.36E-07	1.61E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	41	mg/kg	3.93E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	9.26E-06	1.10E-06	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	50	mg/kg	4.80E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.13E-06	1.34E-06	mg/kg-day	-	mg/kg-day	-
				Naphthalene	896	mg/kg	8.60E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.41E-05	mg/kg-day	1.60E-02	mg/kg-day	1.51E-03
				Phenanthrene	1,900	mg/kg	1.82E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.10E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	720	mg/kg	6.91E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.93E-05	mg/kg-day	9.30E-03	mg/kg-day	2.08E-03
				Dieldrin	0.12	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Aluminum	25,100	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	72	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	165	mg/kg	3.65E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.34E-06	1.02E-06	mg/kg-day	1.23E-04	mg/kg-day	8.31E-03
				Cadmium	52	mg/kg	3.85E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.08E-08	mg/kg-day	1.00E-05	mg/kg-day	1.08E-03
				Chromium	622	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	85,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	4,195	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	907	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Nickel	1,140	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.40E-03	mg/kg-day	

TABLE 7.5 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 1	Sediment	Surface Sediment	Dermal Absorption	Zinc	3,305	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-02	mg/kg-day	
13.56%				Aroclor 1242	6.80	mg/kg	7.03E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.56E-07	1.97E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	7.94	mg/kg	8.20E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.82E-07	2.30E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	1.32	mg/kg	1.36E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	3.03E-08	3.82E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								4.58E-05					0.01
		Exposure Point Total									6.49E-05					0.05
	Exposure Medium Total										6.49E-05					0.05
Area Total											6.49E-05					0.05
Reach 2	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	172	mg/kg	1.92E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.40E-06	5.39E-06	mg/kg-day	-	mg/kg-day	-
19.16%				Benzo(a)pyrene	120	mg/kg	1.34E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	9.78E-06	3.75E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	34	mg/kg	3.80E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.78E-07	1.06E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	29	mg/kg	3.24E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.08E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11.16	mg/kg	1.25E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	9.11E-09	3.49E-07	mg/kg-day	-	mg/kg-day	-
				Carbazole	33	mg/kg	3.69E-07	mg/kg-day	2.00E-02	(mg/kg-day)$^{-1}$	7.38E-09	1.03E-06	mg/kg-day	-	mg/kg-day	-
				Chrysene	326	mg/kg	3.65E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	2.66E-08	1.02E-05	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	15.77	mg/kg	1.76E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.29E-06	4.94E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	17.59	mg/kg	1.97E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.44E-07	5.51E-07	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	372	mg/kg	4.16E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.17E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	254	mg/kg	2.85E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.97E-06	mg/kg-day	3.00E-02	mg/kg-day	2.66E-04
				Total Chlordane	2.35	mg/kg	2.63E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.36E-08	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	8.84	mg/kg	9.89E-08	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	3.36E-08	2.77E-07	mg/kg-day	-	mg/kg-day	-
				Total DDT	10.30	mg/kg	1.15E-07	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	3.92E-08	3.23E-07	mg/kg-day	5.00E-04	mg/kg-day	6.45E-04
				Dieldrin	4.25	mg/kg	4.75E-08	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	7.60E-07	1.33E-07	mg/kg-day	5.00E-05	mg/kg-day	2.66E-03
				gamma-BHC (Lindane)	3.16	mg/kg	3.53E-08	mg/kg-day	1.30E+00	(mg/kg-day)$^{-1}$	4.59E-08	9.89E-08	mg/kg-day	3.00E-04	mg/kg-day	3.30E-04
				Heptachlor	4.61	mg/kg	5.16E-08	mg/kg-day	4.50E+00	(mg/kg-day)$^{-1}$	2.32E-07	1.44E-07	mg/kg-day	5.00E-04	mg/kg-day	2.89E-04
				Hexachlorocyclohexane-all isomers	3.16	mg/kg	3.53E-08	mg/kg-day	1.80E+00	(mg/kg-day)$^{-1}$	6.36E-08	9.89E-08	mg/kg-day	-	mg/kg-day	-
				Toxaphene		mg/kg		mg/kg-day	1.10E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Aluminum	10,507	mg/kg	1.17E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.29E-04	mg/kg-day	1.00E+00	mg/kg-day	3.29E-04
				Antimony	47	mg/kg	5.30E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.48E-06	mg/kg-day	4.00E-04	mg/kg-day	3.71E-03
				Arsenic	180	mg/kg	2.01E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	3.02E-06	5.64E-06	mg/kg-day	3.00E-04	mg/kg-day	1.88E-02
				Cadmium	74	mg/kg	8.26E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.31E-06	mg/kg-day	1.00E-03	mg/kg-day	2.31E-03
				Chromium	620	mg/kg	6.93E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.94E-05	mg/kg-day	3.00E-03	mg/kg-day	6.47E-03
				Iron	186,911	mg/kg	2.09E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.85E-03	mg/kg-day	-	mg/kg-day	-
				Lead	3,201	mg/kg	3.58E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.00E-04	mg/kg-day	-	mg/kg-day	-
				Manganese	1,113	mg/kg	1.25E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.49E-05	mg/kg-day	1.40E-01	mg/kg-day	2.49E-04
				Mercury	7.20	mg/kg	8.05E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.25E-07	mg/kg-day	4.00E-02	mg/kg-day	5.64E-06
				Zinc	8,436	mg/kg	9.43E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.64E-04	mg/kg-day	3.00E-01	mg/kg-day	8.80E-04
				2,3,7,8-Dibenzo-p-dioxin	6.00E-06	mg/kg	6.71E-14	mg/kg-day	1.50E+05	(mg/kg-day)$^{-1}$	1.01E-08	1.88E-13	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	10.40	mg/kg	1.16E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.33E-07	3.26E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.74E-05					0.037
			Dermal Absorption	Benzo(a)anthracene	172	mg/kg	1.65E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	3.89E-06	4.62E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	120	mg/kg	1.15E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.71E-05	3.22E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	34	mg/kg	3.26E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	7.68E-07	9.13E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	29	mg/kg	2.78E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.79E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11.16	mg/kg	1.07E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	2.52E-08	3.00E-07	mg/kg-day	-	mg/kg-day	-
				Carbazole	33	mg/kg	2.44E-07	mg/kg-day	2.86E-02	(mg/kg-day)$^{-1}$	6.96E-09	6.82E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	326	mg/kg	3.13E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	7.37E-08	8.76E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	15.77	mg/kg	1.51E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	3.56E-06	4.24E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	17.59	mg/kg	1.69E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	3.97E-07	4.73E-07	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	372	mg/kg	3.57E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.00E-05	mg/kg-day	-	mg/kg-day	-

TABLE 7.5 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 2	Sediment	Surface Sediment	Dermal Absorption	Pyrene	254	mg/kg	2.44E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.84E-06	mg/kg-day	9.30E-03	mg/kg-day	7.35E-04
19.16%				Total Chlordane	2.35	mg/kg	6.94E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.94E-08	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	8.84	mg/kg	1.96E-08	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	9.51E-09	5.48E-08	mg/kg-day	-	mg/kg-day	-
				Total DDT	10.30	mg/kg	2.28E-08	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	1.11E-08	6.39E-08	mg/kg-day	3.50E-04	mg/kg-day	1.82E-04
				Dieldrin	4.25	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				gamma-BHC (Lindane)	3.16	mg/kg	9.33E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.61E-08	mg/kg-day	2.91E-04	mg/kg-day	8.98E-05
				Heptachlor	4.61	mg/kg	3.40E-09	mg/kg-day	6.25E+00	(mg/kg-day)$^{-1}$	2.13E-08	9.53E-09	mg/kg-day	3.60E-04	mg/kg-day	2.65E-05
				Hexachlorocyclohexane-all isomers	3.16	mg/kg	9.33E-09	mg/kg-day	1.86E+00	(mg/kg-day)$^{-1}$	1.73E-08	2.61E-08	mg/kg-day	-	mg/kg-day	-
				Toxaphene		mg/kg		mg/kg-day	2.20E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Aluminum	10,507	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	47	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	180	mg/kg	3.99E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.46E-06	1.12E-06	mg/kg-day	1.23E-04	mg/kg-day	9.07E-03
				Cadmium	74	mg/kg	5.45E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.53E-08	mg/kg-day	1.00E-05	mg/kg-day	1.53E-03
				Chromium	620	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	186,911	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	3,201	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	1,113	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	7.20	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Zinc	8,436	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-02	mg/kg-day	
				2,3,7,8-Dibenzo-p-dioxin	6.00E-06	mg/kg	4.43E-16	mg/kg-day	3.00E+05	(mg/kg-day)$^{-1}$	1.33E-10	1.24E-15	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	10.40	mg/kg	1.07E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	2.39E-07	3.01E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.76E-05					0.01
		Exposure Point Total									5.49E-05					0.05
	Exposure Medium Total										5.49E-05					0.05
Area Total											5.49E-05					0.05
Reach 3	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	27	mg/kg	3.02E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.20E-07	8.45E-07	mg/kg-day	-	mg/kg-day	-
9.98%				Benzo(a)pyrene	16	mg/kg	1.79E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.31E-06	5.01E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	12	mg/kg	1.34E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	9.80E-08	3.76E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.70	mg/kg	7.49E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.10E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11	mg/kg	1.23E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	8.98E-09	3.44E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	7.60E-07	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	5.55E-09	2.13E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.00	mg/kg	4.47E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	3.27E-07	1.25E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.90	mg/kg	5.48E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	4.00E-08	1.53E-07	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	120	mg/kg	1.34E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.76E-06	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.028	mg/kg	3.13E-10	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	5.01E-09	8.77E-10	mg/kg-day	5.00E-05	mg/kg-day	1.75E-05
				Arsenic	110	mg/kg	1.23E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	1.85E-06	3.44E-06	mg/kg-day	3.00E-04	mg/kg-day	1.15E-02
				Cadmium	36	mg/kg	4.03E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.13E-06	mg/kg-day	1.00E-03	mg/kg-day	1.13E-03
				Chromium	410	mg/kg	4.58E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.28E-05	mg/kg-day	3.00E-03	mg/kg-day	4.28E-03
				Lead	5,200	mg/kg	5.81E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.63E-04	mg/kg-day	-	mg/kg-day	-
				Mercury	15	mg/kg	1.68E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.70E-07	mg/kg-day	4.00E-02	mg/kg-day	1.17E-05
				Aroclor 1248	1.20	mg/kg	1.34E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	2.68E-08	3.76E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.55	mg/kg	6.15E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.23E-08	1.72E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.89E-06					1.69E-02
			Dermal Absorption	Benzo(a)anthracene	27	mg/kg	2.59E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	6.10E-07	7.25E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	16	mg/kg	1.54E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	3.62E-06	4.30E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	12	mg/kg	1.15E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	2.71E-07	3.22E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.70	mg/kg	6.43E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.80E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11	mg/kg	1.06E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	2.49E-08	2.96E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	6.52E-07	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	1.54E-08	1.83E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.00	mg/kg	3.84E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	9.04E-07	1.07E-07	mg/kg-day	-	mg/kg-day	-

TABLE 7.5 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 3	Sediment	Surface Sediment	Dermal Absorption	Indeno(1,2,3-cd)pyrene	4.90	mg/kg	4.70E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.11E-07	1.32E-07	mg/kg-day	-	mg/kg-day	-
9.98%				Phenanthrene	120	mg/kg	1.15E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.22E-06	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.028	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Arsenic	110	mg/kg	2.44E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	8.91E-07	6.82E-07	mg/kg-day	1.23E-04	mg/kg-day	5.54E-03
				Cadmium	36	mg/kg	2.66E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.44E-09	mg/kg-day	1.00E-05	mg/kg-day	7.44E-04
				Chromium	410	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Lead	5,200	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Mercury	15	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1248	1.20	mg/kg	1.24E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	2.76E-08	3.47E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.55	mg/kg	5.68E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.26E-08	1.59E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								6.48E-06					0.01
			Inhalation	Benzo(a)anthracene	27	mg/kg	3.39E-11	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.31E-11	9.50E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	16	mg/kg	2.01E-11	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	7.74E-11	5.63E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	12	mg/kg	1.51E-11	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	5.80E-12	4.22E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.70	mg/kg	8.42E-12	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.36E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	11	mg/kg	1.38E-11	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	5.32E-12	3.87E-11	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	8.54E-11	mg/kg-day	3.85E-02	(mg/kg-day)$^{-1}$	3.29E-12	2.39E-10	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.00	mg/kg	5.03E-12	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	2.11E-11	1.41E-11	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.90	mg/kg	6.16E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	2.37E-12	1.72E-11	mg/kg-day	-	mg/kg-day	-
				Phenanthrene	120	mg/kg	1.51E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.22E-10	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.028	mg/kg	3.52E-14	mg/kg-day	1.61E+01	(mg/kg-day)$^{-1}$	5.66E-13	9.85E-14	mg/kg-day	-	mg/kg-day	-
				Arsenic	110	mg/kg	1.38E-10	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	2.08E-09	3.87E-10	mg/kg-day	-	mg/kg-day	-
				Cadmium	36	mg/kg	4.52E-11	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	2.85E-10	1.27E-10	mg/kg-day	-	mg/kg-day	-
				Chromium	410	mg/kg	5.15E-10	mg/kg-day	4.20E+01	(mg/kg-day)$^{-1}$	2.16E-08	1.44E-09	mg/kg-day	2.20E-06	mg/kg-day	6.56E-04
				Lead	5,200	mg/kg	6.53E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.83E-08	mg/kg-day	-	mg/kg-day	-
				Mercury	15	mg/kg	1.88E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.28E-11	mg/kg-day	8.57E-05	mg/kg-day	6.16E-07
				Aroclor 1248	1.20	mg/kg	1.51E-12	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	3.01E-12	4.22E-12	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.55	mg/kg	6.91E-13	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.38E-12	1.93E-12	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.41E-08					0.00066
		Exposure Point Total									1.04E-05					0.02
	Exposure Medium Total										1.04E-05					0.02
Area Total											1.04E-05					0.02
Reach 4	Sediment	Surface Sediment	Incidental Ingestion	Acenaphthene	1,300	mg/kg	1.45E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.07E-05	mg/kg-day	6.00E-02	mg/kg-day	6.78E-04
5.41%				Benzo(a)anthracene	170	mg/kg	1.90E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.39E-06	5.32E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	98	mg/kg	1.10E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	8.00E-06	3.07E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	17	mg/kg	1.90E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.39E-07	5.32E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	9.10	mg/kg	1.02E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.85E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	27	mg/kg	3.02E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	2.20E-08	8.45E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	190	mg/kg	2.12E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	1.55E-08	5.95E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.50	mg/kg	5.03E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	3.67E-07	1.41E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	43	mg/kg	4.81E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.51E-07	1.35E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	2,000	mg/kg	2.24E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.26E-05	mg/kg-day	4.00E-03	mg/kg-day	1.57E-02
				Naphthalene	2,900	mg/kg	3.24E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.08E-05	mg/kg-day	2.00E-02	mg/kg-day	4.54E-03
				Phenanthrene	1,400	mg/kg	1.57E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.38E-05	mg/kg-day	-	mg/kg-day	-
				Antimony	280	mg/kg	3.13E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.77E-06	mg/kg-day	4.00E-04	mg/kg-day	2.19E-02
				Arsenic	40	mg/kg	4.47E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	6.71E-07	1.25E-06	mg/kg-day	3.00E-04	mg/kg-day	4.17E-03
				Cadmium	23	mg/kg	2.57E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.20E-07	mg/kg-day	1.00E-03	mg/kg-day	7.20E-04
				Chromium	250	mg/kg	2.80E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.83E-06	mg/kg-day	3.00E-03	mg/kg-day	2.61E-03
				Iron	64,000	mg/kg	7.16E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.00E-03	mg/kg-day	-	mg/kg-day	-
				Lead	1,000	mg/kg	1.12E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.13E-05	mg/kg-day	-	mg/kg-day	-

TABLE 7.5 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 4	Sediment	Surface Sediment	Incidental Ingestion	Manganese		mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.40E-01	mg/kg-day	
5.41%				Mercury	12	mg/kg	1.34E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.76E-07	mg/kg-day	4.00E-02	mg/kg-day	9.39E-06
				Aroclor 1248	0.40	mg/kg	4.47E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	8.95E-09	1.25E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.29	mg/kg	3.24E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	6.49E-09	9.08E-09	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.10E-05					0.050
			Dermal Absorption	Acenaphthene	1,300	mg/kg	1.25E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.49E-05	mg/kg-day	1.86E-02	mg/kg-day	1.88E-03
				Benzo(a)anthracene	170	mg/kg	1.63E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	3.84E-06	4.57E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	98	mg/kg	9.40E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.21E-05	2.63E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	17	mg/kg	1.63E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	3.84E-07	4.57E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	9.10	mg/kg	8.73E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.44E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	27	mg/kg	2.59E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	6.10E-08	7.25E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	190	mg/kg	1.82E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	4.29E-08	5.10E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.50	mg/kg	4.32E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.02E-06	1.21E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	43	mg/kg	4.13E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	9.72E-07	1.16E-06	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	2,000	mg/kg	1.92E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.37E-05	mg/kg-day	3.20E-03	mg/kg-day	1.68E-02
				Naphthalene	2,900	mg/kg	2.78E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.79E-05	mg/kg-day	1.60E-02	mg/kg-day	4.87E-03
				Phenanthrene	1,400	mg/kg	1.34E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.76E-05	mg/kg-day	-	mg/kg-day	-
				Antimony	280	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	40	mg/kg	8.86E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	3.24E-07	2.48E-07	mg/kg-day	1.23E-04	mg/kg-day	2.02E-03
				Cadmium	23	mg/kg	1.70E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.75E-09	mg/kg-day	1.00E-05	mg/kg-day	4.75E-04
				Chromium	250	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	64,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	1,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese		mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	12	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1248	0.40	mg/kg	4.13E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	9.18E-09	1.16E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.29	mg/kg	3.00E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	6.66E-09	8.39E-09	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.88E-05					0.03
			Inhalation	Acenaphthene	1,300	mg/kg	1.63E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.57E-09	mg/kg-day	6.00E-02	mg/kg-day	7.62E-08
				Benzo(a)anthracene	170	mg/kg	2.14E-10	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	8.22E-11	5.98E-10	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	98	mg/kg	1.23E-10	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	4.74E-10	3.45E-10	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	17	mg/kg	2.14E-11	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	8.22E-12	5.98E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	9.10	mg/kg	1.14E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.20E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	27	mg/kg	3.39E-11	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.31E-11	9.50E-11	mg/kg-day	-	mg/kg-day	-
				Chrysene	190	mg/kg	2.39E-10	mg/kg-day	3.85E-02	(mg/kg-day)$^{-1}$	9.19E-12	6.68E-10	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	4.50	mg/kg	5.65E-12	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	2.37E-11	1.58E-11	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	43	mg/kg	5.40E-11	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	2.08E-11	1.51E-10	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	2,000	mg/kg	2.51E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.04E-09	mg/kg-day	-	mg/kg-day	-
				Naphthalene	2,900	mg/kg	3.64E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.02E-08	mg/kg-day	8.57E-04	mg/kg-day	1.19E-05
				Phenanthrene	1,400	mg/kg	1.76E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.93E-09	mg/kg-day	-	mg/kg-day	-
				Antimony	280	mg/kg	3.52E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.85E-10	mg/kg-day	-	mg/kg-day	-
				Arsenic	40	mg/kg	5.03E-11	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	7.56E-10	1.41E-10	mg/kg-day	-	mg/kg-day	-
				Cadmium	23	mg/kg	2.89E-11	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	1.82E-10	8.09E-11	mg/kg-day	-	mg/kg-day	-
				Chromium	250	mg/kg	3.14E-10	mg/kg-day	4.20E+01	(mg/kg-day)$^{-1}$	1.32E-08	8.80E-10	mg/kg-day	2.20E-06	mg/kg-day	4.00E-04
				Iron	64,000	mg/kg	8.04E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.25E-07	mg/kg-day	-	mg/kg-day	-

TABLE 7.5 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 4	Sediment	Surface Sediment	Inhalation	Lead	1,000	mg/kg	1.26E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.52E-09	mg/kg-day	-	mg/kg-day	-
5.41%				Manganese		mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.43E-05	mg/kg-day	
				Mercury	12	mg/kg	1.51E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.22E-11	mg/kg-day	8.57E-05	mg/kg-day	4.93E-07
				Aroclor 1248	0.40	mg/kg	5.03E-13	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.00E-12	1.41E-12	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.29	mg/kg	3.64E-13	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	7.28E-13	1.02E-12	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.48E-08					0.00041
		Exposure Point Total									3.98E-05					0.077
	Exposure Medium Total										3.98E-05					0.077
Area Total											3.98E-05					0.077
Reach 5	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	20	mg/kg	2.24E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.63E-07	6.26E-07	mg/kg-day	-	mg/kg-day	-
6.52%				Benzo(a)pyrene	7.20	mg/kg	8.05E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	5.88E-07	2.25E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	4.60	mg/kg	5.14E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.76E-08	1.44E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	2.20	mg/kg	2.46E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.89E-08	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	0.62	mg/kg	6.93E-09	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	5.06E-08	1.94E-08	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	1.80	mg/kg	2.01E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.47E-08	5.64E-08	mg/kg-day	-	mg/kg-day	-
				Aluminum	9,900	mg/kg	1.11E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.10E-04	mg/kg-day	1.00E+00	mg/kg-day	3.10E-04
				Antimony	212	mg/kg	2.37E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.64E-06	mg/kg-day	4.00E-04	mg/kg-day	1.66E-02
				Arsenic	21	mg/kg	2.29E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	3.44E-07	6.42E-07	mg/kg-day	3.00E-04	mg/kg-day	2.14E-03
				Cadmium	10.30	mg/kg	1.15E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.23E-07	mg/kg-day	1.00E-03	mg/kg-day	3.23E-04
				Iron	33,000	mg/kg	3.69E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.03E-03	mg/kg-day	-	mg/kg-day	-
				Lead	600	mg/kg	6.71E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.88E-05	mg/kg-day	-	mg/kg-day	-
				Manganese	2,860	mg/kg	3.20E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	8.95E-05	mg/kg-day	1.40E-01	mg/kg-day	6.40E-04
				Aroclor 1248	0.68	mg/kg	7.56E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.51E-08	2.12E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.21E-06					0.020
			Dermal Absorption	Benzo(a)anthracene	20	mg/kg	1.92E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.52E-07	5.37E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	7.20	mg/kg	6.91E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.63E-06	1.93E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	4.60	mg/kg	4.41E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.04E-07	1.24E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	2.20	mg/kg	2.11E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.91E-08	mg/kg-day	-	mg/kg-day	-
			Dermal Absorption	Dibenz(a,h)anthracene	0.62	mg/kg	5.95E-09	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.40E-07	1.67E-08	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	1.80	mg/kg	1.73E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.07E-08	4.84E-08	mg/kg-day	-	mg/kg-day	-
				Aluminum	9,900	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	212	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	21	mg/kg	4.54E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.66E-07	1.27E-07	mg/kg-day	1.23E-04	mg/kg-day	1.03E-03
				Cadmium	10.30	mg/kg	7.60E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.13E-09	mg/kg-day	1.00E-05	mg/kg-day	2.13E-04
				Iron	33,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	600	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	2,860	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Aroclor 1248	0.68	mg/kg	6.99E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	1.55E-08	1.96E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.54E-06					0.001
			Inhalation	Benzo(a)anthracene	20	mg/kg	2.51E-11	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	9.67E-12	7.04E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	7.20	mg/kg	9.05E-12	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	3.48E-11	2.53E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	4.60	mg/kg	5.78E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	2.23E-12	1.62E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	2.20	mg/kg	2.76E-12	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.74E-12	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	0.62	mg/kg	7.79E-13	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	3.27E-12	2.18E-12	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	1.80	mg/kg	2.26E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	8.71E-13	6.33E-12	mg/kg-day	-	mg/kg-day	-
				Aluminum	9,900	mg/kg	1.24E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.48E-08	mg/kg-day	1.43E-03	mg/kg-day	2.44E-05
				Antimony	212	mg/kg	2.66E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.46E-10	mg/kg-day	-	mg/kg-day	-
				Arsenic	21	mg/kg	2.58E-11	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	3.88E-10	7.21E-11	mg/kg-day	-	mg/kg-day	-
				Cadmium	10.30	mg/kg	1.29E-11	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	8.15E-11	3.62E-11	mg/kg-day	-	mg/kg-day	-
				Iron	33,000	mg/kg	4.15E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.16E-07	mg/kg-day	-	mg/kg-day	-

TABLE 7.5 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 5	Sediment	Surface Sediment	Inhalation	Lead	600	mg/kg	7.54E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.11E-09	mg/kg-day	-	mg/kg-day	-
6.52%				Manganese	2,860	mg/kg	3.59E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.01E-08	mg/kg-day	1.43E-05	mg/kg-day	7.04E-04
				Aroclor 1248	0.68	mg/kg	8.50E-13	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.70E-12	2.38E-12	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								5.22E-10					0.00073
		Exposure Point Total									3.76E-06					0.02
	Exposure Medium Total										3.76E-06					0.02
Area Total											3.76E-06					0.02
Reach 6	Sediment	Surface Sediment	Incidental Ingestion	Benzene	44	mg/kg	4.92E-07	mg/kg-day	5.50E-02	(mg/kg-day)$^{-1}$	2.71E-08	1.38E-06	mg/kg-day	4.00E-03	mg/kg-day	3.44E-04
3.40%				Acenaphthene	1,400	mg/kg	1.57E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.38E-05	mg/kg-day	6.00E-02	mg/kg-day	7.31E-04
				Benzo(a)anthracene	197	mg/kg	2.20E-06	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.61E-06	6.16E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	128	mg/kg	1.43E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.04E-05	4.01E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	22	mg/kg	2.46E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	1.80E-08	6.89E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	195	mg/kg	2.18E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	1.59E-08	6.10E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	7.20	mg/kg	8.05E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	5.88E-07	2.25E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	23	mg/kg	2.57E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	1.88E-07	7.20E-07	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	3,400	mg/kg	3.80E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.06E-04	mg/kg-day	4.00E-03	mg/kg-day	2.66E-02
				Naphthalene	3,800	mg/kg	4.25E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.19E-04	mg/kg-day	2.00E-02	mg/kg-day	5.95E-03
				Phenanthrene	1,900	mg/kg	2.12E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.95E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	638	mg/kg	7.13E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.00E-05	mg/kg-day	3.00E-02	mg/kg-day	6.66E-04
				Aluminum	13,000	mg/kg	1.45E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.07E-04	mg/kg-day	1.00E+00	mg/kg-day	4.07E-04
				Antimony	69	mg/kg	7.72E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.16E-06	mg/kg-day	4.00E-04	mg/kg-day	5.40E-03
				Arsenic	40	mg/kg	4.50E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	6.76E-07	1.26E-06	mg/kg-day	3.00E-04	mg/kg-day	4.20E-03
				Cadmium	34	mg/kg	3.81E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.07E-06	mg/kg-day	1.00E-03	mg/kg-day	1.07E-03
				Chromium	228	mg/kg	2.55E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.13E-06	mg/kg-day	3.00E-03	mg/kg-day	2.38E-03
				Iron	160,000	mg/kg	1.79E-03	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.01E-03	mg/kg-day	-	mg/kg-day	-
				Lead	1,523	mg/kg	1.70E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.77E-05	mg/kg-day	-	mg/kg-day	-
				Manganese	980	mg/kg	1.10E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.07E-05	mg/kg-day	1.40E-01	mg/kg-day	2.19E-04
			Exp. Route Total								1.36E-05					0.048
			Dermal Absorption	Benzene	44	mg/kg		mg/kg-day	5.67E-02	(mg/kg-day)$^{-1}$			mg/kg-day	3.88E-03	mg/kg-day	
				Acenaphthene	1,400	mg/kg	1.34E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.76E-05	mg/kg-day	1.86E-02	mg/kg-day	2.02E-03
				Benzo(a)anthracene	197	mg/kg	1.89E-06	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	4.44E-06	5.29E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	128	mg/kg	1.23E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.89E-05	3.44E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	22	mg/kg	2.11E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	4.97E-08	5.91E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	195	mg/kg	1.87E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	4.40E-08	5.24E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	7.20	mg/kg	6.91E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	1.63E-06	1.93E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	23	mg/kg	2.21E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	5.20E-07	6.18E-07	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	3,400	mg/kg	3.26E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.13E-05	mg/kg-day	3.20E-03	mg/kg-day	2.85E-02
				Naphthalene	3,800	mg/kg	3.65E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.02E-04	mg/kg-day	1.60E-02	mg/kg-day	6.38E-03
				Phenanthrene	1,900	mg/kg	1.82E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.10E-05	mg/kg-day	-	mg/kg-day	-
				Pyrene	638	mg/kg	6.12E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.71E-05	mg/kg-day	9.30E-03	mg/kg-day	1.84E-03
				Aluminum	13,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	1.00E-01	mg/kg-day	
				Antimony	69	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	8.00E-06	mg/kg-day	
				Arsenic	40	mg/kg	8.92E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	3.26E-07	2.50E-07	mg/kg-day	1.23E-04	mg/kg-day	2.03E-03
				Cadmium	34	mg/kg	2.51E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	7.04E-09	mg/kg-day	1.00E-05	mg/kg-day	7.04E-04
				Chromium	228	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	160,000	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	1,523	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Manganese	980	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
			Exp. Route Total								3.59E-05					0.04
		Exposure Point Total									4.95E-05					0.09
	Exposure Medium Total										4.95E-05					0.09
Area Total											4.95E-05					0.09

TABLE 7.5 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 7	Sediment	Surface Sediment	Incidental Ingestion	Benzene	25	mg/kg	2.80E-07	mg/kg-day	5.50E-02	(mg/kg-day)$^{-1}$	1.54E-08	7.83E-07	mg/kg-day	4.00E-03	mg/kg-day	1.96E-04
4.45%				Benzo(a)anthracene	66	mg/kg	7.38E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	5.39E-07	2.07E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.22E-06	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	8.94E-06	3.43E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	7.50	mg/kg	8.39E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	6.12E-08	2.35E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.50	mg/kg	7.27E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.04E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	14	mg/kg	1.57E-07	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	1.14E-08	4.38E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	7.60E-07	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	5.55E-09	2.13E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	2.20	mg/kg	2.46E-08	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	1.80E-07	6.89E-08	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.70	mg/kg	5.26E-08	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.84E-08	1.47E-07	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	630	mg/kg	7.05E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.97E-05	mg/kg-day	4.00E-03	mg/kg-day	4.93E-03
				Naphthalene	820	mg/kg	9.17E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.57E-05	mg/kg-day	2.00E-02	mg/kg-day	1.28E-03
				Phenanthrene	440	mg/kg	4.92E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.38E-05	mg/kg-day	-	mg/kg-day	-
				Total Chlordane	2.14	mg/kg	2.39E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.70E-08	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	6.80	mg/kg	7.60E-08	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	2.59E-08	2.13E-07	mg/kg-day	-	mg/kg-day	-
				Total DDT	2.80	mg/kg	3.13E-08	mg/kg-day	3.40E-01	(mg/kg-day)$^{-1}$	1.06E-08	8.77E-08	mg/kg-day	5.00E-04	mg/kg-day	1.75E-04
				Dieldrin	2.83	mg/kg	3.16E-08	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	5.06E-07	8.86E-08	mg/kg-day	5.00E-05	mg/kg-day	1.77E-03
				Heptachlor	0.19	mg/kg	2.12E-09	mg/kg-day	4.50E+00	(mg/kg-day)$^{-1}$	9.56E-09	5.95E-09	mg/kg-day	5.00E-04	mg/kg-day	1.19E-05
				Toxaphene	2.05	mg/kg	2.29E-08	mg/kg-day	1.10E+00	(mg/kg-day)$^{-1}$	2.52E-08	6.42E-08	mg/kg-day	-	mg/kg-day	-
				Arsenic	24	mg/kg	2.68E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	4.03E-07	7.51E-07	mg/kg-day	3.00E-04	mg/kg-day	2.50E-03
				Cadmium	18	mg/kg	2.01E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	5.64E-07	mg/kg-day	1.00E-03	mg/kg-day	5.64E-04
				Lead	1,306	mg/kg	1.46E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.09E-05	mg/kg-day	-	mg/kg-day	-
				Manganese	614	mg/kg	6.87E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.92E-05	mg/kg-day	1.40E-01	mg/kg-day	1.37E-04
				Mercury	6.30	mg/kg	7.05E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.97E-07	mg/kg-day	4.00E-02	mg/kg-day	4.93E-06
				Aroclor 1248	14	mg/kg	1.53E-07	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	3.05E-07	4.27E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.36	mg/kg	4.03E-09	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	8.05E-09	1.13E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.11E-05					0.012
			Dermal Absorption	Benzene	25	mg/kg		mg/kg-day	5.67E-02	(mg/kg-day)$^{-1}$			mg/kg-day	3.88E-03	mg/kg-day	
				Benzo(a)anthracene	66	mg/kg	6.33E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.49E-06	1.77E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	110	mg/kg	1.05E-06	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	2.47E-05	2.94E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	7.50	mg/kg	7.20E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.69E-07	2.01E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	6.50	mg/kg	6.24E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.75E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	14	mg/kg	1.34E-07	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	3.16E-08	3.76E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	68	mg/kg	6.52E-07	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	1.54E-08	1.83E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	2.20	mg/kg	2.11E-08	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	4.97E-07	5.91E-08	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	4.70	mg/kg	4.51E-08	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.06E-07	1.26E-07	mg/kg-day	-	mg/kg-day	-
				2-Methylnaphthalene	630	mg/kg	6.04E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.69E-05	mg/kg-day	3.20E-03	mg/kg-day	5.29E-03
				Naphthalene	820	mg/kg	7.87E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.20E-05	mg/kg-day	1.60E-02	mg/kg-day	1.38E-03
				Phenanthrene	440	mg/kg	4.22E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.18E-05	mg/kg-day	-	mg/kg-day	-
				Total Chlordane	2.14	mg/kg	6.32E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.77E-08	mg/kg-day	-	mg/kg-day	-
				4,4'-DDE	6.80	mg/kg	1.51E-08	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	7.31E-09	4.22E-08	mg/kg-day	-	mg/kg-day	-
				Total DDT	2.80	mg/kg	6.20E-09	mg/kg-day	4.86E-01	(mg/kg-day)$^{-1}$	3.01E-09	1.74E-08	mg/kg-day	-	mg/kg-day	-
				Dieldrin	2.83	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Heptachlor	0.19	mg/kg	1.40E-10	mg/kg-day	6.25E+00	(mg/kg-day)$^{-1}$	8.76E-10	3.93E-10	mg/kg-day	3.60E-04	mg/kg-day	1.09E-06
				Toxaphene	2.05	mg/kg		mg/kg-day	2.20E+00	(mg/kg-day)$^{-1}$			mg/kg-day	-	mg/kg-day	-
				Arsenic	24	mg/kg	5.31E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	1.94E-07	1.49E-07	mg/kg-day	1.23E-04	mg/kg-day	1.21E-03
				Cadmium	18	mg/kg	1.33E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	3.72E-09	mg/kg-day	1.00E-05	mg/kg-day	3.72E-04

TABLE 7.5 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Reach 7	Sediment	Surface Sediment	Dermal Absorption	Lead	1,306	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
4.45%				Manganese	614	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	5.60E-03	mg/kg-day	
				Mercury	6.30	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1248	14	mg/kg	1.41E-07	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	3.13E-07	3.95E-07	mg/kg-day	-	mg/kg-day	-
				Aroclor 1260	0.36	mg/kg	3.72E-09	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	8.27E-09	1.04E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.76E-05					0.01
		Exposure Point Total									3.87E-05					0.02
	Exposure Medium Total										3.87E-05					0.02
Area Total											3.87E-05					0.02
Roxanna Marsh	Sediment	Surface Sediment	Incidental Ingestion	Benzo(a)anthracene	77	mg/kg	8.63E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	6.30E-07	2.42E-06	mg/kg-day	-	mg/kg-day	-
37.53%				Benzo(a)pyrene	27	mg/kg	3.07E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	2.24E-06	8.59E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	45	mg/kg	5.03E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	3.67E-07	1.41E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	36	mg/kg	4.04E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.13E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	5.18	mg/kg	5.79E-08	mg/kg-day	7.30E-02	(mg/kg-day)$^{-1}$	4.23E-09	1.62E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	258	mg/kg	2.88E-06	mg/kg-day	7.30E-03	(mg/kg-day)$^{-1}$	2.10E-08	8.07E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	30	mg/kg	3.36E-07	mg/kg-day	7.30E+00	(mg/kg-day)$^{-1}$	2.45E-06	9.40E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	35	mg/kg	3.89E-07	mg/kg-day	7.30E-01	(mg/kg-day)$^{-1}$	2.84E-07	1.09E-06	mg/kg-day	-	mg/kg-day	-
				Pyrene	376	mg/kg	4.21E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.18E-05	mg/kg-day	3.00E-02	mg/kg-day	3.93E-04
				Dieldrin	0.036	mg/kg	4.03E-10	mg/kg-day	1.60E+01	(mg/kg-day)$^{-1}$	6.44E-09	1.13E-09	mg/kg-day	5.00E-05	mg/kg-day	2.25E-05
				Arsenic	100	mg/kg	1.12E-06	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	1.68E-06	3.14E-06	mg/kg-day	3.00E-04	mg/kg-day	1.05E-02
				Cadmium	63	mg/kg	7.04E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.97E-06	mg/kg-day	1.00E-03	mg/kg-day	1.97E-03
				Chromium	696	mg/kg	7.78E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	2.18E-05	mg/kg-day	3.00E-03	mg/kg-day	7.26E-03
				Iron	12,800	mg/kg	1.43E-04	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.01E-04	mg/kg-day	-	mg/kg-day	-
				Lead	3,443	mg/kg	3.85E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.08E-04	mg/kg-day	-	mg/kg-day	-
				Mercury	5.60	mg/kg	6.26E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.75E-07	mg/kg-day	4.00E-02	mg/kg-day	4.38E-06
				Aroclor 1260	2.10	mg/kg	2.35E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	4.70E-08	6.58E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1254	4.27	mg/kg	4.77E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	9.55E-08	1.34E-07	mg/kg-day	2.00E-05	mg/kg-day	6.68E-03
				Aroclor 1248	3.23	mg/kg	3.61E-08	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	7.22E-08	1.01E-07	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								7.90E-06					0.027
			Dermal Absorption	Benzo(a)anthracene	77	mg/kg	7.41E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.74E-06	2.07E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	27	mg/kg	2.63E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	6.20E-06	7.37E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	45	mg/kg	4.32E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	1.02E-06	1.21E-06	mg/kg-day	-	mg/kg-day	-
				Benzo(ghi)perylene	36	mg/kg	3.47E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	9.72E-07	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	5.18	mg/kg	4.97E-08	mg/kg-day	2.35E-01	(mg/kg-day)$^{-1}$	1.17E-08	1.39E-07	mg/kg-day	-	mg/kg-day	-
				Chrysene	258	mg/kg	2.47E-06	mg/kg-day	2.35E-02	(mg/kg-day)$^{-1}$	5.82E-08	6.93E-06	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	30	mg/kg	2.88E-07	mg/kg-day	2.35E+01	(mg/kg-day)$^{-1}$	6.78E-06	8.06E-07	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	35	mg/kg	3.34E-07	mg/kg-day	2.35E+00	(mg/kg-day)$^{-1}$	7.86E-07	9.35E-07	mg/kg-day	-	mg/kg-day	-
				Pyrene	376	mg/kg	3.61E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.01E-05	mg/kg-day	9.30E-03	mg/kg-day	1.09E-03
				Dieldrin	0.036	mg/kg		mg/kg-day	3.20E+01	(mg/kg-day)$^{-1}$			mg/kg-day	2.50E-05	mg/kg-day	
				Arsenic	100	mg/kg	2.22E-07	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	8.13E-07	6.23E-07	mg/kg-day	1.23E-04	mg/kg-day	5.06E-03
				Cadmium	63	mg/kg	4.64E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.30E-08	mg/kg-day	1.00E-05	mg/kg-day	1.30E-03
				Chromium	696	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	6.00E-05	mg/kg-day	
				Iron	12,800	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Lead	3,443	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	-	mg/kg-day	-
				Mercury	5.60	mg/kg		mg/kg-day	-	(mg/kg-day)$^{-1}$	-		mg/kg-day	4.00E-06	mg/kg-day	
				Aroclor 1260	2.10	mg/kg	2.17E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	4.82E-08	6.08E-08	mg/kg-day	-	mg/kg-day	-
				Aroclor 1254	4.27	mg/kg	4.41E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	9.80E-08	1.24E-07	mg/kg-day	1.80E-05	mg/kg-day	6.86E-03
				Aroclor 1248	3.23	mg/kg	3.34E-08	mg/kg-day	2.22E+00	(mg/kg-day)$^{-1}$	7.42E-08	9.34E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								1.76E-05					0.01
			Inhalation	Benzo(a)anthracene	77	mg/kg	9.70E-11	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	3.73E-11	2.72E-10	mg/kg-day	-	mg/kg-day	-
				Benzo(a)pyrene	27	mg/kg	3.45E-11	mg/kg-day	3.85E+00	(mg/kg-day)$^{-1}$	1.33E-10	9.65E-11	mg/kg-day	-	mg/kg-day	-
				Benzo(b)fluoranthene	45	mg/kg	5.65E-11	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	2.18E-11	1.58E-10	mg/kg-day	-	mg/kg-day	-

TABLE 7.5 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
% of Total Area							Value	Units	Value	Units		Value	Units	Value	Units	
Roxanna Marsh	Sediment	Surface Sediment	Inhalation	Benzo(ghi)perylene	36	mg/kg	4.54E-11	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.27E-10	mg/kg-day	-	mg/kg-day	-
				Benzo(k)fluoranthene	5.18	mg/kg	6.51E-12	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	2.51E-12	1.82E-11	mg/kg-day	-	mg/kg-day	-
				Chrysene	258	mg/kg	3.24E-10	mg/kg-day	3.85E-02	(mg/kg-day)$^{-1}$	1.25E-11	9.07E-10	mg/kg-day	-	mg/kg-day	-
				Dibenz(a,h)anthracene	30	mg/kg	3.77E-11	mg/kg-day	4.20E+00	(mg/kg-day)$^{-1}$	1.58E-10	1.06E-10	mg/kg-day	-	mg/kg-day	-
				Indeno(1,2,3-cd)pyrene	35	mg/kg	4.37E-11	mg/kg-day	3.85E-01	(mg/kg-day)$^{-1}$	1.68E-11	1.22E-10	mg/kg-day	-	mg/kg-day	-
				Pyrene	376	mg/kg	4.73E-10	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.32E-09	mg/kg-day	-	mg/kg-day	-
				Dieldrin	0.036	mg/kg	4.52E-14	mg/kg-day	1.61E+01	(mg/kg-day)$^{-1}$	7.28E-13	1.27E-13	mg/kg-day	-	mg/kg-day	-
				Arsenic	100	mg/kg	1.26E-10	mg/kg-day	1.51E+01	(mg/kg-day)$^{-1}$	1.90E-09	3.53E-10	mg/kg-day	-	mg/kg-day	-
				Cadmium	63	mg/kg	7.91E-11	mg/kg-day	6.30E+00	(mg/kg-day)$^{-1}$	4.98E-10	2.21E-10	mg/kg-day	-	mg/kg-day	-
				Chromium	696	mg/kg	8.74E-10	mg/kg-day	4.20E+01	(mg/kg-day)$^{-1}$	3.67E-08	2.45E-09	mg/kg-day	2.20E-06	mg/kg-day	1.11E-03
				Iron	12,800	mg/kg	1.61E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.50E-08	mg/kg-day	-	mg/kg-day	-
				Lead	3,443	mg/kg	4.33E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.21E-08	mg/kg-day	-	mg/kg-day	-
				Mercury	5.60	mg/kg	7.04E-12	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.97E-11	mg/kg-day	8.57E-05	mg/kg-day	2.30E-07
				Aroclor 1260	2.10	mg/kg	2.64E-12	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	5.27E-12	7.39E-12	mg/kg-day	-	mg/kg-day	-
				Aroclor 1254	4.27	mg/kg	5.37E-12	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	1.07E-11	1.50E-11	mg/kg-day	-	mg/kg-day	-
				Aroclor 1248	3.23	mg/kg	4.06E-12	mg/kg-day	2.00E+00	(mg/kg-day)$^{-1}$	8.11E-12	1.14E-11	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								3.95E-08					0.0011
		Exposure Point Total									2.56E-05					0.042
	Exposure Medium Total										2.56E-05					0.042
Area Total											2.56E-05					0.042
Surface Water	Surface Water	Surface Water	Incidental Ingestion	Chlorodibromomethane	0.0015	mg/L	6.71E-08	mg/kg-day	8.40E-02	(mg/kg-day)$^{-1}$	5.64E-09	1.88E-07	mg/kg-day	3.00E-03	mg/kg-day	6.26E-05
				Naphthalene	0.0012	mg/L	5.14E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.44E-07	mg/kg-day	2.00E-02	mg/kg-day	7.20E-06
				Aluminum (Total)	1.38	mg/L	6.17E-05	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.73E-04	mg/kg-day	1.00E+00	mg/kg-day	1.73E-04
				Arsenic (Total)	0.004	mg/L	1.79E-07	mg/kg-day	1.50E+00	(mg/kg-day)$^{-1}$	2.68E-07	5.01E-07	mg/kg-day	3.00E-04	mg/kg-day	1.67E-03
				Chromium (Total)	0.0051	mg/L	2.28E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	6.39E-07	mg/kg-day	3.00E-03	mg/kg-day	2.13E-04
				Lead (Total)	0.013	mg/L	5.81E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.63E-06	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								2.74E-07					0.0021
			Dermal Absorption	Chlorodibromomethane	0.0015	mg/L	2.37E-08	mg/kg-day	8.40E-02	(mg/kg-day)$^{-1}$	1.99E-09	6.62E-08	mg/kg-day	2.40E-03	mg/kg-day	2.76E-05
				Naphthalene	0.0012	mg/L	1.59E-07	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	4.45E-07	mg/kg-day	1.60E-02	mg/kg-day	2.78E-05
				Aluminum (Total)	1.38	mg/L	5.55E-06	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.56E-05	mg/kg-day	1.00E-01	mg/kg-day	1.56E-04
				Arsenic (Total)	0.004	mg/L	1.61E-08	mg/kg-day	3.66E+00	(mg/kg-day)$^{-1}$	5.89E-08	4.51E-08	mg/kg-day	1.23E-04	mg/kg-day	3.66E-04
				Chromium (Total)	0.0051	mg/L	4.11E-08	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.15E-07	mg/kg-day	6.00E-05	mg/kg-day	1.92E-03
				Lead (Total)	0.013	mg/L	5.23E-09	mg/kg-day	-	(mg/kg-day)$^{-1}$	-	1.47E-08	mg/kg-day	-	mg/kg-day	-
			Exp. Route Total								6.09E-08					0.0025
		Exposure Point Total									3.35E-07					0.0046
	Exposure Medium Total										3.35E-07					0.0046
Area Total											3.35E-07					0.0046
Weighted Sums of Risk Estimates									Total of Receptor Risks Across All Media		3.61E-05			Total of Receptor Hazards Across All Media		0.048

TABLE 9.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Reach 1	Sediment	Surface Sediment	Benzo(a)anthracene	5.58E-07	-	9.33E-07	1.49E-06		-	-	-	-
13.56%			Benzo(a)pyrene	2.19E-06	-	3.67E-06	5.86E-06		-	-	-	-
			Benzo(b)fluoranthene	1.97E-07	-	3.30E-07	5.27E-07		-	-	-	-
			Dibenz(a,h)anthracene	8.17E-07	-	1.37E-06	2.18E-06		-	-	-	-
			Indeno(1,2,3-cd)pyrene	9.96E-08	-	1.67E-07	2.66E-07		-	-	-	-
			Arsenic	6.75E-07	-	1.97E-07	8.72E-07	Skin	0.004	-	0.0010	0.005
			Chemical Total	4.54E-06	-	6.66E-06	1.12E-05		0.004	-	0.001	0.005
		Exposure Point Total					1.12E-05					0.005
	Exposure Medium Total						1.12E-05					0.005
Area Total							1.12E-05					0.005
Reach 2	Sediment	Surface Sediment	Benzo(a)anthracene	4.84E-07	-	8.11E-07	1.30E-06		-	-	-	-
19.16%			Benzo(a)pyrene	3.37E-06	-	5.64E-06	9.02E-06		-	-	-	-
			Dibenz(a,h)anthracene	4.44E-07	-	7.43E-07	1.19E-06		-	-	-	-
			Dieldrin	2.62E-07	-	-	2.62E-07	Liver	7.65E-04	-	-	0.0008
			Arsenic	1.04E-06	-	3.04E-07	1.35E-06	Skin	5.40E-03	-	1.58E-03	0.007
			Chemical Total	5.60E-06	-	7.50E-06	1.31E-05		0.006		0.0016	0.008
		Exposure Point Total					1.31E-05					0.008
	Exposure Medium Total						1.31E-05					0.008
Area Total							1.31E-05					0.008
Reach 3	Sediment	Surface Sediment	Benzo(a)pyrene	2.35E-07	5.77E-13	3.92E-07	6.27E-07		-	-	-	-
9.98%			Arsenic	3.31E-07	1.55E-11	9.67E-08	4.28E-07	Skin	1.72E-03	-	5.02E-04	0.002
			Chemical Total	5.66E-07	1.61E-11	4.89E-07	1.06E-06		0.002	-	0.001	0.002
		Exposure Point Total					1.06E-06					0.002
	Exposure Medium Total						1.06E-06					0.002
Area Total							1.06E-06					0.002
Reach 4	Sediment	Surface Sediment	Benzo(a)anthracene	1.35E-07	3.321E-13	2.26E-07	3.61E-07		-	-	-	-
5.41%			Benzo(a)pyrene	7.79E-07	1.915E-12	1.30E-06	2.08E-06		-	-	-	-
			Dibenz(a,h)anthracene	3.57E-08	9.591E-14	5.98E-08	9.56E-08		-	-	-	-
			Indeno(1,2,3-cd)pyrene	3.42E-08	8.401E-14	5.72E-08	9.13E-08		-	-	-	-
			Arsenic	6.53E-08	3.055E-12	1.91E-08	8.44E-08	Skin	3.39E-04	-	9.88E-05	0.0004
			Chemical Total	1.05E-06	5.481E-12	1.66E-06	2.71E-06		0.0003	-	0.0001	0.0004
		Exposure Point Total					2.71E-06					0.0004
	Exposure Medium Total						2.71E-06					0.0004
Area Total							2.71E-06					0.0004

TABLE 9.1
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Reach 5	Sediment	Surface Sediment	Benzo(a)pyrene	6.89E-08	1.70E-13	1.15E-07	1.84E-07		-	-	-	-
6.52%			Chemical Total	6.89E-08	1.70E-13	1.15E-07	1.84E-07		-	-	-	
		Exposure Point Total					1.84E-07					
	Exposure Medium Total						1.84E-07					
Area Total							1.84E-07					
Reach 6	Sediment	Surface Sediment	Benzo(a)anthracene	9.84E-08	-	1.65E-07	2.63E-07		-	-	-	-
3.40%			Benzo(a)pyrene	6.40E-07	-	1.07E-06	1.71E-06		-	-	-	-
			Dibenz(a,h)anthracene	3.60E-08	-	6.02E-08	9.62E-08		-	-	-	-
			Arsenic	4.14E-08	-	1.21E-08	5.35E-08	Skin	2.15E-04	-	2.08E-05	0.0002
			Chemical Total	8.15E-07	-	1.31E-06	2.12E-06		0.0002	-	0.00002	0.0002
		Exposure Point Total					2.12E-06					0.0002
	Exposure Medium Total						2.12E-06					0.0002
Area Total							2.12E-06					0.0002
Reach 7	Sediment	Surface Sediment	Benzo(a)anthracene	4.32E-08	-	7.23E-08	1.15E-07		-	-	-	-
4.45%			Benzo(a)pyrene	7.16E-07	-	1.20E-06	1.92E-06		-	-	-	-
			Chemical Total	7.60E-07	-	1.27E-06	2.03E-06		-	-	-	
		Exposure Point Total					2.03E-06					
	Exposure Medium Total						2.03E-06					
Area Total							2.03E-06					
Roxanna Marsh	Sediment	Surface Sediment	Benzo(a)anthracene	4.26E-07	1.05E-12	7.12E-07	1.14E-06		-	-	-	-
37.53%			Benzo(a)pyrene	1.51E-06	3.72E-12	2.53E-06	4.04E-06		-	-	-	-
			Benzo(b)fluoranthene	2.48E-07	6.10E-13	4.15E-07	6.63E-07		-	-	-	-
			Dibenz(a,h)anthracene	1.66E-06	4.44E-12	2.77E-06	4.43E-06		-	-	-	-
			Arsenic	1.14E-06	5.32E-11	3.32E-07	1.47E-06	Skin	5.90E-03	-	1.72E-03	0.008
			Chemical Total	4.98E-06	6.30E-11	6.76E-06	1.17E-05		0.006	-	0.002	0.008
		Exposure Point Total					1.17E-05					0.008
	Exposure Medium Total						1.17E-05					0.008
Area Total							1.17E-05					0.008
Receptor Total						Receptor Risk Total	4.41E-05				Receptor HI Total	0.023

TABLE 9.2 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Reach 1	Sediment	Surface Sediment	Benzo(a)anthracene	3.65E-07	-	6.73E-07	1.04E-06		-	-	-	-
13.56%			Benzo(a)pyrene	1.43E-06	-	2.65E-06	4.08E-06		-	-	-	-
			Benzo(b)fluoranthene	1.29E-07	-	2.38E-07	3.67E-07		-	-	-	-
			Dibenz(a,h)anthracene	5.34E-07	-	9.86E-07	1.52E-06		-	-	-	-
			Arsenic	4.42E-07	-	1.42E-07	5.84E-07	Skin	2.29E-02	-	7.37E-03	0.03
			Chemical Total	2.9E-06	-	4.7E-06	7.59E-06		2E-02	-	7.37E-03	3.03E-02
		Exposure Point Total					7.59E-06					3.03E-02
	Exposure Medium Total						7.59E-06					3.03E-02
Area Total							7.59E-06					3.03E-02
Reach 2	Sediment	Surface Sediment	Benzo(a)anthracene	3.17E-07	-	5.85E-07	9.02E-07		-	-	-	-
19.16%			Benzo(a)pyrene	2.21E-06	-	4.07E-06	6.28E-06		-	-	-	-
			Dibenz(a,h)anthracene	2.90E-07	-	5.36E-07	8.26E-07		-	-	-	-
			Arsenic	6.81E-07	-	2.19E-07	9.00E-07	Skin	3.53E-02	-	1.14E-02	0.05
			Chemical Total	3.50E-06	-	5.41E-06	8.91E-06		3.53E-02	-	1.14E-02	4.67E-02
		Exposure Point Total					8.91E-06					4.67E-02
	Exposure Medium Total						8.91E-06					4.67E-02
Area Total							8.91E-06					4.67E-02
Reach 3	Sediment	Surface Sediment	Benzo(a)pyrene	1.53E-07	1.76E-13	2.83E-07	4.37E-07		-	-	-	-
9.98%			Arsenic	2.17E-07	4.72E-12	6.98E-08	2.87E-07	Skin	1.12E-02	-	3.62E-03	0.01
			Chemical Total	3.70E-07	4.90E-12	3.53E-07	7.23E-07		1.12E-02	-	3.62E-03	1.49E-02
		Exposure Point Total					7.23E-07					1.49E-02
	Exposure Medium Total						7.23E-07					1.49E-02
Area Total							7.23E-07					1.49E-02
Reach 4	Sediment	Surface Sediment	Benzo(a)anthracene	8.84E-08	1.01E-13	1.63E-07	2.51E-07		-	-	-	-
5.41%			Benzo(a)pyrene	5.09E-07	5.84E-13	9.40E-07	1.45E-06		-	-	-	-
			Chemical Total	5.98E-07	6.85E-13	1.10E-06	1.70E-06		-	-	-	-
		Exposure Point Total					1.70E-06					-
	Exposure Medium Total						1.70E-06					-
Area Total							1.70E-06					-

TABLE 9.2 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Resident Wader
Receptor Age: Child

Area	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Reach 5	Sediment	Surface Sediment	Benzo(a)pyrene	4.51E-08	5.17E-14	8.32E-08	1.28E-07		-	-	-	-
6.52%			Chemical Total	4.51E-08	5.17E-14	8.32E-08	1.28E-07		-	-	-	-
		Exposure Point Total					1.28E-07					-
	Exposure Medium Total						1.28E-07					-
Area Total							1.28E-07					-
Reach 6	Sediment	Surface Sediment	Benzo(a)anthracene	6.43E-08	-	1.19E-07	1.83E-07		-	-	-	-
3.40%			Benzo(a)pyrene	4.18E-07	-	7.72E-07	1.19E-06		-	-	-	-
			Dibenz(a,h)anthracene	2.35E-08	-	4.35E-08	6.70E-08		-	-	-	-
			Chemical Total	5.06E-07	-	9.34E-07	1.44E-06		-	-	-	-
		Exposure Point Total					1.44E-06					-
	Exposure Medium Total						1.44E-06					-
Area Total							1.44E-06					-
Reach 7	Sediment	Surface Sediment	Benzo(a)anthracene	2.82E-08	-	5.21E-08	8.04E-08		-	-	-	-
4.45%			Benzo(a)pyrene	4.69E-07	-	8.65E-07	1.33E-06		-	-	-	-
			Chemical Total	4.97E-07	-	9.17E-07	1.41E-06		-	-	-	-
		Exposure Point Total					1.41E-06					-
	Exposure Medium Total						1.41E-06					-
Area Total							1.41E-06					-
Roxanna Marsh	Sediment	Surface Sediment	Benzo(a)anthracene	2.8E-07	3.19E-13	5.14E-07	7.92E-07		-	-	-	-
37.53%			Benzo(a)pyrene	9.9E-07	1.13E-12	1.83E-06	2.81E-06		-	-	-	-
			Dibenz(a,h)anthracene	1.08E-06	1.35E-12	2.00E-06	3.08E-06		-	-	-	-
			Arsenic	7.44E-07	1.62E-11	2.40E-07	9.84E-07	Skin	3.86E-02	-	1.24E-02	0.05
			Chemical Total	3.10E-06	1.90E-11	4.58E-06	7.67E-06		3.86E-02	-	1.24E-02	5.10E-02
		Exposure Point Total					7.67E-06					5.10E-02
	Exposure Medium Total						7.67E-06					5.10E-02
Area Total							7.67E-06					5.10E-02
Receptor Total						Receptor Risk Total	2.96E-05				Receptor HI Total	0.14

TABLE 9.3 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Reach 1	Sediment	Surface Sediment	Benzo(a)anthracene	1.19E-05	-	1.99E-05	3.19E-05		-	-	-	-
33.42%			Benzo(a)pyrene	4.68E-05	-	7.83E-05	1.25E-04		-	-	-	-
			Benzo(b)fluoranthene	4.21E-06	-	7.05E-06	1.13E-05		-	-	-	-
			Chrysene	2.55E-07	-	4.27E-07	6.83E-07		-	-	-	-
			Dibenz(a,h)anthracene	1.74E-05	-	2.92E-05	4.66E-05		-	-	-	-
			Indeno(1,2,3-cd)pyrene	2.13E-06	-	3.56E-06	5.69E-06		-	-	-	-
			Arsenic	1.44E-05	-	4.21E-06	1.86E-05	Skin	7.48E-02		2.18E-02	0.10
			Aroclor 1242	7.93E-07	-	4.92E-07	1.29E-06		-	-	-	-
			Aroclor 1248	9.25E-07	-	5.74E-07	1.50E-06		-	-	-	-
			Chemical Total		-		2.43E-04			-		0.10
		Exposure Point Total					2.43E-04					0.10
	Exposure Medium Total						2.43E-04					0.10
	Fish	Carp Fillet	Chlordane - alpha	8.12E-08	-	-	8.12E-08	Liver	1.08E-03	-	-	0.00
		25.0%	Chlordane - gamma	6.09E-08	-	-	6.09E-08	Liver	8.12E-04	-	-	0.00
			o,p'-DDD	1.09E-07	-	-	1.09E-07		-	-	-	-
			p,p'-DDD	4.57E-07	-	-	4.57E-07		-	-	-	-
			p,p'-DDE	4.93E-07	-	-	4.93E-07		-	-	-	-
			Selenium	-	-	-	-	Skin/Blood/CNS	3.60E-02	-	-	0.04
			Dioxin TEQ	2.95E-05	-	-	2.95E-05		-	-	-	-
			Nondioxin-like PCBs	1.31E-05	-	-	1.31E-05	Eyes/Skin	7.64E-01	-	-	0.76
			Chemical Total		-	-	4.38E-05			-	-	0.80
		Exposure Point Total					4.38E-05					0.80
		Chinook Fillet	Chlordane - alpha	1.89E-07	-	-	1.89E-07	Liver	2.53E-03	-	-	0.00
		25.0%	Chlordane - gamma	1.39E-07	-	-	1.39E-07	Liver	1.85E-03	-	-	0.00
			p,p'-DDD	3.11E-07	-	-	3.11E-07			-	-	-
			p,p'-DDE	9.28E-06	-	-	9.28E-06			-	-	-
			p,p'-DDT	5.62E-07	-	-	5.62E-07	Liver	7.72E-03	-	-	0.01
			Dieldrin	4.18E-06	-	-	4.18E-06	Liver	1.22E-02	-	-	0.01
			Dioxin TEQ	8.68E-05	-	-	8.68E-05			-	-	-
			Nondioxin-like PCBs	1.73E-05	-	-	1.73E-05	Eyes/Skin	1.01E+00	-	-	1.01
			Chemical Total		-	-	1.19E-04			-	-	1.04
		Exposure Point Total					1.19E-04					1.04

TABLE 9.3 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Fish	Goldfish Fillet	Bis(2-ethylhexyl)phthalate	7.60E-07	-	-	7.60E-07	Liver	6.33E-03	-	-	0.01
	(continued)	25.0%	Chlordane - alpha	1.08E-07	-	-	1.08E-07	Liver	1.44E-03	-	-	0.00
			Chlordane - gamma	6.43E-08	-	-	6.43E-08	Liver	8.57E-04	-	-	0.00
			o,p'-DDD	7.19E-08	-	-	7.19E-08			-	-	-
			p,p'-DDD	3.55E-07	-	-	3.55E-07			-	-	-
			p,p'-DDE	5.88E-07	-	-	5.88E-07			-	-	-
			Selenium	-	-	-	0.00E+00	Skin/Blood/CNS	2.53E-02	-	-	0.03
			Dioxin TEQ	3.11E-05	-	-	3.11E-05			-	-	-
			Nondioxin-like PCBs	1.53E-05	-	-	1.53E-05	Eyes/Skin	8.91E-01	-	-	0.89
			Chemical Total		-	-	4.83E-05			-	-	0.93
		Exposure Point Total					4.83E-05					0.93
		Steelhead Fillet	Chlordane - alpha	1.12E-07	-	-	1.12E-07	Liver	1.49E-03	-	-	0.00
		25.0%	Chlordane - gamma	6.77E-08	-	-	6.77E-08	Liver	9.02E-04	-	-	0.00
			p,p'-DDD	1.90E-07	-	-	1.90E-07			-	-	-
			p,p'-DDE	7.75E-06	-	-	7.75E-06			-	-	-
			p,p'-DDT	4.21E-07	-	-	4.21E-07	Liver	5.77E-03	-	-	0.01
			Dioxin TEQ	7.97E-05	-	-	7.97E-05			-	-	-
			Nondioxin-like PCBs	1.30E-05	-	-	1.30E-05	Eyes/Skin	7.57E-01	-	-	0.76
			Chemical Total		-	-	1.01E-04			-	-	0.77
		Exposure Point Total					1.01E-04					0.77
	Exposure Medium Total						3.12E-04					3.53E+00
Area Total							5.55E-04					3.63E+00
Reach 2	Sediment	Surface Sediment	Benzo(a)anthracene	1.03E-05	-	1.73E-05	2.77E-05		-	-	-	-
47.22%			Benzo(a)pyrene	7.21E-05	-	1.21E-04	1.93E-04		-	-	-	-
			Benzo(b)fluoranthene	2.04E-06	-	3.42E-06	5.47E-06		-	-	-	-
			Dibenz(a,h)anthracene	9.48E-06	-	1.59E-05	2.54E-05		-	-	-	-
			Indeno(1,2,3-cd)pyrene	1.06E-06	-	1.77E-06	2.83E-06		-	-	-	-
			Dieldrin	5.60E-06	-	-	5.60E-06	Liver	1.63E-02	-	-	0.02
			Heptachlor	1.71E-06	-	9.47E-08	1.80E-06	Liver	1.77E-03	-	9.82E-05	0.00
			Toxaphene	0.00E+00	-	-	0.00E+00		-	-	-	-
			Arsenic	2.22E-05	-	6.49E-06	2.87E-05	Skin	1.15E-01	-	3.37E-02	0.15
			Aroclor 1248	1.71E-06	-	1.06E-06	2.78E-06		-	-	-	-
			Chemical Total		-		2.93E-04			-		1.67E-01
		Exposure Point Total					2.93E-04					1.67E-01
	Exposure Medium Total						2.93E-04					1.67E-01

TABLE 9.3 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Fish	Chinook Fillet	Chlordane - alpha	5.45E-07	-	-	5.45E-07	Liver	7.27E-03	-	-	0.01
		50.0%	o,p'-DDD	3.28E-07	-	-	3.28E-07		-	-	-	-
			p,p'-DDD	1.34E-06	-	-	1.34E-06		-	-	-	-
			p,p'-DDE	1.94E-05	-	-	1.94E-05		-	-	-	-
			p,p'-DDT	1.22E-06	-	-	1.22E-06	Liver	1.67E-02	-	-	0.02
			Dieldrin	8.74E-06	-	-	8.74E-06	Liver	2.55E-02	-	-	0.03
			Chromium	-	-	-	0.00E+00	GI/Embryo	9.62E-02	-	-	0.10
			Dioxin TEQ	2.03E-04	-	-	2.03E-04		-	-	-	-
			Nondioxin-like PCBs	4.62E-05	-	-	4.62E-05	Eyes/Skin	2.69E+00	-	-	2.69
			Chemical Total		-	-	2.80E-04			-	-	2.84E+00
		Exposure Point Total					2.80E-04					2.84E+00
		Goldfish Fillet	Chlordane - alpha	2.87E-07	-	-	2.87E-07	Liver	3.82E-03	-	-	0.00
		50.0%	Chlordane - gamma	2.29E-07	-	-	2.29E-07	Liver	3.06E-03	-	-	0.00
			o,p'-DDD	6.95E-07	-	-	6.95E-07		-	-	-	-
			p,p'-DDD	3.46E-06	-	-	3.46E-06		-	-	-	-
			p,p'-DDE	1.31E-06	-	-	1.31E-06		-	-	-	-
			Dieldrin	7.87E-06	-	-	7.87E-06	Liver	2.29E-02	-	-	0.02
			gamma-BHC (Lindane)	4.62E-07	-	-	4.62E-07	Liver	2.76E-03	-	-	0.00
			Dioxin TEQ	9.01E-05	-	-	9.01E-05		-	-	-	-
			Nondioxin-like PCBs	4.60E-05	-	-	4.60E-05	Eyes/Skin	2.68E+00	-	-	2.68
			Chemical Total		-	-	1.50E-04			-	-	2.72E+00
		Exposure Point Total					1.50E-04					2.72E+00
	Exposure Medium Total						4.31E-04					5.56E+00
Area Total							7.24E-04					5.72E+00
Reach 6	Sediment	Surface Sediment	Benzo(a)anthracene	2.10E-06	-	3.52E-06	5.62E-06		-	-	-	-
8.39%			Benzo(a)pyrene	1.37E-05	-	2.29E-05	3.65E-05		-	-	-	-
			Dibenz(a,h)anthracene	7.69E-07	-	1.29E-06	2.06E-06		-	-	-	-
			Indeno(1,2,3-cd)pyrene	2.46E-07	-	4.11E-07	6.57E-07		-	-	-	-
			Arsenic	8.84E-07	-	2.58E-07	1.14E-06	Skin	4.59E-03	-	1.34E-03	0.01
			Chemical Total		-		4.60E-05			-		5.92E-03
		Exposure Point Total					4.60E-05					5.92E-03
	Exposure Medium Total						4.60E-05					5.92E-03

TABLE 9.3 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Fish	Carp Fillet	Benzo(a)anthracene	4.25E-08	-	-	4.25E-08		-	-	-	-
		100.0%	Benzo(b)fluoranthene	2.83E-08	-	-	2.83E-08		-	-	-	-
			Chlordane - alpha	4.99E-07	-	-	4.99E-07	Liver	6.66E-03	-	-	0.01
			Chlordane - gamma	3.98E-07	-	-	3.98E-07	Liver	5.30E-03	-	-	0.01
			o,p'-DDD	3.15E-07	-	-	3.15E-07		-	-	-	-
			p,p'-DDD	1.19E-06	-	-	1.19E-06		-	-	-	-
			p,p'-DDE	1.23E-06	-	-	1.23E-06		-	-	-	-
			Dieldrin	1.09E-05	-	-	1.09E-05	Liver	3.17E-02	-	-	0.03
			Chromium	-	-	-	0.00E+00	GI/Embryo	2.69E-02	-	-	0.03
			Dioxin TEQ	8.74E-05	-	-	8.74E-05		-	-	-	-
			Nondioxin-like PCBs	5.78E-05	-	-	5.78E-05	Eyes/Skin	3.37E+00	-	-	3.37
			Chemical Total		-	-	1.60E-04			-	-	3.44E+00
		Exposure Point Total					1.60E-04					3.44E+00
	Exposure Medium Total						1.60E-04					3.44E+00
Area Total							2.06E-04					3.45E+00
Reach 7	Sediment	Surface Sediment	Benzo(a)anthracene	9.22E-07	-	1.54E-06	2.47E-06		-	-	-	-
10.98%			Benzo(a)pyrene	1.53E-05	-	2.56E-05	4.09E-05		-	-	-	-
			Benzo(b)fluoranthene	1.05E-07	-	1.75E-07	2.80E-07		-	-	-	-
			Dibenz(a,h)anthracene	3.07E-07	-	5.14E-07	8.22E-07		-	-	-	-
			Indeno(1,2,3-cd)pyrene	6.57E-08	-	1.10E-07	1.76E-07		-	-	-	-
			Dieldrin	8.67E-07	-	-	8.67E-07	Liver	2.53E-03	-	-	0.003
			Arsenic	6.89E-07	-	2.01E-07	8.90E-07	Skin	3.57E-03	-	1.04E-03	0.005
			Aroclor 1248	5.23E-07	-	3.24E-07	8.47E-07		-	-	-	-
			Chemical Total		-		4.73E-05			-		7.15E-03
		Exposure Point Total					4.73E-05					7.15E-03
	Exposure Medium Total						4.73E-05					7.15E-03

TABLE 9.3 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Fish	Carp Fillet	Chlordane - alpha	1.84E-07	-	-	1.84E-07	Liver	2.46E-03	-	-	0.00
		50.0%	Chlordane - gamma	2.89E-07	-	-	2.89E-07	Liver	3.85E-03	-	-	0.00
			o,p'-DDD	1.60E-07	-	-	1.60E-07		-	-	-	-
			p,p'-DDD	5.73E-07	-	-	5.73E-07		-	-	-	-
			p,p'-DDE	5.03E-07	-	-	5.03E-07		-	-	-	-
			Dieldrin	3.15E-06	-	-	3.15E-06	Liver	9.19E-03	-	-	0.01
			Chromium		-	-	0.00E+00	GI/Embryo	2.45E-02	-	-	0.02
			Dioxin TEQ	2.77E-05	-	-	2.77E-05		-	-	-	-
			Nondioxin-like PCBs	1.65E-05	-	-	1.65E-05	Eyes/Skin	9.63E-01	-	-	0.96
			Chemical Total		-	-	4.91E-05			-	-	1.00E+00
		Exposure Point Total					4.91E-05					1.00E+00
		Goldfish Fillet	Benzo(a)anthracene	3.24E-08	-	-	3.24E-08		-	-	-	-
		50.0%	Chlordane - alpha	6.62E-07	-	-	6.62E-07	Liver	8.83E-03	-	-	0.01
			Chlordane - gamma	4.89E-07	-	-	4.89E-07	Liver	6.52E-03	-	-	0.01
			o,p'-DDD	2.67E-07	-	-	2.67E-07		-	-	-	-
			p,p'-DDD	1.68E-06	-	-	1.68E-06		-	-	-	-
			p,p'-DDE	1.47E-06	-	-	1.47E-06		-	-	-	-
			Dieldrin	7.52E-06	-	-	7.52E-06	Liver	2.19E-02	-	-	0.02
			Dioxin TEQ	8.71E-05	-	-	8.71E-05		-	-	-	-
			Nondioxin-like PCBs	5.19E-05	-	-	5.19E-05	Eyes/Skin	3.03E+00	-	-	3.03
			Chemical Total		-	-	1.51E-04			-	-	3.07E+00
		Exposure Point Total					1.51E-04					3.07E+00
	Exposure Medium Total						2.00E-04					4.07E+00
Area Total							2.48E-04					4.08E+00
Surface Water	Surface Water	Surface Water	Arsenic (Total)	1.05E-06	-	2.91E-07	1.34E-06	Skin	5.43E-03	-	1.51E-03	0.002
			Chemical Total		-		1.34E-06			-		1.51E-03
		Exposure Point Total					1.34E-06					1.51E-03
	Exposure Medium Total						1.34E-06					1.51E-03
Area Total							1.34E-06					1.51E-03
Receptor Total						Receptor Risk Total	1.73E-03				Receptor HI Total	16.88

Total Liver HI Across All Media =	0.24
Total Skin HI Across All Media =	16.42
Total GI/Embryo HI Across All Media	0.15

TABLE 9.4 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Reach 1	Sediment	Surface Sediment	Benzo(a)anthracene	1.00E-05	-	4.73E-06	1.48E-05		-	-	-	-
33.42%			Benzo(a)pyrene	3.94E-05	-	1.86E-05	5.80E-05		-	-	-	-
			Benzo(b)fluoranthene	3.55E-06	-	1.67E-06	5.22E-06		-	-	-	-
			Dibenz(a,h)anthracene	1.47E-05	-	6.92E-06	2.16E-05		-	-	-	-
			Indeno(1,2,3-cd)pyrene	1.79E-06	-	8.44E-07	2.64E-06		-	-	-	-
			Arsenic	1.21E-05	-	9.98E-07	1.31E-05	Skin	3.78E-01	-	3.11E-02	0.41
			Aroclor 1242	6.68E-07	-	1.17E-07	7.85E-07		-	-	-	-
			Aroclor 1248	7.79E-07	-	1.36E-07	9.16E-07		-	-	-	-
			Chemical Total		-		1.17E-04		-	-		0.41
		Exposure Point Total					1.17E-04					0.41
	Exposure Medium Total						1.17E-04					0.41
	Fish	Carp Fillet	p,p'-DDD	7.63E-08	-	-	7.63E-08		-	-	-	-
		25.0%	p,p'-DDE	8.23E-08	-	-	8.23E-08		-	-	-	-
			Selenium		-	-	0.00E+00	Skin/Blood/CNS	3.60E-02	-	-	0.04
			Dioxin TEQ	4.91E-06	-	-	4.91E-06			-	-	-
			Nondioxin-like PCBs	2.19E-06	-	-	2.19E-06	Eyes/Skin	7.65E-01	-	-	0.77
			Chemical Total		-	-	7.26E-06			-	-	0.80
		Exposure Point Total					7.26E-06					0.80
		Chinook Fillet	Chlordane - alpha	3.16E-08	-	-	3.16E-08	Liver	2.53E-03	-	-	0.00
		25.0%	p,p'-DDD	5.19E-08	-	-	5.19E-08		-	-	-	
			p,p'-DDE	1.55E-06	-	-	1.55E-06		-	-	-	
			p,p'-DDT	9.38E-08	-	-	9.38E-08	Liver	7.71E-03	-	-	0.01
			Dieldrin	6.97E-07	-	-	6.97E-07	Liver	1.22E-02	-	-	0.01
			Dioxin TEQ	1.45E-05	-	-	1.45E-05		-	-	-	
			Nondioxin-like PCBs	2.89E-06	-	-	2.89E-06	Eyes/Skin	1.01E+00	-	-	1.01
			Chemical Total		-	-	1.98E-05			-	-	1.03
		Exposure Point Total					1.98E-05					1.03

TABLE 9.4 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Fish	Goldfish Fillet	Bis(2-ethylhexyl)phthalate	1.27E-07	-	-	1.27E-07	Liver	6.34E-03	-	-	0.01
	(continued)	25.0%	p,p'-DDD	5.92E-08	-	-	5.92E-08		-	-	-	-
			p,p'-DDE	9.82E-08	-	-	9.82E-08		-	-	-	-
			Selenium		-	-	0.00E+00	Skin/Blood/CNS	2.53E-02	-	-	0.03
			Dioxin TEQ	5.19E-06	-	-	5.19E-06		-	-	-	-
			Nondioxin-like PCBs	2.55E-06	-	-	2.55E-06	Eyes/Skin	8.91E-01	-	-	0.89
			Chemical Total		-	-	8.02E-06			-	-	0.92
		Exposure Point Total					8.02E-06					0.92
		Steelhead Fillet	p,p'-DDD	3.17E-08	-	-	3.17E-08			-	-	-
		25.0%	p,p'-DDE	1.29E-06	-	-	1.29E-06			-	-	-
			p,p'-DDT	7.02E-08	-	-	7.02E-08	Liver	5.77E-03	-	-	0.01
			Dioxin TEQ	1.33E-05	-	-	1.33E-05			-	-	-
			Nondioxin-like PCBs	2.17E-06	-	-	2.17E-06	Eyes/Skin	7.57E-01	-	-	0.76
			Chemical Total		-	-	1.69E-05			-	-	0.76
		Exposure Point Total					1.69E-05					0.76
	Exposure Medium Total						5.19E-05					3.52
Area Total							1.69E-04					3.93
Reach 2	Sediment	Surface Sediment	Benzo(a)anthracene	8.72E-06	-	4.11E-06	1.28E-05		-	-	-	-
47.22%			Benzo(a)pyrene	6.07E-05	-	2.86E-05	8.93E-05		-	-	-	-
			Benzo(b)fluoranthene	1.72E-06	-	8.11E-07	2.53E-06		-	-	-	-
			Dibenz(a,h)anthracene	7.99E-06	-	3.76E-06	1.17E-05		-	-	-	-
			Indeno(1,2,3-cd)pyrene	8.91E-07	-	4.20E-07	1.31E-06		-	-	-	-
			Dieldrin	4.72E-06	-		4.72E-06	Liver	8.26E-02	-		0.08
			Heptachlor	1.44E-06	-	2.25E-08	1.46E-06	Liver	8.96E-03	-	1.40E-04	0.01
			Toxaphene	0.00E+00	-		0.00E+00		-	-	-	-
			Arsenic	1.87E-05	-	1.54E-06	2.03E-05	Skin	5.83E-01	-	4.79E-02	0.63
			Aroclor 1248	1.44E-06	-	2.52E-07	1.70E-06		-	-	-	-
			Chemical Total		-		1.46E-04					0.72
		Exposure Point Total					1.46E-04					0.72
	Exposure Medium Total						1.46E-04					0.72

TABLE 9.4 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Fish	Chinook Fillet 50.0%	Chlordane - alpha	9.09E-08	-	-	9.09E-08	Liver	7.27E-03	-	-	0.01
			p,p'-DDD	2.23E-07	-	-	2.23E-07			-	-	-
			p,p'-DDE	3.23E-06	-	-	3.23E-06			-	-	-
			p,p'-DDT	2.03E-07	-	-	2.03E-07			-	-	-
			Dieldrin	1.46E-06	-	-	1.46E-06	Liver	2.55E-02	-	-	0.03
			Chromium	-	-	-	-	GI/Embryo	9.63E-02	-	-	0.10
			Dioxin TEQ	3.38E-05	-	-	3.38E-05		-	-	-	-
			Nondioxin-like PCBs	4.62E-05	-	-	4.62E-05	Eyes/Skin	2.69E+00			2.69
			Chemical Total		-	-	8.52E-05			-	-	2.82
		Exposure Point Total					8.52E-05					2.82
		Goldfish Fillet 50.0%	o,p'-DDD	1.16E-07	-	-	1.16E-07			-	-	-
			p,p'-DDD	5.78E-07	-	-	5.78E-07			-	-	-
			p,p'-DDE	2.19E-07	-	-	2.19E-07			-	-	-
			Dieldrin	1.31E-06	-	-	1.31E-06	Liver	2.29E-02	-	-	0.02
			gamma-BHC (Lindane)	7.70E-08	-	-	7.70E-08	Liver	2.76E-03	-	-	0.00
			Dioxin TEQ	1.50E-05	-	-	1.50E-05			-	-	-
			Nondioxin-like PCBs	7.68E-06	-	-	7.68E-06	Eyes/Skin	2.68E+00	-	-	2.68
			Chemical Total		-	-	2.50E-05			-	-	2.71
		Exposure Point Total					2.50E-05					2.71
	Exposure Medium Total						1.10E-04					5.53
Area Total							2.56E-04					6.25
Reach 6 8.39%	Sediment	Surface Sediment	Benzo(a)anthracene	1.77E-06	-	8.33E-07	2.60E-06		-	-	-	-
			Benzo(a)pyrene	1.15E-05	-	5.42E-06	1.69E-05		-	-	-	-
			Dibenz(a,h)anthracene	6.48E-07	-	3.05E-07	9.53E-07		-	-	-	-
			Indeno(1,2,3-cd)pyrene	2.07E-07	-	9.74E-08	3.04E-07		-	-	-	-
			2-Methylnaphthalene	-	-	-	-	Lung	1.47E-01	-	3.19E-01	0.47
			Arsenic	7.45E-07	-	6.12E-08	8.06E-07	Skin	2.32E-02	-	2.27E-02	0.05
			Chemical Total		-		2.16E-05			-		0.51
		Exposure Point Total					2.16E-05					0.51
	Exposure Medium Total						2.16E-05					0.51

TABLE 9.4 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Fish	Carp Fillet 100.0%	Chlordane - alpha	8.33E-08	-	-	8.33E-08	Liver	6.66E-03	-	-	0.01
			Chlordane - gamma	6.63E-08	-	-	6.63E-08	Liver	5.30E-03	-	-	0.01
			o,p'-DDD	5.25E-08	-	-	5.25E-08			-	-	-
			p,p'-DDD	1.99E-07	-	-	1.99E-07			-	-	-
			p,p'-DDE	2.05E-07	-	-	2.05E-07			-	-	-
			Dieldrin	1.81E-06	-	-	1.81E-06	Liver	3.17E-02	-	-	0.03
			Chromium	-	-	-	-	GI/Embryo	2.69E-02	-	-	0.03
			Dioxin TEQ	1.46E-05	-	-	1.46E-05			-	-	-
			Nondioxin-like PCBs	9.64E-06	-	-	9.64E-06	Eyes/Skin	3.37E+00	-	-	3.37
			Chemical Total		-	-	2.66E-05			-	-	3.44
		Exposure Point Total					2.66E-05					3.44
	Exposure Medium Total						2.66E-05					3.44
Area Total							4.82E-05					3.95
Reach 7 10.98%	Sediment	Surface Sediment	Benzo(a)anthracene	7.77E-07	-	3.66E-07	1.14E-06		-	-	-	-
			Benzo(a)pyrene	1.29E-05	-	6.07E-06	1.90E-05		-	-	-	-
			Dibenz(a,h)anthracene	2.59E-07	-	1.22E-07	3.81E-07		-	-	-	-
			Dieldrin	7.30E-07	-	-	7.30E-07	Liver	1.28E-02	-	-	0.01
			Arsenic	5.81E-07	-	4.77E-08	6.28E-07	Skin	1.81E-02	-	1.48E-03	0.02
			Aroclor 1248	4.40E-07	-	7.69E-08	5.17E-07		-	-	-	
			Chemical Total		-		2.24E-05			-		0.03
		Exposure Point Total					2.24E-05					0.03
	Exposure Medium Total						2.24E-05					0.03

TABLE 9.4 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Active Angler
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Fish	Carp Fillet 50.0%	Chlordane - alpha	3.08E-08	-	-	3.08E-08	Liver	2.46E-03	-	-	0.00
			Chlordane - gamma	4.82E-08	-	-	4.82E-08	Liver	3.85E-03	-	-	0.00
			o,p'-DDD	2.67E-08	-	-	2.67E-08			-	-	-
			p,p'-DDD	9.56E-08	-	-	9.56E-08			-	-	-
			p,p'-DDE	8.39E-08	-	-	8.39E-08			-	-	-
			Dieldrin	5.25E-07	-	-	5.25E-07	Liver	9.19E-03	-	-	0.01
			Chromium	-	-	-	-	GI/Embryo	2.45E-02	-	-	0.02
			Dioxin TEQ	4.63E-06	-	-	4.63E-06			-	-	-
			Nondioxin-like PCBs	2.76E-06	-	-	2.76E-06	Eyes/Skin	9.63E-01	-	-	0.96
			Chemical Total		-	-	8.19E-06			-	-	1.00
		Exposure Point Total					8.19E-06					1.00
		Goldfish Fillet 50.0%	Chlordane - alpha	1.10E-07	-	-	1.10E-07	Liver	8.83E-03	-	-	0.01
			Chlordane - gamma	8.16E-08	-	-	8.16E-08	Liver	6.52E-03	-	-	0.01
			o,p'-DDD	4.45E-08	-	-	4.45E-08			-	-	-
			p,p'-DDD	2.80E-07	-	-	2.80E-07			-	-	-
			p,p'-DDE	2.45E-07	-	-	2.45E-07			-	-	-
			Dieldrin	1.25E-06	-	-	1.25E-06	Liver	2.19E-02	-	-	0.02
			Dioxin TEQ	1.45E-05	-	-	1.45E-05			-	-	-
			Nondioxin-like PCBs	8.67E-06	-	-	8.67E-06	Eyes/Skin	3.03E+00	-	-	3.03
			Chemical Total		-	-	2.52E-05			-	-	3.07
		Exposure Point Total					2.52E-05					3.07
	Exposure Medium Total						3.34E-05					4.07
Area Total							5.58E-05					4.10
Receptor Total						Receptor Risk Total	5.3E-04				Receptor HI Total	18.24

Total Skin HI Across All Media = 14.58
Total Liver HI Across All Media = 0.29

TABLE 9.5 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Reach 1	Sediment	Surface Sediment	Benzo(a)anthracene	3.10E-07	-	8.58E-07	1.17E-06		-	-	-	-
13.56%			Benzo(a)pyrene	1.22E-06	-	3.37E-06	4.59E-06		-	-	-	-
			Benzo(b)fluoranthene	1.10E-07	-	3.03E-07	4.13E-07		-	-	-	-
			Dibenz(a,h)anthracene	4.54E-07	-	1.26E-06	1.71E-06		-	-	-	-
			Indeno(1,2,3-cd)pyrene	5.53E-08	-	1.53E-07	2.09E-07		-	-	-	-
			Arsenic	3.75E-07	-	1.81E-07	5.56E-07	Skin	2.33E-03	-	1.13E-03	0.0035
			Chemical Total	2.52E-06	-	6.12E-06	8.64E-06		2E-03	-	1.13E-03	3.46E-03
		Exposure Point Total					8.64E-06					3.46E-03
	Exposure Medium Total						8.64E-06					3.46E-03
Area Total							8.64E-06					3.46E-03
Reach 2	Sediment	Surface Sediment	Benzo(a)anthracene	2.69E-07	-	7.45E-07	1.01E-06		-	-	-	-
19.16%			Benzo(a)pyrene	1.87E-06	-	5.19E-06	7.06E-06		-	-	-	-
			Dibenz(a,h)anthracene	2.47E-07	-	6.83E-07	9.29E-07		-	-	-	-
			Arsenic	5.78E-07	-	2.79E-07	8.58E-07	Skin	3.60E-03	-	1.74E-03	0.01
			Chemical Total	2.97E-06	-	6.89E-06	9.86E-06		3.60E-03	-	1.74E-03	5.34E-03
		Exposure Point Total					9.86E-06					5.34E-03
	Exposure Medium Total						9.86E-06					5.34E-03
Area Total							9.86E-06					5.34E-03
Reach 3	Sediment	Surface Sediment	Benzo(a)pyrene	1.30E-07	7.72E-12	3.61E-07	4.91E-07		-	-	-	-
9.98%			Arsenic	1.84E-07	2.08E-10	8.89E-08	2.73E-07	Skin	1.15E-03	-	5.53E-04	0.0017
			Chemical Total	3.14E-07	2.15E-10	4.50E-07	7.64E-07			-		1.70E-03
		Exposure Point Total					7.64E-07					1.70E-03
	Exposure Medium Total						7.64E-07					1.70E-03
Area Total							7.64E-07					1.70E-03
Reach 4	Sediment	Surface Sediment	Benzo(a)anthracene	7.50E-08	4.45E-12	2.08E-07	2.83E-07		-	-	-	-
5.41%			Benzo(a)pyrene	4.33E-07	2.56E-11	1.20E-06	1.63E-06		-	-	-	-
			Dibenz(a,h)anthracene	1.99E-08	1.28E-12	5.50E-08	7.48E-08		-	-	-	-
			Chemical Total	5.27E-07	3.14E-11	1.46E-06	1.99E-06		-	-	-	
		Exposure Point Total					1.99E-06					
	Exposure Medium Total						1.99E-06					
Area Total							1.99E-06					
Reach 5	Sediment	Surface Sediment	Benzo(a)pyrene	3.83E-08	2.27E-12	1.06E-07	1.44E-07		-	-	-	
6.52%			Chemical Total	3.83E-08	2.27E-12	1.06E-07	1.44E-07		-	-	-	
		Exposure Point Total					1.44E-07					
	Exposure Medium Total						1.44E-07					
Area Total							1.44E-07					

TABLE 9.5 RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
West Branch of the Grand Calumet River, Lake County, Indiana

Scenario Timeframe: Current/Future
Receptor Population: Maintenance/Utility Worker
Receptor Age: Adult

Area	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Reach 6	Sediment	Surface Sediment	Benzo(a)anthracene	5.46E-08	-	1.51E-07	2.06E-07		-	-	-	-
3.40%			Benzo(a)pyrene	3.55E-07	-	9.83E-07	1.34E-06		-	-	-	-
			Dibenz(a,h)anthracene	2.00E-08	-	5.53E-08	7.53E-08		-	-	-	-
			Chemical Total	4.30E-07	-	1.19E-06	1.62E-06		-	-	-	-
		Exposure Point Total					1.62E-06					-
	Exposure Medium Total						1.62E-06					-
Area Total							1.62E-06					
Reach 7	Sediment	Surface Sediment	Benzo(a)anthracene	2.40E-08	-	6.64E-08	9.04E-08		-	-	-	-
4.45%			Benzo(a)pyrene	3.98E-07	-	1.10E-06	1.50E-06		-	-	-	-
			Chemical Total	4.22E-07	-	1.17E-06	1.59E-06		-	-	-	
		Exposure Point Total					1.59E-06					
	Exposure Medium Total						1.59E-06					
Area Total							1.59E-06					
Roxanna Marsh	Sediment	Surface Sediment	Benzo(a)anthracene	2.36E-07	1.40E-11	6.55E-07	8.91E-07		-	-	-	-
37.53%			Benzo(a)pyrene	8.40E-07	4.98E-11	2.33E-06	3.17E-06		-	-	-	-
			Benzo(b)fluoranthene	1.38E-07	8.17E-12	3.81E-07	5.19E-07		-	-	-	-
			Dibenz(a,h)anthracene	9.20E-07	5.95E-11	2.55E-06	3.47E-06		-	-	-	-
			Arsenic	6.32E-07	7.13E-10	3.05E-07	9.38E-07	Skin	3.93E-03	-	1.90E-03	0.0058
			Chemical Total	2.77E-06	8.44E-10	6.21E-06	8.98E-06		3.93E-03	-	1.90E-03	5.83E-03
		Exposure Point Total					8.98E-06					5.83E-03
	Exposure Medium Total						8.98E-06					5.83E-03
Area Total							8.98E-06					5.83E-03
Receptor Total						Receptor Risk Total	3.36E-05				Receptor HI Total	0.016

APPENDIX A

TOXICITY PROFILES

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ALDRIN and DIELDRIN

CAS # 309-00-2 and 60-57-1

Division of Toxicology ToxFAQs™ September 2002

This fact sheet answers the most frequently asked health questions (FAQs) about aldrin and dieldrin. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to aldrin and dieldrin happens mostly from eating contaminated foods, such as root crops, fish, or seafood. Aldrin and dieldrin build up in the body after years of exposure and can affect the nervous system. Aldrin has been found in at least 207 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA). Dieldrin has been found in at least 287 of the 1,613 sites.

What are aldrin and dieldrin?

Aldrin and dieldrin are insecticides with similar chemical structures. They are discussed together in this fact sheet because aldrin quickly breaks down to dieldrin in the body and in the environment. Pure aldrin and dieldrin are white powders with a mild chemical odor. The less pure commercial powders have a tan color. Neither substance occurs naturally in the environment.

From the 1950s until 1970, aldrin and dieldrin were widely used pesticides for crops like corn and cotton. Because of concerns about damage to the environment and potentially to human health, EPA banned all uses of aldrin and dieldrin in 1974, except to control termites. In 1987, EPA banned all uses.

What happens to aldrin and dieldrin when they enter the environment?

- ❑ Sunlight and bacteria change aldrin to dieldrin so that we mostly find dieldrin in the environment.
- ❑ They bind tightly to soil and slowly evaporate to the air.
- ❑ Dieldrin in soil and water breaks down very slowly.
- ❑ Plants take in and store aldrin and dieldrin from the soil.
- ❑ Aldrin rapidly changes to dieldrin in plants and animals.
- ❑ Dieldrin is stored in the fat and leaves the body very slowly.

How might I be exposed to aldrin or dieldrin?

- ❑ Dieldrin is everywhere in the environment, but at very low levels.
- ❑ Eating food like fish or shellfish from lakes or streams contaminated with either chemical, or contaminated root crops, dairy products, or meats.
- ❑ Air, surface water, or soil near waste sites may contain higher levels.
- ❑ Living in homes that were once treated with aldrin or dieldrin to control termites.

How can aldrin and dieldrin affect my health?

People who have intentionally or accidentally ingested large amounts of aldrin or dieldrin have suffered convulsions and some died. Health effects may also occur after a longer period of exposure to smaller amounts because these chemicals build up in the body.

Some workers exposed to moderate levels in the air for a long time had headaches, dizziness, irritability, vomiting, and uncontrolled muscle movements. Workers removed from the source of exposure rapidly recovered from most of these effects.

Animals exposed to high amounts of aldrin or dieldrin also had nervous system effects. In animals, oral exposure to lower levels for a long period also affected the liver and decreased their ability to fight infections. We do not know whether aldrin or dieldrin affect the ability of people to fight disease.

Studies in animals have given conflicting results about whether aldrin and dieldrin affect reproduction in male animals and whether these chemicals may damage the sperm.

We do not know whether aldrin or dieldrin affect reproduction in humans.

How likely are aldrin and dieldrin to cause cancer?

There is no conclusive evidence that aldrin or dieldrin cause cancer in humans. Aldrin and dieldrin have been shown to cause liver cancer in mice. The International Agency for Research on Cancer (IARC) has determined that aldrin and dieldrin are not classifiable as to human carcinogenicity. The EPA has determined that aldrin and dieldrin are probable human carcinogens.

How can aldrin and dieldrin affect children?

Children can be exposed to aldrin and dieldrin in the same way as adults. There are no known unique exposure pathways for children. Children who swallowed amounts of aldrin or dieldrin much larger than those found in the environment suffered convulsions and some died, as occurred in adults. However, we do not know whether children are more susceptible than adults to the effects of aldrin or dieldrin.

We do not know whether aldrin or dieldrin cause birth defects in humans. Pregnant animals that ingested aldrin or dieldrin had some babies with low birth weight and some with alterations in the skeleton. Dieldrin has been found in human breast milk, therefore, it can be passed to suckling infants.

How can families reduce the risk of exposure to aldrin and dieldrin?

❑ Since aldrin and dieldrin are no longer produced or used, exposure to these compounds will occur only from past usage.

❑ Because aldrin and dieldrin were applied to the basement of some homes for termite protection, before buying a home families should investigate what, if any, pesticides have been used within the home.

Is there a medical test to show whether I've been exposed to aldrin and dieldrin?

There are laboratory tests that can measure aldrin and dieldrin in your blood, urine, and body tissues. Because aldrin changes to dieldrin fairly quickly in the body, the test has to be done shortly after you are exposed to aldrin. Since dieldrin can stay in the body for months, measurements of dieldrin can be made much longer after exposure to either aldrin or dieldrin. The tests cannot tell you whether harmful health effects will occur. These tests are not routinely available at the doctor's office because they require special equipment.

Has the federal government made recommendations to protect human health?

The EPA limits the amount of aldrin and dieldrin that may be present in drinking water to 0.001 and 0.002 milligrams per liter (mg/L) of water, respectively, for protection against health effects other than cancer. The EPA has determined that a concentration of aldrin and dieldrin of 0.0002 mg/L in drinking water limits the lifetime risk of developing cancer from exposure to each compound to 1 in 10,000.

The Occupational Safety and Health Administration (OSHA) sets a maximum average of 0.25 milligrams of aldrin and dieldrin per cubic meter of air (0.25 mg/m^3) in the workplace during an 8-hour shift, 40 hour week. The National Institute for Occupational Safety and Health (NIOSH) also recommends a limit of 0.25 mg/m^3 for both compounds for up to a 10-hour work day, 40-hour week.

The Food and Drug Administration (FDA) regulates the residues of aldrin and dieldrin in raw foods. The allowable range is from 0 to 0.1 ppm, depending on the type of food product.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Aldrin/Dieldrin (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

ARSENIC
CAS # 7440-38-2

Division of Toxicology ToxFAQs™ December 2003

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occurs mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found at 1,014 of the 1,598 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Organic arsenic compounds are used as pesticides, primarily on cotton plants.

What happens to arsenic when it enters the environment?

- Arsenic cannot be destroyed in the environment. It can only change its form.
- Arsenic in air will settle to the ground or is washed out of the air by rain.
- Many arsenic compounds can dissolve in water.
- Fish and shellfish can accumulate arsenic, but the arsenic in fish is mostly in a form that is not harmful.

How might I be exposed to arsenic?

- Eating food, drinking water, or breathing air containing arsenic.
- Breathing contaminated workplace air.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living near uncontrolled hazardous waste sites containing arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs. Ingesting high levels of inorganic arsenic can result in death. Lower levels of arsenic can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the

appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Organic arsenic compounds are less toxic than inorganic arsenic compounds. Exposure to high levels of some organic arsenic compounds may cause similar effects as inorganic arsenic.

How likely is arsenic to cause cancer?

Several studies have shown that inorganic arsenic can increase the risk of lung cancer, skin cancer, bladder cancer, liver cancer, kidney cancer, and prostate cancer. The World Health Organization (WHO), the Department of Health and Human Services (DHHS), and the EPA have determined that inorganic arsenic is a human carcinogen.

How can arsenic affect children?

We do not know if exposure to arsenic will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to inorganic arsenic.

It is likely that health effects seen in children exposed to high amounts of arsenic will be similar to the effects seen in adults.

How can families reduce the risk of exposure to arsenic?

❑ If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
❑ If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.

Is there a medical test to show whether I've been exposed to arsenic?

There are tests to measure the level of arsenic in blood, urine, hair, or fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels or arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict how the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or canceled many uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration has set limits of 10 μg arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Arsenic. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

CHLORDANE
CAS # 57-74-9

Agency for Toxic Substances and Disease Registry ToxFAQs September 1995

This fact sheet answers the most frequently asked health questions (FAQs) about chlordane. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to chlordane occurs mostly from eating contaminated foods, such as root crops, meats, fish, and shellfish, or from touching contaminated soil. High levels of chlordane can cause damage to the nervous system or liver. This chemical has been found in at least 171 of 1,416 National Priorities List sites identified by the Environmental Protection Agency.

What is chlordane?
(Pronounced klôr′dān′)

Chlordane is a manufactured chemical that was used as a pesticide in the United States from 1948 to 1988. Technical chlordane is not a single chemical, but is actually a mixture of pure chlordane mixed with many related chemicals. It doesn't occur naturally in the environment. It is a thick liquid whose color ranges from colorless to amber. Chlordane has a mild, irritating smell.

Some of its trade names are Octachlor and Velsicol 1068. Until 1983, chlordane was used as a pesticide on crops like corn and citrus and on home lawns and gardens.

Because of concern about damage to the environment and harm to human health, the Environmental Protection Agency (EPA) banned all uses of chlordane in 1983 except to control termites. In 1988, EPA banned all uses.

What happens to chlordane when it enters the environment?

- Chlordane entered the environment when it was used as a pesticide on crops, on lawns and gardens, and to control termites.
- Chlordane sticks strongly to soil particles at the surface and is not likely to enter groundwater.
- It can stay in the soil for over 20 years.
- Most chlordane leaves soil by evaporation to the air.
- It breaks down very slowly.
- Chlordane doesn't dissolve easily in water.
- It builds up in the tissues of fish, birds, and mammals.

How might I be exposed to chlordane?

- By eating crops grown in soil that contains chlordane.
- By eating fish or shellfish caught in water that is contaminated by chlordane.
- By breathing air or touching soil near homes treated for termites with chlordane.
- By breathing air or by touching soil near waste sites or landfills.

How can chlordane affect my health?

Chlordane affects the nervous system, the digestive system, and the liver in people and animals. Headaches, irritability, confusion, weakness, vision problems, vomiting, stomach cramps, diarrhea, and jaundice have occurred in people who breathed air containing high concentrations of chlordane or accidentally swallowed small amounts of chlordane. Large amounts of chlordane taken by mouth can cause convulsions and death in people.

A man who had long-term skin contact with soil containing high levels of chlordane had convulsions. Japanese workers who used chlordane over a long period of time had minor changes in liver function.

Animals given high levels of chlordane by mouth for short periods died or had convulsions. Long-term exposure caused harmful effects in the liver of test animals.

We do not know whether chlordane affects the ability of people to have children or whether it causes birth defects. Animals exposed before birth or while nursing developed behavioral effects later.

How likely is chlordane to cause cancer?

The International Agency for Research on Cancer has determined that chlordane is not classifiable as to its carcinogenicity to humans. Studies of workers who made or used chlordane do not show that exposure to chlordane is related to cancer, but the information is not sufficient to know for sure. Mice fed low levels of chlordane in food developed liver cancer.

Is there a medical test to show whether I've been exposed to chlordane?

Laboratory tests can measure chlordane and its breakdown products in blood, fat, urine, feces, and breast milk. The amount of breakdown products measured in body fat or breast milk does not tell how much or how long ago you were exposed to chlordane or if harmful effects will occur.

Has the federal government made recommendations to protect human health?

In 1988, the EPA banned all uses of chlordane. The EPA recommends that a child should not drink water with more than 60 parts of chlordane per billion parts of drinking water (60 ppb) for longer than 1 day. EPA has set a limit in drinking water of 2 ppb.

EPA requires spills or releases of chlordane into the environment of 1 pound or more to be reported to EPA.

The Food and Drug Administration (FDA) limits the amount of chlordane and its breakdown products in most fruits and vegetables to less than 300 ppb and in animal fat and fish to less than 100 ppb.

The Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Health and Safety (NIOSH), and the American Conference of Governmental Industrial Hygienists (ACGIH) set a maximum level of 0.5 milligrams of chlordane per cubic meter (mg/m^3) in workplace air for an 8-hour workday, 40-hour workweek. These agencies have advised that eye and skin contact should be avoided because this may be a significant route of exposure.

Glossary

Carcinogenicity: Ability to cause cancer.

Long-term: Lasting one year or longer.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

ppb: Parts per billion.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1994. Toxicological profile for chlordane (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

CHROMIUM
CAS # 7440-47-3

Division of Toxicology ToxFAQs™ February 2001

This fact sheet answers the most frequently asked health questions (FAQs) about chromium. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and can cause cancer. Chromium has been found at 1,036 of the 1,591 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, soil, and in volcanic dust and gases. Chromium is present in the environment in several different forms. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

Chromium(III) occurs naturally in the environment and is an essential nutrient. Chromium(VI) and chromium(0) are generally produced by industrial processes.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- ❑ Chromium enters the air, water, and soil mostly in the chromium(III) and chromium(VI) forms.
- ❑ In air, chromium compounds are present mostly as fine dust particles which eventually settle over land and water.
- ❑ Chromium can strongly attach to soil and only a small amount can dissolve in water and move deeper in the soil to underground water.
- ❑ Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

- ❑ Eating food containing chromium(III).
- ❑ Breathing contaminated workplace air or skin contact during use in the workplace.
- ❑ Drinking contaminated well water.
- ❑ Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the nose, such as runny nose, nosebleeds, and ulcers and holes in the nasal septum.

Ingesting large amounts of chromium(VI) can cause stomach upsets and ulcers, convulsions, kidney and liver damage, and even death.

Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive to chromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

How likely is chromium to cause cancer?

Several studies have shown that chromium(VI) compounds can increase the risk of lung cancer. Animal studies have also shown an increased risk of cancer.

The World Health Organization (WHO) has determined that chromium(VI) is a human carcinogen.

The Department of Health and Human Services (DHHS) has determined that certain chromium(VI) compounds are known to cause cancer in humans.

The EPA has determined that chromium(VI) in air is a human carcinogen.

How can chromium affect children?

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to chromium(VI).

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

How can families reduce the risk of exposure to chromium?

❑ Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.

❑ Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

Is there a medical test to show whether I've been exposed to chromium?

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. There are tests to measure the level of chromium in hair, urine, and blood. These tests are most useful for people exposed to high levels. These tests cannot determine the exact levels of chromium that you may have been exposed to or predict how the levels in your tissues will affect your health.

Has the federal government made recommendations to protect human health?

EPA has set a limit of 100 μg chromium(III) and chromium(VI) per liter of drinking water (100 μg/L).

The Occupational Safety and Health Administration (OSHA) has set limits of 500 μg water soluble chromium(III) compounds per cubic meter of workplace air (500 $\mu g/m^3$), 1,000 $\mu g/m^3$ for metallic chromium(0) and insoluble chromium compounds, and 52 $\mu g/m^3$ for chromium(VI) compounds for 8-hour work shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Chromium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

DDT, DDE, AND DDD

CAS # 50-29-3, 72-55-9, 72-54-8

Division of Toxicology ToxFAQs™ September 2002

This fact sheet answers the most frequently asked health questions (FAQs) about DDT, DDE, and DDD. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to DDT, DDE, and DDD occurs mostly from eating foods containing small amounts of these compounds, particularly meat, fish and poultry. High levels of DDT can affect the nervous system causing excitability, tremors and seizures. In women, DDE can cause a reduction in the duration of lactation and an increased chance of having a premature baby. DDT, DDE, and DDD have been found in at least 441 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are DDT, DDE, and DDD?

DDT (dichlorodiphenyltrichloroethane) is a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria. DDT is a white, crystalline solid with no odor or taste. Its use in the U.S. was banned in 1972 because of damage to wildlife, but is still used in some countries.

DDE (dichlorodiphenyldichloroethylene) and DDD (dichlorodiphenyldichloroethane) are chemicals similar to DDT that contaminate commercial DDT preparations. DDE has no commercial use. DDD was also used to kill pests, but its use has also been banned. One form of DDD has been used medically to treat cancer of the adrenal gland.

What happens to DDT, DDE, and DDD when they enter the environment?

- DDT entered the environment when it was used as a pesticide; it still enters the environment due to current use in other countries.
- DDE enters the environment as contaminant or breakdown product of DDT; DDD also enters the environment as a breakdown product of DDT.
- DDT, DDE, and DDD in air are rapidly broken down by sunlight. Half of what's in air breaks down within 2 days.
- They stick strongly to soil; most DDT in soil is broken down slowly to DDE and DDD by microorganisms; half the DDT in soil will break down in 2-15 years, depending on the type of soil.
- Only a small amount will go through the soil into groundwater; they do not dissolve easily in water.
- DDT, and especially DDE, build up in plants and in fatty tissues of fish, birds, and other animals.

How might I be exposed to DDT, DDE, and DDD?

- Eating contaminated foods, such as root and leafy vegetables, fatty meat, fish, and poultry, but levels are very low.
- Eating contaminated imported foods from countries that still allow the use of DDT to control pests.
- Breathing contaminated air or drinking contaminated water near waste sites and landfills that may contain higher levels of these chemicals.
- Infants fed on breast milk from mothers who have been exposed.
- Breathing or swallowing soil particles near waste sites or landfills that contain these chemicals.

How can DDT, DDE, and DDD affect my health?

DDT affects the nervous system. People who accidentally swallowed large amounts of DDT became excitable and had tremors and seizures. These effects went away after the exposure stopped. No effects were seen in people who took small daily doses of DDT by capsule for 18 months.

A study in humans showed that women who had high amounts of a form of DDE in their breast milk were unable to

breast feed their babies for as long as women who had little DDE in the breast milk. Another study in humans showed that women who had high amounts of DDE in breast milk had an increased chance of having premature babies.
In animals, short-term exposure to large amounts of DDT in food affected the nervous system, while long-term exposure to smaller amounts affected the liver. Also in animals, short-term oral exposure to small amounts of DDT or its breakdown products may also have harmful effects on reproduction.

How likely are DDT, DDE, and DDD to cause cancer?

Studies in DDT-exposed workers did not show increases in cancer. Studies in animals given DDT with the food have shown that DDT can cause liver cancer.
The Department of Health and Human Services (DHHS) determined that DDT may reasonable be anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) determined that DDT may possibly cause cancer in humans. The EPA determined that DDT, DDE, and DDD are probable human carcinogens.

How can DDT, DDE, and DDD affect children?

There are no studies on the health effects of children exposed to DDT, DDE, or DDD. We can assume that children exposed to large amounts of DDT will have health effects similar to the effects seen in adults. However, we do not know whether children differ from adults in their susceptibility to these substances.
There is no evidence that DDT, DDE, or DDD cause birth defects in people. A study showed that teenage boys whose mothers had higher DDE amounts in the blood when they were pregnant were taller than those whose mothers had lower DDE levels. However, a different study found the opposite in preteen girls. The reason for the discrepancy between these studies is unknown.
Studies in rats have shown that DDT and DDE can mimic the action of natural hormones and in this way affect the development of the reproductive and nervous systems. Puberty was delayed in male rats given high amounts of DDE as juveniles. This could possibly happen in humans.
A study in mice showed that exposure to DDT during the first weeks of life may cause neurobehavioral problems later in life.

How can families reduce the risk of exposure to DDT,DDE, and DDE?

- ❑ Most families will be exposed to DDT by eating food or drinking liquids contaminated with small amounts of DDT.
- ❑ Cooking will reduce the amount of DDT in fish.
- ❑ Washing fruit and vegetables will remove most DDT from their surface.
- ❑ Follow health advisories that tell you about consumption of fish and wildlife caught in contaminated areas.

Is there a medical test to show whether I've been exposed to DDT, DDE, and DDD?

Laboratory tests can detect DDT, DDE, and DDD in fat, blood, urine, semen, and breast milk. These tests may show low, moderate, or excessive exposure to these compounds, but cannot tell the exact amount you were exposed to, or whether you will experience adverse effects. These tests are not routinely available at the doctor's office because they require special equipment.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) sets a limit of 1 milligram of DDT per cubic meter of air (1 mg/m^3) in the workplace for an 8-hour shift, 40-hour workweek.
The Food and Drug Administration (FDA) has set limits for DDT, DDE, and DDD in foodstuff at or above which the agency will take legal action to remove the products from the market.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for DDT/DDE/DDD (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Di(2-ethylhexyl) phthalate (DEHP)

CAS # 117-81-7

Division of Toxicology ToxFAQs™ September 2002

This fact sheet answers the most frequently asked health questions (FAQs) about di(2-ethylhexyl) phthalate (DEHP). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Di(2-ethylhexyl) phthalate (DEHP) is found in many plastics. Exposure to DEHP is generally very low. Increased exposures may come from intravenous fluids delivered through plastic tubing, and from ingesting contaminated foods or water. DEHP is not toxic at the low levels usually present in the environment. In animals, high levels of DEHP damaged the liver and kidney and affected the ability to reproduce. DEHP has been found in at least 733 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is di(2-ethylhexyl) phthlate?

Di(2-ethylhexyl) phthlate (DEHP) is a manufactured chemical that is commonly added to plastics to make them flexible. DEHP is a colorless liquid with almost no odor.

DEHP is present in plastic products such as wall coverings, tablecloths, floor tiles, furniture upholstery, shower curtains, garden hoses, swimming pool liners, rainwear, baby pants, dolls, some toys, shoes, automobile upholstery and tops, packaging film and sheets, sheathing for wire and cable, medical tubing, and blood storage bags.

What happens to DEHP when it enters the environment?

- ❑ DEHP is everywhere in the environment because of its use in plastics, but it does not evaporate easily or dissolve in water easily.
- ❑ DEHP can be released in small amounts to indoor air from plastic materials, coatings, and flooring.
- ❑ It dissolves faster in water if gas, oil, or paint removers are present.
- ❑ It attaches strongly to soil particles.
- ❑ DEHP in soil or water can be broken down by microorganisms into harmless compounds.
- ❑ DEHP does not break down easily when it is deep in the soil or at the bottom of lakes or rivers.
- ❑ It is in plants, fish, and other animals, but animals high on the food chain are able to break down DEHP, so tissue levels are usually low.

How might I be exposed to DEHP?

DEHP is usually present at very low levels in:

- ❑ Medical products packaged in plastic such as blood products.
- ❑ Some foods packaged in plastics, especially fatty foods like milk products, fish or seafood, and oils.
- ❑ Well water near waste sites.
- ❑ Workplace air or indoor air where DEHP is released, but usually not at levels of concern.
- ❑ Fluids from plastic intravenous tubing if used extensively as for kidney dialysis.

How can DEHP affect my health?

At the levels found in the environment, DEHP is not expected to cause harmful health effects in humans. Most of what we know about the health effects of DEHP comes from studies of rats and mice given high amounts of DEHP.

Harmful effects in animals generally occurred only with high amounts of DEHP or with prolonged exposures. Moreover, absorption and breakdown of DEHP in humans is different than in rats or mice, so the effects seen in rats and mice may not occur in humans.

Rats that breathed DEHP in the air showed no serious harmful effects. Their lifespan and ability to reproduce were not affected.

Brief oral exposure to very high levels of DEHP damaged sperm in mice. Although the effect reversed when exposure ceased, sexual maturity was delayed in the animals.

High amounts of DEHP damaged the liver of rats and mice. Whether or not DEHP contributes to human kidney damage is unclear.

Skin contact with products containing DEHP will probably cause no harmful effects because it cannot be taken up easily through the skin.

How likely is DEHP to cause cancer?

The Department of Health and Human Services (DHHS) has determined that DEHP may reasonably be anticipated to be a human carcinogen. The EPA has determined that DEHP is a probable human carcinogen. These determinations were based entirely on liver cancer in rats and mice. The International Agency for Research on Cancer (IARC) has stated that DEHP cannot be classified as to its carcinogenicity to humans.

How can DEHP affect children?

Children can be exposed to DEHP in the same manner as adults. In addition, small children can be exposed by sucking on or skin contact with plastic toys and pacifiers that contain DEHP, but there is no conclusive evidence of adverse health effects after such exposures. Nonetheless, because of concern for children's health, many toy manufacturers have discontinued use of DEHP in their products. In pregnant rats and mice exposed to high amounts of DEHP, researchers observed birth defects and fetal deaths.

How can families reduce the risk of exposure to DEHP?

- It is almost impossible to completely avoid contact with some DEHP because it is commonly found in plastics.
- Prevent babies and small children from chewing on plastic objects not designed for that purpose.

Is there a medical test to show whether I've been exposed to DEHP?

There is a test available that measures a breakdown product of DEHP called mono(2-ethylhexyl) phthalate (MEHP) in your urine or blood. This test can only detect recent exposure because DEHP is rapidly broken down and eliminated from your body. This test is not routinely available at the doctor's office because it requires special equipment.

Has the federal government made recommendations to protect human health?

The EPA limits the amount of DEHP that may be present in drinking water to 6 parts of DEHP per billion parts of water (6 ppb).

The Occupational Safety and Health Administration (OSHA) sets a maximum average of 5 milligrams of DEHP per cubic meter of air (5 mg/m^3) in the workplace during an 8-hour shift. The short-term (15-minute) exposure limit is 10 mg/m^3.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Di(2-ethylhexyl) phthlate (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

CHLORINATED DIBENZO-p-DIOXINS (CDDs)

Agency for Toxic Substances and Disease Registry ToxFAQs February 1999

This fact sheet answers the most frequently asked health questions (FAQs) about chlorinated dibenzo-p-dioxins (CDDs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chlorinated dibenzo-p-dioxins (CDDs) (75 chemicals) occurs mainly from eating food that contains the chemicals. One chemical in this group, 2,3,7,8-tetrachlorodibenzo-p-dioxin or 2,3,7,8-TCDD, has been shown to be very toxic in animal studies. It causes effects on the skin and may cause cancer in people. This chemical has been found in at least 91 of 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are CDDs?

CDDs are a family of 75 chemically related compounds commonly known as chlorinated dioxins. One of these compounds is called 2,3,7,8-TCDD. It is one of the most toxic of the CDDs and is the one most studied.

In the pure form, CDDs are crystals or colorless solids. CDDs enter the environment as mixtures containing a number of individual components. 2,3,7,8-TCDD is odorless and the odors of the other CDDs are not known.

CDDs are not intentionally manufactured by industry except for research purposes. They (mainly 2,3,7,8-TCDD) may be formed during the chlorine bleaching process at pulp and paper mills. CDDs are also formed during chlorination by waste and drinking water treatment plants. They can occur as contaminants in the manufacture of certain organic chemicals. CDDs are released into the air in emissions from municipal solid waste and industrial incinerators.

What happens to CDDs when they enter the environment?

- When released into the air, some CDDs may be transported long distances, even around the globe.
- When released in waste waters, some CDDs are broken down by sunlight, some evaporate to air, but most attach to soil and settle to the bottom sediment in water.
- CDD concentrations may build up in the food chain, resulting in measurable levels in animals.

How might I be exposed to CDDs?

- Eating food, primarily meat, dairy products, and fish, makes up more than 90% of the intake of CDDs for the general population.
- Breathing low levels in air and drinking low levels in water.
- Skin contact with certain pesticides and herbicides.
- Living near an uncontrolled hazardous waste site containing CDDs or incinerators releasing CDDs.
- Working in industries involved in producing certain pesticides containing CDDs as impurities, working at paper and pulp mills, or operating incinerators.

How can CDDs affect my health?

The most noted health effect in people exposed to large amounts of 2,3,7,8-TCDD is chloracne. Chloracne is a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other skin effects noted in people exposed to high doses of 2,3,7,8-TCDD include skin rashes, dis-

coloration, and excessive body hair. Changes in blood and urine that may indicate liver damage also are seen in people. Exposure to high concentrations of CDDs may induce long-term alterations in glucose metabolism and subtle changes in hormonal levels.

In certain animal species, 2,3,7,8-TCDD is especially harmful and can cause death after a single exposure. Exposure to lower levels can cause a variety of effects in animals, such as weight loss, liver damage, and disruption of the endocrine system. In many species of animals, 2,3,7,8-TCDD weakens the immune system and causes a decrease in the system's ability to fight bacteria and viruses. In other animal studies, exposure to 2,3,7,8-TCDD has caused reproductive damage and birth defects. Some animal species exposed to CDDs during pregnancy had miscarriages and the offspring of animals exposed to 2,3,7,8-TCDD during pregnancy often had severe birth defects including skeletal deformities, kidney defects, and weakened immune responses.

How likely are CDDs to cause cancer?

Several studies suggest that exposure to 2,3,7,8-TCDD increases the risk of several types of cancer in people. Animal studies have also shown an increased risk of cancer from exposure to 2,3,7,8-TCDD.

The World Health Organization (WHO) has determined that 2,3,7,8-TCDD is a human carcinogen.

The Department of Health and Human Services (DHHS) has determined that 2,3,7,8-TCDD may reasonably be anticipated to cause cancer.

How can CDDs affect children?

Very few studies have looked at the effects of CDDs on children. Chloracne has been seen in children exposed to high levels of CDDs. We don't know if CDDs affect the ability of people to have children or if it causes birth defects, but given the effects observed in animal studies, this cannot be ruled out.

How can families reduce the risk of exposure to CDDs?

- ❑ Children should avoid playing in soils near uncontrolled hazardous waste sites.
- ❑ Discourage children from eating dirt or putting toys or other objects in their mouths.
- ❑ Everyone should wash hands frequently if playing or working near uncontrolled hazardous waste sites.
- ❑ For new mothers and young children, restrict eating foods from the proximity of uncontrolled sites with known CDDs.

Is there a medical test to show whether I've been exposed to CDDs?

Tests are available to measure CDD levels in body fat, blood, and breast milk, but these tests are not routinely available. Most people have low levels of CDDs in their body fat and blood, and levels considerably above these levels indicate past exposure to above-normal levels of 2,3,7,8-TCDD. Although CDDs stay in body fat for a long time, tests cannot be used to determine when exposure occurred.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.00003 micrograms of 2,3,7,8-TCDD per liter of drinking water (0.00003 μg/L). Discharges, spills, or accidental releases of 1 pound or more of 2,3,7,8-TCDD must be reported to EPA. The Food and Drug Administration (FDA) recommends against eating fish and shellfish with levels of 2,3,7,8-TCDD greater than 50 parts per trillion (50 ppt).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. Toxicological profile for chlorinated dibenzo-p-dioxins. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

HEPTACHLOR/ HEPTACHLOR EPOXIDE

CAS # 76-44-8 and 1024-57-3

Agency for Toxic Substances and Disease Registry ToxFAQs April 1993

This fact sheet answers the most frequently asked health questions (FAQs) about heptachlor/heptachlor epoxide. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to heptachlor and heptachlor epoxide happens mostly from eating contaminated foods and milk, or skin contact with contaminated soil. At high levels, they can cause damage to your nervous system. Heptachlor and heptachlor epoxide have been found in at least 129 and 87 sites, respectively, of 1,300 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are heptachlor/heptachlor epoxide?

(Pronounced hĕp′tə-klôr/hĕp′tə-klôr ĕ-pŏk′sīd)

Heptachlor is a manufactured chemical and doesn't occur naturally. Pure heptachlor is a white powder that smells like camphor (mothballs).

The less pure grade is tan. Trade names include Heptagran®, Basaklor®, Drinox®, Soleptax®, Termide®, and Velsicol 104®.

Heptachlor was used extensively in the past for killing insects in homes, buildings, and on food crops, especially corn. Use slowed in the 1970s and stopped in 1988.

Heptachlor epoxide is also a white powder and is a breakdown product of heptachlor. The epoxide is more likely to be found in the environment than heptachlor.

What happens to heptachlor and heptachlor epoxide when they enter the environment?

- ❑ Heptachlor doesn't dissolve easily in water; heptachlor epoxide dissolves more easily.
- ❑ They stick strongly to soil particles and evaporate slowly to air.
- ❑ Heptachlor epoxide can stay in the soil and water for many years.
- ❑ Animals change heptachlor to the epoxide.
- ❑ Plants can take up heptachlor from the soil.
- ❑ Levels build up in the tissues of fish and cattle.

How might I be exposed to heptachlor and heptachlor epoxide?

- ❑ Eating crops grown in soil that contains heptachlor.
- ❑ Eating fish, dairy products, and fatty meats from animals exposed to heptachlor in their food.
- ❑ Breathing air, drinking water, or skin contact with soil near waste sites or landfills.
- ❑ Breast milk (from mothers who had high exposures).

How can heptachlor and heptachlor epoxide affect my health?

Heptachlor and heptachlor epoxide are clearly toxic to humans and animals and can damage the nervous system. There are some human data on brief exposures to high levels. A few reports showed that people who accidentally swallowed

pesticides containing heptachlor, or who spilled pesticides on their clothes became dizzy, confused, or had convulsions.

Most of what we know about the health effects of these pesticides comes from studies on mice and rats fed heptachlor and heptachlor epoxide in the food or water. Very high levels for short periods produce serious liver problems. Mice had trouble walking and rats developed tremors. High levels of heptachlor in the feed for several weeks damaged the livers of rats and the livers and adrenal glands of mice.

We do not know if heptachlor or the epoxide affect the ability of men or women to have children. Animals that ate food containing heptachlor before and/or during pregnancy had smaller litters or were unable to reproduce. Some of the offspring had cataracts and some didn't live long after birth.

How likely are heptachlor and heptachlor epoxide to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that heptachlor and heptachlor epoxide are not classifiable as to their carcinogenicity to humans because insufficient data are available to establish a clear assessment.

Is there a medical test to show whether I've been exposed to heptachlor and heptachlor epoxide?

Laboratory tests can measure heptachlor and heptachlor epoxide following exposure to high levels. The blood tests for these chemicals must be done within a short period after exposure.

Levels in fat can be measured for a much longer period after exposure. If heptachlor or heptachlor epoxide are found in your fat, it isn't possible to tell exactly when you were exposed to these chemicals or if harmful health effects will occur.

Has the federal government made recommendations to protect human health?

The EPA banned the sale of all heptachlor products and restricted the use of heptachlor to the control of fire ants in power transformers. EPA recommends a maximum of 2.78 parts of heptachlor and heptachlor epoxide per trillion parts of drinking water or seafood (2.78 ppt) that you eat each day. For longer exposures, a child should not drink water with greater than 5,000 ppt heptachlor or 150 ppt heptachlor epopxide. Quantities greater than 1 pound of heptachlor or heptachlor epoxide that enter the environment must immediately be reported to the National Response Center.

The Food and Drug Administration (FDA) limits the amount of heptachlor and heptachlor epoxide on raw food crops and on edible seafood to from 0-10 parts per billion (ppb), depending on the type of food product. The limit on edible seafood is 300 ppb, and for the fat of food-producing animals is 200 ppb.

The American Conference of Governmental Industrial Hygienists (ACGIH) and the Occupational Safety and Health Administration (OSHA) recommend a maximum in workplace air over an 8-hour workday for a 40-hour work week of 0.5 milligrams of heptachlor per cubic meter (0.5 mg/m^3).

Glossary

Carcinogenicity: Ability to cause cancer.

Milligram (mg): One thousandths of a gram.

ppt: Parts per trillion.

ppb: Parts per billion.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Toxicological profile for heptachlor and heptachlor epoxide. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs)

Agency for Toxic Substances and Disease Registry ToxFAQs September 1996

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.

- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

POLYCHLORINATED BIPHENYLS

Division of Toxicology ToxFAQs™ February 2001

This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

❑ PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.

❑ PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.

❑ PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.

❑ PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

❑ Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.

❑ Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.

❑ Breathing air near hazardous waste sites and drinking contaminated well water.

❑ In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects

of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. The EPA and the International Agency for Research on Cancer (IARC) have determined that PCBs are probably carcinogenic to humans.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risk of exposure to PCBs?

❑ You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.

❑ Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.

❑ Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.

❑ If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to PCBs?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

SELENIUM

CAS # 7782-49-2

Division of Toxicology ToxFAQs™ September 2003

This fact sheet answers the most frequently asked health questions (FAQs) about selenium. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: People may be exposed to low levels of selenium daily through food and water. Selenium is a trace mineral needed in small amounts for good health, but exposure to much higher levels can result in neurological effects and brittle hair and deformed nails. Occupational inhalation exposure to selenium vapors may cause dizziness, fatigue, irritation of mucous membranes, and respiratory effects. This substance has been found in at least 508 of the 1,636 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is selenium?

Selenium is a naturally occurring mineral element that is distributed widely in nature in most rocks and soils. In its pure form, it exists as metallic gray to black hexagonal crystals, but in nature it is usually combined with sulfide or with silver, copper, lead, and nickel minerals. Most processed selenium is used in the electronics industry, but it is also used: as a nutritional supplement; in the glass industry; as a component of pigments in plastics, paints, enamels, inks, and rubber; in the preparation of pharmaceuticals; as a nutritional feed additive for poultry and livestock; in pesticide formulations; in rubber production; as an ingredient in antidandruff shampoos; and as a constituent of fungicides. Radioactive selenium is used in diagnostic medicine.

What happens to selenium when it enters the environment?

❑ Selenium occurs naturally in the environment and can be released by both natural and manufacturing processes.
❑ Selenium dust can enter the air from burning coal and oil. This selenium dust will eventually settle over the land and water.
❑ It also enters water from rocks and soil, and from agricultural and industrial waste. Some selenium compounds will dissolve in water, and some will settle to the bottom as particles.
❑ Insoluble forms of selenium will remain in soil, but soluble forms are very mobile and may enter surface water from soils.
❑ Selenium may accumulate up the food chain.

How might I be exposed to selenium?

❑ The general population is exposed to very low levels of selenium in air, food, and water. The majority of the daily intake comes from food.
❑ People working in or living near industries where selenium is produced, processed, or converted into commercial products may be exposed to higher levels of selenium in the air.
❑ People living in the vicinity of hazardous waste sites or coal burning plants may also be exposed to higher levels of selenium.

How can selenium affect my health?

Selenium has both beneficial and harmful effects. Low doses of selenium are needed to maintain good health. However, exposure to high levels can cause adverse health effects. Short-term oral exposure to high concentrations of selenium may cause nausea, vomiting, and diarrhea. Chronic oral exposure to high concentrations of selenium compounds can produce a disease called selenosis. The major signs of selenosis are hair loss, nail brittleness, and neurological abnormalities (such as numbness and other odd sensations

in the extremities).
Brief exposures to high levels of elemental selenium or selenium dioxide in air can result in respiratory tract irritation, bronchitis, difficulty breathing, and stomach pains. Longer-term exposure to either of these air-borne forms can cause respiratory irritation, bronchial spasms, and coughing.
Levels of these forms of selenium that would be necessary to produce such effects are normally not seen outside of the workplace.
Animal studies have shown that very high amounts of selenium can affect sperm production and the female reproductive cycle. We do not know if similar effects would occur in humans.

How likely is selenium to cause cancer?

Studies of laboratory animals and people show that most selenium compounds probably do not cause cancer. In fact, studies in humans suggest that lower-than-normal selenium levels in the diet might increase the risk of cancer.
The International Agency for Research on Cancer (IARC) has determined that selenium and selenium compounds are not classifiable as to their carcinogenicity to humans.
The EPA has determined that one specific form of selenium, selenium sulfide, is a probable human carcinogen. Selenium sulfide is not present in foods and is a very different chemical from the organic and inorganic selenium compounds found in foods and in the environment.

How can selenium affect children?

It is likely that the health effects seen in children exposed to selenium will be similar to the effects seen in adults. However, one study found that children may be less susceptible to the health effects of selenium than adults. Selenium compounds have not been shown to cause birth defects in humans or in other mammals.

How can families reduce the risk of exposure to selenium?

❑ Certain dietary supplements and shampoos contain selenium; these should be used according to the manufacturer's directions.
❑ Children living near waste sites that contain selenium or coal burning plants should be encouraged to wash their hands before eating and to avoid putting their unwashed hands in their mouths.

Is there a medical test to show whether I've been exposed to selenium?

Low levels of selenium are normally found in body tissues and urine. Blood and urine tests for selenium are most useful for people who have recently been exposed to high levels. Toenail clippings can be used to determine longer-term exposure. These tests are not usually available at your doctor's office, but your doctor can send the samples to a laboratory that can perform the tests. None of these tests, however, can predict whether you will experience any health effects.

Has the federal government made recommendations to protect human health?

The EPA restricts the amount of selenium allowed in public water supplies to 50 parts total selenium per billion parts of water (50 ppb).
The Occupational Safety and Health Administration (OSHA) sets a limit of 0.2 mg selenium/m^3 of workroom air for an 8-hour work shift.
ATSDR and the EPA have determined that 5 micrograms of selenium per kilogram of body weight taken daily would not be expected to cause any adverse health effects over a lifetime of such intake.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2003. Toxicological Profile for Selenium (Update) Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

TOXAPHENE
CAS # 8001-35-2

Agency for Toxic Substances and Disease Registry ToxFAQs September 1997

This fact sheet answers the most frequently asked health questions (FAQs) about toxaphene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Toxaphene is an insecticide which is currently banned for all uses in the United States. Breathing, eating, or drinking high levels of toxaphene could damage the lungs, nervous system, and kidneys, and can even cause death. Toxaphene has been found in at least 58 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is toxaphene?
(Pronounced tŏk′sə-fēn)

Toxaphene is an insecticide containing over 670 chemicals. It is usually found as a solid or gas, and in its original form it is a yellow to amber waxy solid that smells like turpentine.

It does not burn and evaporates when in solid form or when mixed with liquids. Toxaphene is also known as camphechlor, chlorocamphene, polychlorocamphene, and chlorinated camphene.

Toxaphene was one of the most heavily used insecticides in the United States until 1982, when it was canceled for most uses; all uses were banned in 1990. It was used primarily in the southern United States to control insect pests on cotton and other crops. It was also used to control insect pests on livestock and to kill unwanted fish in lakes.

What happens to toxaphene when it enters the environment?

- Toxaphene may enter the environment from hazardous waste sites.
- It may enter the air by evaporation.
- It does not dissolve well in water, so it is more likely to be found in air, soil, or sediment at the bottom of lakes or streams, than in surface water.
- Toxaphene breaks down very slowly in the environment.
- Toxaphene accumulates in fish and mammals.

How might I be exposed to toxaphene?

- People who breathe air near a hazardous waste site where toxaphene was disposed could be exposed to it.
- Infants or toddlers could be exposed by eating contaminated soil.
- People who eat large quantities of fish and shellfish which were contaminated with toxaphene could be exposed.
- People who drink water from wells containing toxaphene could also be exposed.

How can toxaphene affect my health?

Breathing, eating, or drinking high levels of toxaphene could damage the lungs, nervous system, and kidneys, and can even cause death. However, since toxaphene is no longer used in the United States, most people would not be exposed to high levels of it.

People could be exposed to low levels of it; however,

there is no information on how low levels affect people.

Studies show that animals which ate food or drank water containing toxaphene had effects on the liver, kidneys, adrenal glands, and immune system.

It is not known whether toxaphene can affect reproduction or cause birth defects in people. Animal studies have reported that toxaphene affects the development of newborn animals when their mothers are exposed during pregnancy.

How likely is toxaphene to cause cancer?

It is not known whether toxaphene causes cancer in people. An animal study reported that toxaphene caused cancer of the thyroid gland when the animals were exposed to high levels over their lifetimes.

The Department of Health and Human Services (DHHS) has determined that toxaphene may reasonably be anticipated to be a carcinogen.

Is there a medical test to show whether I've been exposed to toxaphene?

Toxaphene and its breakdown products can be detected in blood, urine, breast milk, and body tissues. Urine and blood tests are the most common tests used. These tests aren't available at most doctors' offices, but can be done at special laboratories that have the right equipment. However, these tests cannot determine how much toxaphene you have been exposed to, or whether you will experience any health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a drinking water standard of 0.003 milligrams of toxaphene per liter of drinking water (0.003 mg/L).

The EPA also requires spills or accidental releases into the environment of 1 pound or more of toxaphene be reported.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 0.5 milligrams toxaphene per cubic meter of air (0.5 mg/m^3) for an 8-hour workday, 40 hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that toxaphene levels should be as low as possible in the workplace due to its potential carcinogenicity.

The American Conference of Governmental Industrial Hydienists (ACGIH) recommend 0.5 mg/m^3 for an 8-hour workday, 40-hour workweek. They also recommend that 1 mg/m^3 be considered a level that should not be exceeded in a 15-minute period.

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Insecticide: A substance that kills insects.

Milligram (mg): One thousandth of a gram.

Sediment: Mud and debris that have settled to the bottom of a body of water.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for Toxaphene produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

APPENDIX B

SURFACE AREA COMPUTATIONS

Appendix B
Computation of Surface Areas
BASELINE HUMAN HEALTH RISK ASSESSMENT
West Branch of the Grand Calumet River

REACH	AREA SQ FT	ACRES	Fraction of Total	Fraction of 1,2,6,7
R	845499.6	19.4	0.375314	
1	305435.5	7.0	0.135582	0.334189
2	431570.1	9.9	0.191572	0.472197
3	224743.6	5.2	0.099763	
4	121796.4	2.8	0.054065	
5	146776.3	3.4	0.065153	
6	76645.32	1.8	0.034023	0.083861
7	100310.4	2.3	0.044527	0.109753
Total Sq Ft	2252777			913961.2

APPENDIX C

IEUBK MODEL OUTPUT

LEAD MODEL FOR WINDOWS Version 1.0

==========

Model Version: 1.0 Build 259
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

==========

The time step used in this model run: 2 - Daily (once a day).

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (ug Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	6.240
4-5	6.010
5-6	6.340
6-7	7.000

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.050

Drinking Water Concentration: 13.000 ug Pb/L

****** Soil & Dust ******

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
.5-1	0.000	200.000
1-2	0.000	200.000
2-3	0.000	200.000
3-4	0.000	200.000
4-5	0.000	200.000
5-6	0.000	200.000
6-7	4195.000	200.000

****** Alternate Intake ******

Age	Alternate (ug Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 2.500 ug Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (ug/dL)	Diet (ug/day)	Alternate (ug/day)	Water (ug/day)
.5-1	0.021	2.621	0.000	0.000
1-2	0.034	2.741	0.000	0.000
2-3	0.062	3.094	0.000	0.000
3-4	0.067	2.990	0.000	0.000
4-5	0.067	2.898	0.000	0.000
5-6	0.093	3.067	0.000	0.000
6-7	0.093	2.267	0.000	0.210

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	2.079	4.721	2.6
1-2	3.304	6.079	2.6
2-3	3.321	6.477	2.4
3-4	3.709	6.766	2.4
4-5	3.732	6.697	2.2
5-6	3.744	6.905	2.1
6-7	89.993	92.563	16.2

LEAD MODEL FOR WINDOWS Version 1.0

==========

Model Version: 1.0 Build 259
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

==========

The time step used in this model run: 2 - Daily (once a day).

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (ug Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	6.240
4-5	6.010
5-6	6.340
6-7	7.000

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.050
4-5	0.050
5-6	0.050
6-7	0.050

Drinking Water Concentration: 13.000 ug Pb/L

****** Soil & Dust ******

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
.5-1	0.000	200.000
1-2	0.000	200.000
2-3	0.000	200.000
3-4	5200.000	200.000
4-5	5200.000	200.000
5-6	5200.000	200.000
6-7	5200.000	200.000

****** Alternate Intake ******

Age	Alternate (ug Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 2.500 ug Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (ug/dL)	Diet (ug/day)	Alternate (ug/day)	Water (ug/day)
.5-1	0.021	2.549	0.000	0.000
1-2	0.034	2.650	0.000	0.000
2-3	0.062	3.005	0.000	0.000
3-4	0.067	2.784	0.000	0.290
4-5	0.067	2.721	0.000	0.294
5-6	0.093	2.899	0.000	0.297
6-7	0.093	3.169	0.000	0.294

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	4.547	7.118	3.9
1-2	7.183	9.867	4.1
2-3	7.255	10.322	3.8
3-4	14.654	17.794	5.5
4-5	14.875	17.957	5.9
5-6	15.020	18.310	5.6
6-7	18.541	22.097	5.8