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Duxbury Operations
397 Washington Street
Duxbury, Massachusetts 02332
Telephone 781-934-0571
Fax: 781-934-2124

June 30, 2011

Superfund Records Center
SITE: Fletcher's Paint
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Ms. Ellen Iorio
U.S. Army Corps of Engineers
New England District
696 Virginia Rd.
Concord, MA 01742-2751

CONTRACT NO. DACW33-03-D-0004
DELIVERY ORDER: 31
SUBMITTAL OF DELIVERABLE – ***Final Report Supplemental Baseline Human Health and Ecological Risk Assessments*** – **Fletcher's Paint Works and Storage Facility Superfund Site**

Dear Ms. Iorio:

Enclosed please find two (2) hard copies of the Draft Report for Delivery Order 31 entitled Final Report Supplemental Baseline Human Health and Ecological Risk Assessments for Fletcher's Paint Works and Storage Facility Superfund Site. Also included are five (5) CDs containing electronic copies of the document. This document has been reviewed by Battelle's Quality Assurance Officer and by a Battelle senior scientist for technical accuracy.

Please contact Norman Richardson at (781) 869-1417 or richardson@battelle.org if you have any technical questions regarding this submittal.

Sincerely,

Norman A. Richardson
Project Manager

Lisa F. Lefkovitz
Program Manager

encl.

cc:
Cheryl Sprague/ Rick Sugatt/ Cornell Rosiu – USEPA
Robin Mongeon – NHDES
Ken Finkelstein – NOAA
Ken Munney – USFWS
Jim Walsh – Avatar Environmental, Inc.
Mark Applebee – Watermark Environmental
Paul Hare – General Electric Company
Corey Averill – ARCADIS U.S. Inc.
Guy Scaife – Town of Milford
Tom Roy – Aries Engineering

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FINAL REPORT

SUPPLEMENTAL BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS

Fletcher's Paint Works And Storage Facility Superfund Site

Milford, New Hampshire

Contract No. DACW33-03-D-0004
Delivery Order No. 31

June 8, 2011

FINAL

SUPPLEMENTAL BASELINE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS

Fletcher's Paint Works and Storage Facility Superfund Site

Milford, NH

Submitted to

Department of the Army
U.S. Army Corps of Engineers
North Atlantic Division
New England District

Prepared for:

US Army Corps of Engineers
696 Virginia Road
Concord, MA 01742

Contract No. DACW33-03-D-004
Delivery Order No. 31

June 8, 2011

Prepared by:

Battelle
The Business of Innovation
397 Washington Street
Duxbury, MA 02332

AVATAR ENVIRONMENTAL
107 South Church Street
West Chester, PA 19382

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ACRONYMS

ABS	absorption factor (dermal)
ADD	average daily dose
ADL	Arthur D. Little
AF	adherence factor (skin-to-skin)
AT	averaging time
ATSDR	Agency for Toxic Substances and Disease Registry
AWHL	Alpha Woods Hole Laboratory
BAF	bioaccumulation factor
BAZ	Biologically Active Zone
BEC	Baystate Environmental Consultants
BERA	Baseline Ecological Risk Assessment
BHC	hexachlorocyclohexane
BHHERA	Baseline Human Health and Ecological Risk Assessment
BHHRA	Baseline Human Health Risk Assessment
BSAF	biota-sediment accumulation factor
BW	body weight
CBR	critical body residue
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	contaminant of potential concern
CSM	conceptual site model
CTE	central tendency estimate
DDE	dichlorodiphenyldichloroethylene
DDD	dichlorodiphenyldichloroethane
DDx	dichlorodiphenyltrichloroethane (DDT) and its derivatives (DDD and DDE)
ED	exposure duration
EF	exposure frequency
EPC	exposure point concentration
ERED	Environmental Residue Effects Database
FI	fraction ingested
GE	General Electric Company
GOF	goodness of fit
HEAST	Health Effects Assessment Summary Tables
HI	hazard index
HMW	high molecular weight
HQ	hazard quotient
IR	ingestion rate
IRIS	Integrated Risk Information System
LADD	lifetime average daily dose
LBB	lethal body burden

LMW	low molecular weight
LOAEL	lowest observed adverse effects level
MDL	method detection limit
MRL	Minimum Risk Level
MSL	Medium-specific Screening Level
NAS	National Academy of Sciences
NEA	Northeast Analytical, Inc.
NCEA	National Center for Environmental Assessment
NHDES	New Hampshire Department of Environmental Services
NOAEL	no observed adverse effects level
NPL	National Priority List
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PPRTV	Professional Peer Reviewed Toxicity Values
RAGS	Risk Assessment Guidance for Superfund
RBC	risk-based concentration
RfD	reference dose
RI/FS	Remedial Investigation/Feasibility Study
RL	reporting limit
RME	reasonable maximum exposure
ROD	Record of Decision
ROS	regression on order statistics
RPD	relative percent difference
SA	surface area
SAB	Science Advisory Board
SARA	Superfund Amendments and Reauthorization Act
SLERA	screening level ecological risk assessment
SOW	Scope of Work
STL	Severn Trent Laboratories
SUF	site use factor
SVOC	semi-volatile organic compound
TEF	toxic equivalency factor
TEQ	toxic equivalency
THQ	target hazard quotient
TOC	total organic carbon
TR	target risk
TRV	toxicity reference value
UCL	upper confidence limit
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	underground storage tank

VOC	volatile organic compound
WHO	World Health Organization

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EXECUTIVE SUMMARY

A baseline human health and ecological risk assessment (BHHERA) was prepared by Battelle, with assistance from Avatar Environmental, LLC, for the Souhegan River adjacent to the Fletcher's Paint Works and Storage Facility Superfund Site ("Site") in Milford, New Hampshire to supplement an earlier BHHERA conducted at the Site (Arthur D. Little [ADL], 1994a; 1997). This work was conducted under contract DACW33-03-D-004 to the United States Army Corps of Engineers (USACE), Delivery Order 31. The Site was placed on the National Priorities List (NPL) by the United States Environmental Protection Agency (USEPA) on March 31, 1989. This BHHERA was conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986 and under the authority of USEPA. It supplements the 1997 Preliminary Ecological Assessment conducted by ADL for USEPA and uses more recently collected data to assess the current and future health risks to human and ecological receptors in the absence of any remedial actions.

The Site is approximately 12 acres and is located within a mixed-use area of residential, recreational, and commercial/industrial properties. The Site was divided into two operable units (OUs) to investigate apparent releases of hazardous substances to the environment. OU-1 consists of the Elm Street area, Mill Street area, and a drainage ditch/culvert system connecting these two areas. It also includes a plume of groundwater contamination extending from the Mill Street area through the Elm Street area to the Souhegan River. OU-2 is comprised of the Keyes Municipal Well Field and the section of the Souhegan River located in the vicinity of the Elm Street area of the Site and is the focus of this supplemental BHHERA. The human health risk assessment for the Keyes Field is included in the OU-2 Remedial Investigation report (Watermark, 2010). This supplemental risk assessment focuses on human and ecological exposures to Site-related contaminants that have come to reside within a one-mile section of the Souhegan River. This section includes a reach that runs adjacent to the Site (Area A), which includes a sandbar island and is located just downstream of the footbridge at Keyes Field, and a reach downstream of the Site (Area B), near the Goldman Dam (Figure 2). In addition, the river reach immediately upstream of the Site (Area C) was selected to represent background conditions.

Fletcher's Paint manufactured, stored, and sold paints and stains for residential use from 1949 to 1991. Annual production was 25,000 to 35,000 gallons of both water-based paints and solvent-based oil paints. Manufacturing occurred at the Elm Street area, and a wood-frame building in the Mill Street area was used for storage of bulk paint pigments. In 1984, volatile organic compounds (VOCs) were detected in the nearby Keyes Municipal Water Supply Well by NHDES (formerly known as the New Hampshire Water Supply and Pollution Control Commission). This triggered the removal of the Keyes Well from service and prompted a series of CERCLA investigative activities to determine the contaminant source.

Preliminary investigation inspections by USEPA revealed that several hundred drums containing resins, pigments, solvents, and PCBs were stored on the Fletcher's Paint Elm Street property. The majority of these drums were bulging, rusty, and dented, and the ground beneath the drums was stained. High concentrations of PCBs were found in the soils at both the Mill Street and Elm Street areas. From May to October 1988, USEPA conducted removal activities at both the Elm Street and Mill Street areas.

PCB, VOC, SVOC and heavy metal contamination from the Site has migrated to the river via former Fletcher's Paint manufacturing activities, improper storage of drums, and runoff from the Elm Street area, as well as surface water runoff from Mill Street, through the drainage ditch/culvert system. Previous assessments identified elevated risk to benthic and pelagic biota and upper trophic level ecological receptors from exposure to polychlorinated biphenyls (PCBs) and pesticides (ADL, 1994a; 1994b; 1997).

PCBs also contributed the majority of potential cancer risk to humans from Souhegan River sediments (ADL, 1994a). Therefore, the focus of this supplemental BHHERA is on PCB contamination.

Surface sediment (defined as the top 0 to 6 or 7 inches) and fish tissue data collected between 2004 and 2007 were used to determine the potential risks to human health and ecological receptors posed by the contaminated sediment and the potential ingestion of fish.

Human Health Risks

The purpose of this Baseline Human Health Risk Assessment (BHHRA) was to estimate the potential risks (cancer and noncancer) associated with human contact with contamination, principally PCBs, in the Souhegan River in the vicinity of the Fletcher's Paint Site for current and reasonably anticipated future uses.

The Souhegan River portion of OU-2 at the Site was divided into three exposure areas of concern:

- **Area A/B -** Area A is directly across from the Elm Street Area, downstream of the footbridge at Keyes Field; Area B is located downstream of the Elm Street area to the Goldman Dam impoundment;
- **Area C** - background area, located upstream of Area A; and
- **Rope Swing/Hot Spot Area -** An area of statistically elevated PCB concentrations in Area A that includes a deep pool across from the Elm Street Area where a rope swing is located.

Exposure areas A and B were combined into one exposure area (Area A/B) for sample grouping and exposure calculations because these areas were determined to represent a single exposure point, and the high variability in the data prevented delineation of the boundary between the two areas based on sediment chemical and physical characteristics. In addition, a "hot spot" was identified near the former source of PCBs to the Souhegan River, where statistical analysis determined that PCB concentrations were significantly elevated compared to nearby samples. This concentration hot spot coincides with the area where a rope swing is located, potentially resulting in more frequent human exposure. Therefore, the hot spot concentrations were used to calculate intakes for an adolescent using the rope swing and swimming in that immediate vicinity.

Only exposures to surficial (i.e., 0-6 inch bgs) sediments and fish tissue were quantitatively evaluated. The exposure scenarios evaluated consisted of child, adult, and adolescent recreational users engaged in sediment contact activities that included angling/wading, swimming, rope swing use, and ingesting fish (specifically the fillet portion of redbreast sunfish) caught from the Souhegan River. Exposures to other media (i.e., subsurface sediment, bank soil, sandbar soil, and surface water) were qualitatively evaluated.

With the exception of cancer risk from arsenic due to direct sediment contact exposures, only PCB-related (e.g., total PCB, dioxin-like PCB TEQ, and non-dioxin-like PCB plus dioxin-like PCB) exposures resulted in cancer risks greater than 1E-06 and HIs greater than one and therefore exceeded EPA's risk criteria. Given that arsenic cancer risks estimated for Area C were greater than those for Area A/B, it is likely that risks from arsenic are due to background conditions or can be attributed to an upstream source.

RME cancer risks from PCB-related COPCs in the vicinity of the site (i.e., Areas A/B and Rope Swing Area) are summarized below.

COPC	PCB-related Cancer Risks – RME Case			
	Sediment Contact (0-6 inches bgs)			Fish Consumer
	Angler/Wader	Swimmer	Rope Swinger	
Total PCBs	2E-06 to 4E-06	4E-06 to 6E-06	1E-06 to 4E-06	2E-04 to 3E-04
TEQ	1E-07	1E-07	3E-06	2E-05
Non-dioxin-like PCBs plus dioxin-like PCBs	3E-06	6E-06	7E-06	4E-04

RME HIs from total PCBs in the vicinity of the Site (i.e., Area A/B and Rope Swing Area) are summarized below.

Receptor	Total PCB Hazard Quotients/Indices – RME Case			
	Sediment Contact (0-6 inches bgs)			Fish Consumer
	Angler/Wader	Swimmer	Rope Swinger	
Child	0.3 to 0.5	0.3 to 0.5	NE	20 to 31
Adolescent	NE	NE	0.3 to 0.8	NE
Adult	0.1 to 0.2	0.2 to 0.3	NE	10 to 15

For both cancer risks and noncancer hazards, subtracting background risk contributions from Site risks would result in a negligible change in the risk results.

CTE results followed the same patterns as the RME, but direct sediment contact cancer risks were all below 1E-06 and total HIs for the child and adult were less than one. For fish ingestion, the CTE total cancer risks for total PCBs ranged from 4E-05 to 6E-05, for TEQ was 3E-06, and for non-dioxin-like PCBs plus dioxin-like PCB congeners the cancer risk was 7E-05. The total PCB HQs for the child and adult Fish Consumers ranged from 6.1 to 9.4 for the child and from 3.1 to 4.8 for the adult.

Qualitative evaluations for PCB exposures in Area A/B for bank soil, sandbar soil, and surface water indicate that it is unlikely that direct contact exposure to these media would lead to unacceptable adverse health effects from PCB-related COPCs.

A qualitative analysis of the subsurface sediment (intervals ranging from 6-56 inches bgs) was performed to account for the possibility that scouring events expose the underlying sediment. Maximum detected concentrations of PCB-related COPC concentrations at depth were equal to or greater than the surficial sediment EPCs used in this BHHRA. The table below summarizes the potential cancer risks and noncancer health hazards from the maximum concentrations at the various depth intervals.

COPC	PCB-related RME Cancer Risks for Sediment at Depth (6-56 inches bgs)	
	Total Cancer Risk	HI (child/adult where applicable)
Area A/B – Swimmer		
Total PCBs	1E-05 to 2E-04	19/12
TEQ	6E-07 to 1E-05	---
Non-dioxin-like PCBs plus dioxin-like PCBs	1E-05 to 2E-04	---
Rope Swing Area – Rope Swinger		
Total PCBs	5E-05	12
TEQ	3E-06	---
Non-dioxin-like PCBs plus dioxin-like PCBs	6E-05	---

Cancer risks for the Swimmer are greater than 1E-04 from the maximum concentration in the 6 to 14 inch depth interval.

In summary, the findings of the human health risk assessment are that:

1) cancer risks and hazard quotients from the consumption of recreationally caught fish are higher than EPA risk criteria;
2) cancer risks from the recreational scenarios involving direct contact with surface sediment (i.e., angling, wading, swimming, and rope swinging contact with sediments 0-6 inches bgs) are higher than EPA risk criteria but hazard indices are lower; and,
3) should subsurface sediments become exposed (e.g., due to erosion), cancer risks and hazard quotients from the recreational scenarios involving direct contact with subsurface sediment (6-56 inches bgs) may exceed EPA risk criteria.

Ecological Risks

Risks to ecological receptors including benthic invertebrates, fish, and upper-trophic level wildlife receptors were evaluated in this supplemental BERA. Fish were represented by white sucker, redbreast sunfish, and salmon fry; upper-trophic level wildlife receptors were represented by the belted kingfisher, mink, and green heron.

Despite the detection of a few pesticides with elevated concentrations in surface water during the 1990s, the surface water ingestion pathway does not likely represent a substantial exposure pathway to Site-related contaminants for any receptors evaluated. Rather, the major pathways for ecological receptors are direct exposure to sediment (benthic invertebrates) and the sediment and fish tissue ingestion pathways (fish and wildlife), with a significant portion of observed risk to wildlife receptors coming from the latter. In addition, there is a low risk from exposure to bank soils that may be inundated with flooded river water during high flow events. In the events of potential sediment scouring, subsurface sediments could pose the potential for significant ecological risk if receptors are exposed to these sediments.

Ecological risks were evaluated using Site-collected surface sediment and fish tissue data collected from two areas potentially affected by contamination (Areas A and B) and one background area (Area C). In addition, a hot spot was identified near the former source of PCBs to the Souhegan River, where a statistical analysis indicated that PCB concentrations were significantly elevated compared to nearby samples. Several data gaps were identified for this assessment, including limited available data particularly for PCB congeners. The risk analysis conducted using the available measured PCB (including limited congener) data was supplemented using a regression-based approach to estimate congener concentrations. Although improving spatial coverage for determining exposures, the supplemental approach was determined to introduce unacceptable uncertainty to the assessment and is provided in the appendix of this report for comparison purposes only. Furthermore, exposure areas A and B were combined into one exposure area (Area A/B) for sample grouping and exposure calculations because these areas were determined to represent a single ecological exposure point, and the high variability in the data prevented delineation of the boundary between the two areas based on sediment chemical and physical characteristics. The Hot Spot area, located within Area A, was evaluated as a second exposure point for the ecological risk assessment.

PCBs, which are the primary contaminants at the site, have the potential to bioaccumulate and be transferred through the aquatic food web to upper trophic level receptors. Therefore, PCBs in sediment may present risk to wildlife, as well as fish and invertebrates, from multiple exposure routes. The potential for chemicals to bioaccumulate in fish tissue from sediment at the Site, measured as the

normalized ratio of fish tissue concentrations to sediment concentrations and represented by a biota-sediment accumulation factor (BSAF), was determined to be lower than other sites with PCB contamination.

Overall, risks to benthic invertebrates are mainly attributed to PCBs in sediment, followed by pesticides (Figure 10). Based on HQs greater than 1.0, indicating a potential for adverse effects, there is risk to benthic invertebrates from exposure to mean and maximum concentrations of individual COPCs in sediment for the following chemicals:

COPC	HQ for maximum concentration	Maximum Concentration (mg/kg)			HQ for mean concentration
		Value	Location	Area	
Lead	2.3	81	T-2-8	A/B	0.24
Silver	1.7	1.7	DEP-4	A/B	1.2
Arsenic	1.4	13	DEP-4	A/B	0.49
Cadmium	9.6	9.5	DEP-4	A/B	0.39
Total PCB congeners	180	11	SED-02A	Hot Spot	19
Alpha-BHC	1.5	0.0091	T-15-6	Hot Spot	0.78
Beta-BHC	12	0.061	T-15-6	Hot Spot	1.2
Gamma-BHC	5.1	0.012	T-15-6	Hot Spot	0.88
Endrin	4.1	0.0091	SD-27	Hot Spot	4.0
4,4'-DDD	13	0.065	DEP-5	A/B	2.1
4,4'- DDE	6.3	0.020	T-15-6	Hot Spot	0.90
4,4'- DDT	16	0.066	DEP-5	A/B	2.6
Endosulfan I	2.7	0.0079	T-15-6	Hot Spot	0.48
Endosulfan II	1.9	0.026	T-15-6	Hot Spot	0.65
HPAH	6.8	11	DEP-5	A/B	0.74
LPAH	3.6	2.0	DEP-5	A/B	1.3

Risks to white sucker, based on CBRs, are attributed mainly to metals in sediment, followed by PCBs. Risks to redbreast sunfish are also attributed primarily to metals, with the greatest risk to sunfish being from mercury body burdens, again followed by PCBs. Risks to invertebrates and fish associated with exposure to PCBs are relatively similar in both the Hot Spot Area and in Area A/B, most likely because of the occurrence of sediment samples without elevated PCB concentrations within the Hot Spot Area for the assessment of risks to benthic invertebrates and the mobility of fish that would expose these receptors to lower contaminant concentration outside of the Hot Spot Area.

Risks to the upper trophic-level wildlife receptors are attributed to PCBs, including both total PCBs and dioxin-like congeners (i.e., TEQs) mainly from exposure to these COPCs in fish tissue (Figures 12 through 14). The greatest risk was observed for piscivorous mammals, represented by the mink. The assessment of risks to wildlife from exposure to PCBs in the tissue of benthic-dwelling fish species, represented by white sucker, was considered most appropriate for this evaluation because whole body data were available for white sucker. Risks from exposure to white sucker in Area A/B, expressed as HQs, were identified for both NOAELs and LOAELs and showed low to moderate risks as follows:

Ecological Risks Related to Ingestion of White Sucker within Area A/B COPC	Belted Kingfisher		Green Heron		Mink	
	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ
Total PCB (Aroclor)	8.1E+00	1.0E+01	8.1E+00	1.0E+01	4.4E+01	5.3E+01
Total PCB (Congener)	7.0E+00	8.7E+00	6.8E+00	8.5E+00	3.8E+01	4.5E+01
PCB_TEQ_BIRD	6.6E+00	6.6E+01	7.5E+00	7.5E+01	NA	NA
PCB_TEQ_MAMMAL	NA	NA	NA	NA	5.9E+00	1.6E+02

The supplemental BERA found that exposure to PCBs in Area A/B for benthic invertebrates, fish, and wildlife resulted in substantially higher risks relative to those estimated for the background area (Area C). Although risk to mink from exposure to PCBs in white sucker in background Area C was found to be slightly higher than Area A/B, this anomalous finding is due to the presence of two potent dioxin-like congeners that were uniquely detected in a single sample from background Area C. These compounds appear to be unrelated to the site as they were not detected in surface sediment samples during this same sampling event conducted in 2006. Assessment of exposures to COPCs in redbreast sunfish indicated that risk to mink from PCB exposures in Area A/B is greater than exposure risk for background Area C.

A qualitative evaluation of COPC concentrations in surface water, river bank soil, and sub-surface sediment indicated a low potential for adverse effects from exposure to metals in surface water, a low potential for adverse effects on benthic invertebrates from exposure to PCBs in river bank soil, and elevated concentrations of PCBs in sub-surface sediment in the Hot Spot Area. Because of the low HQs (< 10) and likelihood that COPCs in surface water and eroded river bank soil will be diluted within the river, risks from exposure to these media is considered to negligible. However, storm events and flooding could result in scouring of the river bed, exposing sediment with higher concentrations of PCBs than surface sediment and elevating risks to ecological receptors.

General Conclusions

There is elevated risk to human and ecological receptors from exposure to PCBs in Souhegan River sediments Site. There is risk to human receptors from direct contact with sediments and fish ingestion, with fish ingestion risks being of particular concern, within Area A/B of the OU-2 Souhegan River study area. There is also some risk to benthic invertebrates from exposure to metals and pesticides in sediment. The observed risk is elevated compared with the background area located upstream from the Site. A hot spot was identified within Area A/B of the OU-2 Souhegan River study area where there are statistically significant elevated concentrations of PCBs. Within this area, there are also elevated concentrations of PCBs in sub-surface sediments that could pose greater risk to human and ecological receptors if storm and flood events expose these deeper sediment layers. Consequently, the Hot Spot Area could provide a continuing source of PCBs to the Souhegan River if not remediated.

1.0 INTRODUCTION

The supplemental baseline human health and ecological risk assessment (BHHERA) was prepared by Battelle, with assistance from Avatar Environmental, LLC, under contract DACW33-03-D-004 to the United States Army Corps of Engineers (USACE), Delivery Order 31. The supplemental BHHERA was conducted at the Fletcher's Paint Works and Storage Facility Superfund Site ("Site") along the Souhegan River in Milford, New Hampshire. This Site was placed on the National Priorities List (NPL) by the United States Environmental Protection Agency (USEPA) on March 31, 1989. The BHHERA evaluates human and ecological risks in the Souhegan River, which is part of Operable Unit 2 (OU-2) at the Site.

The BHHERA was conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments and Reauthorization Act (SARA) of 1986 and under the authority of USEPA. This BHHERA supplements the 1997 Preliminary Ecological Assessment conducted by ADL for USEPA (Arthur D. Little [ADL], 1994a; 1997) and uses more recently collected data to assess the current and future health risks to human and ecological receptors in the absence of any remedial actions. Results of the risk assessments will be used to make Site-specific risk management decisions during the remedy-selection process (USEPA, 1997a).

1.1 Site Location

The Site is approximately 12 acres and is located within a mixed-use area of residential, recreational, and commercial/industrial properties immediately west of the Town of Milford, New Hampshire (Figure 1). It is situated in a densely populated residential and commercial area, located approximately one-eighth of a mile from the downtown Milford area. Approximately 11,400 people living within three miles of the Site obtain their drinking water from public and private wells; however, groundwater associated with the study area is not used as a drinking water source (USEPA, 2007a).

The Site was divided into two operable units to investigate apparent releases of hazardous substances to the environment. OU-1 consists of the Elm Street area, Mill Street area, and a drainage ditch/culvert system connecting these two areas. It also includes a plume of groundwater contamination extending from the Mill Street area through the Elm Street area to the Souhegan River. OU-2 is comprised of the Keyes Municipal Well Field and the section of the Souhegan River located in the vicinity of the Elm Street area of the Site. The human health risk assessment for the Keyes Field is included in the OU-2 Remedial Investigation report (Watermark, 2010).

As shown on Figure 1, the Souhegan River is located north of the Elm Street area and flows from west to east, through the Town of Milford. It eventually discharges into the Merrimack River, which is located about 12 miles downstream of the Site (ARCADIS, 2007). These supplemental risk assessments focus on human and ecological exposures to Site-related contaminants that have come to reside in this one-mile section of the river. This section includes a reach adjacent to the Site (Area A), which includes a sandbar island and is located just downstream of the footbridge at Keyes Field, and a reach downstream of the Site (Area B), near the Goldman Dam (Figure 2). In addition, the river reach immediately upstream of the Site (Area C) was selected to represent background conditions.

1.2 Study Objectives

This supplemental BHHERA evaluates risks to ecological and human health receptors from exposure to sediment and fish tissue in areas of the Souhegan River that have been impacted by contamination from the Site. Previous assessments identified elevated risk quotients for benthic and pelagic biota and upper

trophic level receptors from exposure to polychlorinated biphenyls (PCBs) and pesticides (ADL, 1994a; 1994b; 1997). PCBs also contributed the majority of potential cancer risk to humans from Souhegan River sediments (ADL, 1994a). Therefore, the focus of the supplemental BHHERA is on PCB contamination. The specific objectives are as follows:

- Review all data collected at Areas A, B, and C to understand the nature and extent of PCB contamination in the Souhegan River impacted or potentially impacted by OU-1;
- Use recently collected surface sediment and fish tissue data (2004, 2006, and 2007) to quantitatively evaluate the risks to human health and ecological receptors as a result of their direct contact with these areas of the river and ingestion of fish tissue caught from these areas; and,
- Qualitatively review surface water, soil, and subsurface sediment data to assess the potential for risks to human and ecological receptors from exposures to these media.

1.3 Organization

This document is organized in the following sections:

Section 1: Introduction. This section presents the Site location and study objectives.

Section 2: Site Description. This section provides a description of the Site, including the ecological setting and hydrology. It also summarizes the history of the Site, including the natural and cultural resources.

Section 3: Data Assessment. This section provides a description of the investigations that have occurred at the Site and provides a summary of the datasets used for the risk assessments.

Section 4: Human Health Risk Assessment. This section provides the supplemental baseline human health risk assessment.

Section 5: Ecological Risk Assessment. This section provides the supplemental baseline ecological risk assessment.

Section 6: Risk Assessment Conclusions. Summary conclusions of the report are presented in this section.

Section 7: References. This section presents a bibliography of references.

Tables

Figures

Appendices

2.0 SITE DESCRIPTION

This section presents the ecological setting, local hydrology, a brief history of the Site, and describes the natural and cultural resources that occur at the Site.

2.1 Ecological Setting

Upstream of the Site, beyond Keyes Field, the Souhegan River corridor is mostly wooded and includes some high quality riverine and riparian habitat. The river varies from approximately 60 to 100 feet wide with water depths from 0 to 8 feet. The substrate consists of mainly clean, course sands and gravel, with some organic sediment. The gradual grade of the river in this area results in a relatively slow flow rate. Sparse emergent and submergent vegetation is located in areas where the river bends or where log jams and sandbars create quiet pockets of water. The habitat in this portion of the river is considered moderate-to-high quality for wildlife (ADL, 1997). Trees and shrubs overhanging the river stabilize the bank and provide shade, cover, and feeding habitat for a variety of wildlife. The river provides adequate habitat for many bird species due to the diversity of habitat types, abundance of food, and lack of human disturbance. It is estimated that this river corridor supports 72 species and 63 genera of amphibians, reptiles, fish, birds, and mammals (ADL, 1997).

The reach of the Souhegan River adjacent to the Elm Street area has physical characteristics (including width, flow rate, and substrate composition) that are similar to the upstream area; however, it is more developed and therefore has lower habitat quality for wildlife. The slope of the riverbank has been altered by anthropogenic influence in some areas, reducing the extent of shrub and herbaceous cover, and enhancing soil erosion into the river. A swimming hole is located directly across the river from the Elm Street area, which is influenced by human recreational activities. A large sandbar in the middle of the river deflects waterflow toward the northern bank, resulting in relatively calm water and abundant aquatic vegetation in the backwater habitat, adjacent to the Elm Street area. This area is also characterized by coarse and fine grain sediment accumulation and shallow water depths. The narrow width of the vegetated corridor and the higher degree of anthropogenic influence diminishes the overall habitat value of this area (ADL, 1997).

Approximately one-half mile below the Elm Street area, the Goldman Dam is located on the Souhegan River. The dam is a barrier to migratory fish passage and is under consideration for removal by the New Hampshire Department of Environmental Services (NHDES) and the U.S. Fish and Wildlife Service (USFWS). The Merrimack Village Dam, located 18 km downstream, was removed in late summer 2008 by the National Oceanic and Atmospheric Administration's (NOAA) Open River's Initiative. Its removal supports efforts to provide access for migratory fish along the entire Souhegan River. A State fish hatchery is located upstream of the Site on the Souhegan River and annually releases stocks of Atlantic salmon fingerlings and smolts. These fish pass the Site on their downstream migration to the Merrimack River and, ultimately, the Atlantic Ocean.

2.2 Local Hydrology

The majority of the Elm Street area is located within the 100-year flood plain of the Souhegan River. The flow gradient of the river is relatively low, with mean river elevations ranging from 230 feet to 240 feet above mean sea level. The flow gradient of the river is relatively low due to minor topographical changes. The river receives groundwater and surface water runoff from the Elm Street area from direct overland flow and through a catch basin located along Keyes Drive, which discharges through an outfall into the river (ARCADIS, 2007). These is also a storm water drainage ditch and culvert system under the east side of the Elm Street area which still drains run-off from the Mill Street Pond area and beyond into the Souhegan River.

The Site is situated along the southeastern extent of the Milford-Souhegan Aquifer. Depth to groundwater across the Site varies from approximately 20 feet at the Elm Street area to 12 feet at Keyes Field. The saturated thickness also varies from approximately 20 feet beneath the Elm Street area to 55 feet beneath Keyes Field. The base of the Milford-Souhegan Aquifer is locally defined by a discontinuous veneer of clayey silt with gravel (lower glacial till) that ranges in thickness from 0 to 4 feet. At locations where the lower glacial till is discontinuous, such as the eastern half of the Elm Street area, direct hydraulic communication exists between the bedrock and overburden aquifers (USEPA, 1998).

Groundwater flow is generally toward the Souhegan River and flows in a north-northeast direction across the Elm Street area and Keyes Field. This lateral flow is consistent with regional interpretations that suggest that the river is the primary groundwater discharge point associated with this part of the Milford-Souhegan Aquifer. Vertical flow in both the overburden and bedrock aquifers is generally upward in the immediate vicinity of the Souhegan River and prevails downward in the vicinity of the Mill Street area (USEPA, 1998).

During the operational period of the former Fletcher's Paint Works, in addition to the storm water drainage culvert mentioned above, several outfalls carried runoff from an underground storage tank (UST) and building roof drains to the Souhegan River. Due to flooding during heavy precipitation events (likely caused by blockages in the portions of the culvert system near the Elm Street area), the Town of Milford installed additional storm drain piping to direct overflow to a nearby alternate discharge location (ARCADIS, 2007).

2.3 Site History

Fletcher's Paint manufactured, stored, and sold paints and stains for residential use from 1949 to 1991. Annual production was 25,000 to 35,000 gallons of both water-based paints and solvent-based oil paints. Manufacturing occurred at the Elm Street area, and a wood-frame building in the Mill Street area was used for storage of bulk paint pigments.

Land use at the Elm Street site prior to 1949 included agricultural farming in the 1800s (as part of the Crosby Farm), hide storage for the nearby tannery, a turn of the century blacksmith and carriage painting business, an armory (1913 to 1926), the town burning dump (1929 to 1947), and an automotive dealership (1920 to 1949). The Mill Street area contained two sheds that were used by Fletcher's Paint to store bulk paint pigments for over 25 years. Previously, they had been used for grain storage.

From May to October 1988, USEPA conducted removal activities at both the Elm Street and Mill Street areas. At the Elm Street area the main activities performed by USEPA were the staging, sampling, analysis, and disposal of 863 drums of hazardous substances and the covering of the contaminated soils of the parking lot with geotextile fabric and fill. The Mill Street area soils were also temporarily covered with fabric and fill. As a result of the contamination found at the Site, the Fletcher Paint Works and Storage Facility Superfund Site was proposed for inclusion on the NPL on June 24, 1988 and finalized on March 30, 1989.

Additional removal actions occurred at the Site from 1991 to 1997 and included the installation of a fence at the Elm Street area in 1991, the demolition of the Mill Street shed in 1993, and the cleanup of PCB contaminated soils from residential properties near the Mill Street area in 1995. Furthermore, the General Electric Company (GE) has performed cleanup activities at the Korean War Memorial to address PCB contaminated soils, and at the Draper Energy property to address Site conditions following several fires. In December 2000, USEPA demolished and disposed of the unoccupied, former Fletcher's Paint Works Elm Street building as part of the cleanup remedy for OU-1.

In April of 1996 USEPA completed a Remedial Investigation/Feasibility Study (RI/FS). This study and other supplemental studies have revealed that soils, sediments, surface water, and groundwater are contaminated with volatile and semi-volatile organic compounds (SVOCs), metals, PCBs, and pesticides as a result of activities that occurred at the Fletcher's Paint properties. In addition, the RI studies show that the Souhegan River had surface water and sediment contamination, as well as potential impact to certain fish and biota within the river as a result of the contamination. PCB, VOC, SVOC and heavy metal contamination from the Site has migrated to the river via former Fletcher's Paint manufacturing activities, improper storage of drums, and runoff from the Elm Street area, as well as surface water runoff from Mill Street, through the drainage ditch/culvert system.

USEPA separated the Souhegan River (now OU-2) from the Fletcher Paint properties (OU-1) to allow additional investigations on the river. The OU-1 remedy includes the cleanup of the higher PCB-contaminated soils at both the Elm Street and Mill Street areas to prevent accidental contact and ingestion, and to minimize future groundwater contamination. Lower levels of PCB contamination will be addressed through the installation of a cover to minimize infiltration. Natural attenuation is also a component of the groundwater remedy for OU-1. Contaminated soils in the Elm Street area, adjacent to the river, and the subject of the OU-1 remedy, include soils that will be excavated to a depth of approximately 23 feet, or to the season low water table, to meet Record of Decision (ROD) cleanup levels.

Additional OU-2 studies were conducted from 2004 through 2007 to determine the extent of the PCB contamination in the river and in the biota within the river. These investigations are the subject of these risk assessments for OU-2 at the Site.

2.3.1 Fishing Advisories

Currently, the State of New Hampshire has freshwater fishing advisories for mercury in several streams, brooks, rivers, ponds, and lakes. No advisory exists for fish consumption (other than for mercury) in the vicinity of the Site. However, in 1997, a Health Consultation was prepared by the New Hampshire Office of Health Management under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR's health consultation report, "Evaluation of Chemical Contamination of fish from the Souhegan River Area of Fletcher's Paint Storage Facility" is included in Appendix A and can also be accessed online at http://www.atsdr.cdc.gov/hac/pha/fletcher/fps_p1.html. The purpose of this Health Consultation was to evaluate the contaminant levels in fish caught in the Souhegan River near the Site and to provide recommendations on how to minimize human health risks. Twenty fish were sampled in 1995 for various compounds, including pesticides and PCBs. All fish contained levels of the pesticide dichlorodiphenyldichloroethylene (DDE) and PCBs (represented by Aroclors). The consultation made several recommendations, including reducing exposure to contaminants in the river near the Site by limiting the consumption of fish caught in the area and by avoiding contact with soil and sediment in the area (NH Office of Health Management, 1997).

Signs posted on the fence near the riverbank at the upstream and downstream property boundaries of the Site indicate that hazardous materials are present. However, there is no ban against fishing or swimming, and it is likely that recreational activities continue to occur due to the accessibility of the river and proximity to many town and private recreational areas (discussed in the following section) (NH Office of Health Management, 1997).

2.3.2 Natural and Cultural Resources

The Site is bounded to the south by Elm Street, to the north by the Souhegan River, to the west by Keyes Field, and to the east by a cemetery. Keyes Field is approximately 19 acres in size and is located on Elm

Street, abutting the Souhegan River. Facilities include a swimming pool, wading pool, a children's playground and swings, a baseball diamond, two softball diamonds, a soccer field, open space for walks and play, a picnic area with BBQ grills, a pavilion with tables, a basketball court, and a street hockey court (Town of Milford website, 2007). A footbridge is located adjacent to the tennis courts and provides access from Keyes Field to the opposite side of the river, where the local Boys and Girls Club is situated.

The Souhegan River runs adjacent to the Elm Street area and Keyes Field and is used for recreational swimming and fishing. A site visit conducted on May 19, 1994 noted people utilizing the sandbar in the river for sunbathing and determined that the river was easily accessed from both Keyes Field and the cemetery (NH Office of Health Management, 1997). In 1997, a rope swing was installed across the river from the Fletcher's Paint Building and a visible path in the riverbed suggests a frequently used connection between Keyes Field, the sandbar, and the swing.

The Souhegan River is considered "priority" Atlantic salmon nursery habitat. Some wild populations of Atlantic salmon in New England are listed as federally endangered. However, stocked populations, such as the local Merrimack population and fish in the Souhegan River, are not. Several northeast rivers are stocked annually by the State of New Hampshire from two fish hatcheries that are located along the river, Souhegan Valley Aquaculture and the Milford State Fish Hatchery. The stocked salmon use the Souhegan River primarily as a nursery for fry, parr, smolt, as well as spawning habitat for grilse. The young salmon feed on aquatic invertebrates in the water column and associated with the benthos, and, after spending up to two years in the freshwater habitat of the Souhegan and Merrimack rivers, they migrate to the Atlantic Ocean where they mature.

A key concern of the ecological risk assessment is that these fish, in their earliest and most sensitive life stages, could be exposed to PCB-contaminated sediments and prey during their journey to the ocean. Salmon fry are not stocked in the immediate vicinity of the Site; however, approximately 4,000 fry may be released annually below the McLain Dam in Milford just downstream from the Goldman Dam, approximately 0.7 stream miles from the Site. Up to another 90,000 fry may be stocked annually upstream from the site, with the closest upstream stocking point being near Riverway East, approximately 1.25 stream miles from the Site. These fish will pass through the portion of the Souhegan River affected by Site during their seaward migration and, again, when they return to the river to spawn. Another fish species that is stocked closer to the Site is Atlantic shad (*Alosa sapidissima*), and up to 400 adult shad have been stocked just upstream from the Site along the river where the baseball field is located.

The Souhegan River near the Site is currently inaccessible to wild runs of anadromous fish species returning to the river to spawn because of two nearby dams (Goldman and McLain) downstream from the Site that prevent the fish from traveling upstream. However, as discussed in Section 2.1, the Goldman Dam is being considered for removal by NHDES and UFWS. Removal of the dams could cause potential future exposures of contaminants to adult salmon returning to this reach of the river to spawn.

3.0 DATA ASSESSMENT

Analytical chemistry data from the Site have been collected from 1991 through 2007. Data collected between 1991 and 2004 were used to support the RI and previous risk assessments (ADL, 1994a; 1994b; 1997). For the supplemental BHHERA, surface sediment (defined as the top 0 to 6 inches) data collected between 2004 and 2007 and fish tissue data collected in 2006 were used to determine the potential risks to human health and ecological receptors posed by the contaminated sediment and the potential ingestion of fish.

3.1 Summary of Previous Investigations

This section describes the previous investigations that were conducted at the Site and summarizes the resulting analytical data. The following table summarizes the available data evaluated for use in this assessment.

			Exposure Area			Analytical Parameters								
Year	Sample Category	Depth (inches)	Area A	Area B	Area C	VOCs	PAHs	Pesticides	PCBs - Aroclors	PCBs - Congeners	Inorganics	TOC	Lipid	Other
Sediment														
2004	Shallow	0 - 3	31	0	0	31	31	31	31	0	31	0	-	USACE/EPA
2006	Shallow	0 - 6[a]	20	17	5	0	42	42	42	7	42	42	-	% moisture, grainsize; split samples (GE & EPA)
2007	Shallow	0 - 6	6	3	0	0	0	0	9	9	0	0	-	USACE/EPA
	Total (0 - 6 inches)		**57**	**20**	**5**	**31**	**73**	**73**	**82**	**16**	**73**	**42**	**0**	
2006	Deep	6 - 12[b]	18	14	4	0	36	36	36	7	36	36	-	% moisture, grainsize; split samples (GE & EPA)
2007	Deep	6 - 12	4	1	0	0	0	0	5	5	0	0	-	USACE/EPA
	Total (6 - 12 inches)		**22**	**15**	**4**	**0**	**36**	**36**	**41**	**12**	**36**	**36**	**0**	
2006	Deep	12 - 24[c]	15	11	4	0	30	30	30	6	30	30	-	% moisture, grainsize; split samples (GE & EPA)
2006	Deep	24 - 56[d]	12	8	4	0	2	2	21	5	2	2	-	% moisture, grainsize; split samples (GE & EPA)
Bank Soil														
2007	Shallow	0 - 3	9	3	0	0	0	0	12	12	0	0	-	USACE/EPA
2007	Deep	0 - 12	9	3	0	0	0	0	12	12	0	0	-	USACE/EPA
Sandbar Soil														
2007	Shallow	0 - 12	2	0	0	0	0	0	2	0	0	0	-	USACE/EPA
2007	Deep	12 - 24	2	0	0	0	0	0	2	0	0	0	-	USACE/EPA
Fish Tissue														
2006	Redbreast Sunfish	-	6	6	6	0	18	18	18	18	18	-	18	Individual Fillet; Split samples (GE & EPA)
2006	Yellow Bullhead	-	6	6	8	0	11	19	18	18	19	-	19	Individual Fillet; Split samples (GE & EPA)
2006	Brown Bullhead	-	0	0	4	0	0	0	4	4	0	-	4	Individual Fillet; Split samples (EPA)
2006	White Sucker	-	6	6	6	0	0	0	18	18	0	-	18	Individual Whole Body; Split samples (EPA)
2006	White Sucker	-	6	6	6	0	18	18	18	0	18	-	18	Composite Whole Body (GE)

Notes
a. Vertical depth of 0" to 6" (± 1").
b. Vertical depths between 6" and approximately 12" (deepest sample to 14").
c. Vertical depths between 12" and appoximately 24" (deepest sample to 27").
d. Most sampling depths in this category are between 24" and 36".

All data used in the risk assessments (i.e., 2004, 2006, and 2007 datasets) are provided in summary tables in Appendix A.

3.1.1 Historical Data – 1990s Investigations

Sampling activities in the 1990s involved the collection of sediment and surface water samples from 22 locations within the Souhegan River for miscellaneous analyses. Most of the samples were collected between 1991 and 1993, and additional surface water and sediment samples, as well as biota samples, were collected in November 1994 to support the previous BHHERA and RI (ADL, 1994a, 1994b; 1997). Included in this dataset were biological samples from several species of fish captured in the Souhegan River. These samples included the collection of 20 fillet samples, 20 offal (i.e., the carcass remaining after removal of the fillets) samples, and 40 whole fish samples for analysis of pesticides and PCBs. Twenty mussel samples were also collected for analysis of pesticides and PCBs.

In addition to data collection activities, ecological assessment studies were also conducted during the 1990s. The Preliminary Ecological Assessment (ADL, 1994b, 1997) evaluated available analytical data for sediment , surface water and tissue and calculated both total site and incremental ecological risks to ecological receptors identified significant risks to both benthic and pelagic organisms associated with exposure to PCBs and pesticides. In addition, these reports concluded that these COPCs posed a bioaccumulation hazard to wildlife species (including the same representative species evaluated in this report) that were exposed to the aquatic food chain in the vicinity of the Site.

These investigations identified PCBs as the primary contaminant at the Site. Although PCBs were not extensively used in the paint operations, "scrap pyranol", which contained various mixtures of PCBs, trichlorobenzene and trichloroethylene, was used and resold for other non-paint related purposes such as a dust suppressant, heating oil and as a compound for the roofing cement industry. The Fletcher's Paint Works also used the scrap pyranol to suppress the dust at the Elm Street facility. These activities resulted in ubiquitous surface soil contamination, and well as contamination of sub-surface soil and ground water from infiltration and contamination of Souhegan River sediments via runoff and groundwater discharge.

3.1.2 2004 Data Collection

In 2004, supplemental sediment investigation activities were performed on behalf of USEPA in the section of the Souhegan River immediately adjacent to the Elm Street area. Surficial sediment samples (top three inches) were collected from 31 sampling locations in Area A and analyzed for VOCs, polycyclic aromatic hydrocarbons (PAHs), pesticides, PCB Aroclors, and metals (Figure 3). Elevated PCB concentrations were found in the sediments collected near the Site.

3.1.3 2006 Data Collection

Additional sediment and fish tissue data were collected in 2006 by USEPA and ARCADIS/BBL, under contract to GE to more fully characterize the current nature and extent of PCB contamination in the Souhegan River associated with the Site and downstream as far as the Goldman Dam.

Fish tissue samples were collected from all three areas of the Souhegan River (Areas A, B, and C) for a total of 115 samples (Figure 4). The samples were split by a USEPA-associated laboratory (Alpha Woods Hole Laboratory [AWHL]) and analyzed for PCB congeners. The split samples were submitted to a GE-associated laboratory (Northeast Analytical, Inc [NEA]) for the analysis of PCB Aroclors, metals, pesticides, PAHs, and percent lipids. Species of fish included redbreast sunfish (*Lepomis auritus)*, yellow and brown bullheads (*Ameiurus natalis* and *A. nebulosus*, respectively) and white sucker (*Catostomus commersonii*).

Sediment core samples were collected from up to four depth intervals (0-6, 6-12, 12-24, and 24-56 inches), depending on location, from the three areas of the Souhegan River (Figure 4). A total of 42 sediment cores were collected and split. The samples were analyzed by the USEPA laboratory (AWHL) for PCB congeners and by the GE laboratory (NEA) for PCB Aroclors, total organic carbon (TOC), and percent moisture. Samples were also submitted to Severn Trent Laboratories (STL), a GE laboratory, for the analysis of SVOCs, pesticides, metals, and grain size. The sediment sampling program and data results are available in the 2007 *Souhegan River Supplemental Investigation Data Summary Report* (ARCADIS, 2007).

3.1.4 2007 Data Collection

In June 2007, the USEPA and USACE collected additional sediment and bank soil samples from the Souhegan River following a significant flooding event in April of that year. Ten sediment samples were collected from Area A, four sediment samples were collected from Area B, 24 soil samples were collected along the river bank in Areas A and B, and four soil samples were collected from the sandbar in Area A (Figure 5). The samples were analyzed for PCB Aroclors and congeners. The purpose of the investigation was to obtain supplemental data to support the boundary of the contamination and to determine if the significant flooding event in April 2007 had re-deposited contaminated sediments onto the river banks (USACE, 1997).

3.2 Data Usability and Summary Procedures

Validated analytical data from field efforts collected between 2004 and 2007 were submitted to Battelle by USACE in various electronic formats (Excel, Word, pdf). The data were reviewed for quality, consistency, and completeness and loaded into an Access database. Record counts, a review of the contents of key fields, duplicate checks, parameter listings, identification of data gaps, and a review of the file structures were performed. Some data gaps that were identified included missing coordinate information, sampling depths, tissue types, and definitions for codes used in the data submissions. Additional information was found in reports and/or maps from previous projects to help complete the data gaps.

3.2.1 Standardization and Processing

There were 24 analytes whose parameter names were slightly different for the same chemical. Parameter names were standardized based on the CAS number. All data were formatted, imported into an Access database, checked for duplicates, standardized by parameter, and loaded into a final Oracle database table. Data with an "ND" notation and lacking a specific method detection limit (MDL) or reporting limit (RL) were not used. Data that were rejected during the validation process ("R" qualified) were eliminated from the risk assessment datasets. In cases of field duplicates and 2006 split samples, the results were 1) averaged if both sample results were detects, 2) the detected value was reported over a non-detect, or 3) the higher value was reported if the relative percent difference (RPD) between replicates was greater than 50%. A value of one-half the MDL was reported for non-detects (i.e., "U"-qualified data).

Several chemical parameters were grouped and isomers of individual pesticides (e.g., alpha-chlordane, gamma-chlordane) were summed and reported as totals (e.g., total chlordane). In general, if any result was qualified as non-detect (i.e., "U" qualified), a value of one-half the MDL was used in the summation. This was the case for most of the summed compounds; however, for a few compounds (notably total hexachlorocyclohexane [BHC] and total Aroclors), zero was used for non-detects in the summation to avoid overestimating the total value. Although ProUCL software provides more robust methods for dealing with non-detects and cautions against using substitution methods, those methods are not appropriate for small datasets (i.e., less than 10 data points) or datasets with low detection frequencies.

For BHCs, values below the MDL could not be estimated due to the high frequency of non-detects and low number of detects in the dataset. Non-detects for alpha-, beta-, delta- and gamma-BHCs were treated as zero for calculating total BHCs so that the total value was not overestimated as a result of high detection limits. Likewise, total Aroclors were calculated for 40 samples where only individual Aroclor analysis was performed (see Table 3-1). Total Aroclors were calculated using zero values as a substitution for the non-detects because it is unlikely that more than a couple of Aroclors will be detected in any sample, and substituting a value of one-half the MDL for each individual Aroclor for would lead to an overestimate of total Aroclor concentrations. If all Aroclors were non-detects, then the MDL for all Aroclors in that sample was reported for the total Aroclor concentration. This method appears consistent with procedures performed on the samples in the dataset with both individual and total Aroclor results. PAHs were summed as either total low molecular weight (LMW PAHs) or total high molecular weight PAHs (HMW PAHs) based on the number of aromatic rings in the chemical structure as follows:

- LMW PAHs consist of 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Fluorene, Naphthalene, and Phenanthrene.
- HMW PAHs consist of Benz[a]anthracene, Benzo[a]pyrene, Fluoranthene, Chrysene, Pyrene, Dibenz[a,h]anthracene, Indeno[1,2,3-cd]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[g,h,i]perylene.

Two methods were used for PAH analysis, PAH SIM in 2004 and SW-846 Method 8270C in 2006. The SIM method is more sensitive and has lower detection limits than 8270C, but detections in both datasets were relatively low. Because the MDLs for the 2006 data exceeded detected concentrations by the SIM method (2004 dataset), three possible approaches were evaluated to calculate total LMW PAHs and total HMW PAHs:

1) For each individual PAH, a value of one-half the MDL could be substituted for non-detects and the PAHs then summed for LMW and HMW PAHs. This approach most likely inflates the total PAH estimates, resulting in an overestimate.
2) For each individual PAH, non-detects could be treated as zero and each group of PAHs then summed to get the total concentration. This approach most likely underestimates the total PAH estimates.
3) For each individual PAH, a value of one-half the minimum detected value could be substituted for non-detects and each group of PAHs then summed to get the total concentration. This is likely the most reliable approach and the one selected for treatment of PAHs analyzed by both SIM and 8270C methods.

A Toxic Equivalency (TEQ) approach was employed for the 2006 sediment and fish tissue data sets to estimate the dioxin-like toxicity of samples that were analyzed for the 12 World Health Organization (WHO) congeners. The TEQ was calculated as the sum across all congeners of the product of the congener concentration and a congener-specific Toxicity Equivalency Factor (TEF) as shown in Equation 3-1.

$$TEQ = \sum PCB_{congener}(ng/g) \times TEF \qquad \text{(Equation 3-1)}$$

The TEFs estimate the degree to which a planar or co-planar PCB can initiate dioxin-like effects, relative to 2,3,7,8-tetrachlorodibenzo p dioxin. For each sample, TEQs were calculated using the 1998 TEFs (Van den Berg et al., 1998) for birds and fish and the 2005 TEFs for mammals (Van den Berg et al., 2006). In general, a value of one-half the MDL was used in the summation of TEQs for congeners that were detected in some samples but not in others. However, in background Area C, only one congener was detected in one sample. Therefore, to avoid overestimating the TEQ with a value of one-half the

MDL substituted for the non-detects, only the congener that was detected was used to calculate the TEQ and zeros were substituted for the other non-detected congeners. Additional information on the handling of PCB data is presented in the next section (Section 3.2.2).

Surface sediment data were extracted from the database and used for analysis. Miscellaneous classes of chemicals, such as grain size and chemical surrogates (TCMX and DCBP), were excluded from the analysis. In addition, only compounds analyzed for in sediments and tissue were included in the datasets. Fish tissue data for white suckers (including both composite and individual samples) were used for the ecological risk assessment; tissue data for redbreast sunfish (including both skin-on and skin-off data) were used for both the human health and ecological risk assessment. A qualitative evaluation of risk was performed on the bank and sandbar soil data, as well as the deeper (6 to 56 inches) sediment data. Summary tables of all analytical data are presented in Appendix A.

3.2.2 PCB Data Approach

Most of the PCB data available for the Site consists of concentrations of individual Aroclors and total PCBs calculated as the sum of Aroclors (Table 3-1). Samples collected in 2004 were only analyzed for Aroclors. Additional samples collected in 2006 were analyzed for both Aroclors and PCB congeners, but only six samples were analyzed for both. All 2007 samples collected were analyzed for both PCB congeners and Aroclors (nine samples).

Aroclor data have been routinely used to estimate PCB exposures for risk assessments due to their lower analytical costs relative to congener analysis. However, the composition of Aroclors in the environment changes over time due to weathering processes such as volatilization, partitioning, chemical transformation, photo-degradation, biodegradation, or bioaccumulation of individual PCB congeners (Erickson, 1997). This causes the relative contribution of individual congeners to Aroclors to be less precise over time as PCB mixtures weather and change. The presence of mixtures of Aroclors may also complicate the identification of individual Aroclors because the congeners that comprise the individual Aroclors overlap (i.e., one congener may be found in more than one Aroclor). Due to these issues, Aroclor analysis provides a less accurate estimate of total PCB concentration (Rushneck et al., 2004).

Analytical techniques that quantify the concentrations of individual PCB congeners provide better estimates of total PCB concentrations, regardless of the extent of weathering or the numbers of Aroclors present. In addition, recent guidance recommends more detailed congener data for risk assessments at sites where PCBs are contaminants of concern (DeGrandchamp and Barron, 2005). USEPA (1996a) guidance states:

> *Although PCB exposures are often characterized in terms of Aroclors, this can be both imprecise and inappropriate. Total PCBs or congener or isomer analyses are recommended.*

The Fletcher's Paint Aroclor data provide good spatial and temporal coverage within the Souhegan River near the Site. However, congener data would help to determine the occurrence and concentrations of the individual compounds that make up the Aroclors and, therefore, provide a more accurate characterization of risks. Furthermore, most of the exposure risk from PCBs comes from a few congeners with dioxin-like properties.

In the absence of Site-specific congener data, the relative congener composition of Aroclors and, ultimately, dioxin-like congeners can be estimated based on known percentages of congeners within each Aroclor (Rushneck *et al*., 2004; Frame *et al*., 1996, 1997, 1999). However, due to weathering processes discussed above, the actual composition of PCB congeners in Aroclors historically released to sediments

may differ from the original congener profiles of the unweathered Aroclors. In an attempt to overcome this issue for the BHHERA, TEQs and total PCB congeners were estimated by a different approach, using the statistical relationship between congeners and Aroclors at locations where both congener and Aroclor data were collected. It is likely that PCBs in sediment adjacent to and downstream from the Site are from the same source; therefore, PCBs in these sediments are likely to have the same PCB congener signature (i.e., the relative concentrations of the individual congeners is likely to be similar). It is also likely that PCBs in these sediments have been subjected to the same weathering processes and have weathered and changed similarly. Based on these assumptions, it can be assumed that there is a strong relationship between the Aroclors and congeners at sample locations where these parameters were measured. Any PCBs in sediment samples upstream from the Site at background Area C are assumed to be from other sources that are not potentially site-related, and PCB congeners and Aroclors may not have the same statistical relationship as congeners and Aroclors adjacent to and downstream from the Site. Because of the limited number of samples collected and because congener analysis was only performed for one sample, this relationship was not determined.

The approach used to estimate total PCB congeners and TEQs is detailed in Appendix B. A strong statistical relationship was identified, but the strength of the relationship, as determined by the R-squared value of the regression equation, was artificially inflated by a single high PCB concentration that drove the relationship (Appendix B). Therefore, the accuracy of the equation that would be used to estimate total PCB congeners and TEQs was questionable. The attempt to estimate total PCB congeners and TEQs for all sample locations across the site did not bring any additional value to the risk assessment; the assessment was based on total Aroclors across the site. The assessment of risks based on total PCB congeners and TEQs was limited to sample locations where congener concentrations were measured.

For each location where congener analysis was performed, TEQs were calculated for each of the WHO dioxin-like PCB congeners that were detected in at least one sample. Each concentration was multiplied by its respective TEF (Van den Berg et al., 2006) and summed to obtain a total TEQ for that sample. Any congener that was not detected in any sample was removed from the calculation; for all congeners detected in at least one sample, concentrations below MDLs were included in the calculations at a value of one-half the MDL. For each location where congener data were measured, the concentrations of the individual congeners were subtracted from the total PCB congener concentration to yield a non-dioxin-like PCB concentration. The resulting total PCB congener minus the dioxin-like congener concentration was used to estimate non-dioxin-like risks to human receptors.

3.2.3 Exposure Area Determination

Samples for the investigations at the Fletcher's Paint Superfund Site were collected from a portion of the Souhegan River stretching from approximately 2,000 feet upstream from the northern boundary of the site to 2,400 feet downstream from the site to Goldman Dam. These samples were assigned to Areas A, B, and C depending on whether they were adjacent to, downstream from, or upstream from the site, respectively (Figure 4).

Because of the inability to distinguish between Areas A and B both physically and based on sediment chemical concentrations, these two areas were combined for the assessment. On a smaller spatial scale, because of geographic patterns in sediment chemical concentrations a subset of samples within Area A was assessed separately for risks to human and ecological receptors. A preliminary review of the data for total PCBs that were collected in 2006 and 2007 indicated a high variability in concentrations of total PCBs, TOC, and grain size in sediment samples collected between the Elm Street area and the Goldman dam. As such, there was no qualitative difference in the range of sediment concentrations detected in the two areas, which made it difficult to draw a boundary line separating the two areas and determine which areas to place the 10 samples into that were taken between Areas A and B (Sample IDs: T-11-7-A,

DEP-5, T-10-6, DEP-4, T-9-4, T-9-7-A, T-8-7-A, T-7-8, T-6-2, and T-6-8) . There are also no physical barriers between Areas A and B. Because the two areas are not physically or ecologically independent of each other, no justification could be made for drawing a distinct line between the two areas. Therefore, for the purposes of the human health and ecological risk assessments, sampling Areas A and B were combined into a single exposure area (Area A/B) to address the question:

> *Do samples from locations affected by Site-related activities (Area A/B) have different concentrations of contaminants of potential concern (COPCs) from locations that are not affected by Site-related activities (Area C)?*

The null hypothesis for this question would be:

> *Concentrations of COPCs at sample locations influenced by Site-related activities (Area A/B) are not different from concentrations of COPCs at sample locations that are not influenced by Site-related activities (Area C).*

Both the Scope of Work (SOW) and subsequent Work Plan for this Delivery Order specified three distinct areas (Areas A, B, and C). However, due to the release of contaminants from historical Site operations and the transport of Site-related contaminants downstream, all sample locations adjacent to and downstream from the Elm Street Area are potentially impacted by Site-related activities. Therefore, sample data for Areas A and B were combined into one exposure area (Area A/B).In lieu of defining Areas A and B as being separate; a statistical outlier analysis was done to identify a hot spot area adjacent to the site where PCD concentrations are significantly elevated. Area C was used as a background reference location.

A subset of elevated concentrations in a potential "hot spot" immediately within the vicinity of the Elm Street Area was evaluated in addition to the entire Area A/B in both the human health and ecological risk assessments. This area includes the Rope Swing area used recreationally by human receptor and was defined by samples with elevated PCB concentrations that are statistically significantly different from nearby samples based on outlier tests at the 0.05 significance level (Table 3-2). A total of 17 samples were determined to be significantly statistically different (elevated concentrations) and an additional nine samples (not statistically elevated) were located spatially within the Hotspot Area. In total, 26 samples were included in the analysis of the Rope Swing/Hot Spot Area (Figure 6 and Table 3-2). Although one sample in Area B (T-2-8) was statistically significantly different, the elevated PCB concentration was isolated to this one sample in Area B and therefore was not included in the Area A hot spot. Additional samples collected in Area B showed much lower PCB concentrations and the elevated PCB concentration in this one sample in Area B was deemed an outlier.

The five samples collected in 2006 upstream from the Elm Street Area (above the footbridge) are considered to be un-influenced by Site activities and grouped into Area C as background locations.

In summary, exposure areas for the BHHERA were grouped as follows:

- A group of samples from Areas A and B into one exposure area (Area A/B);
- A subset of samples with statistically elevated PCB concentrations in river sediment within Area A in the immediate vicinity of Elm Street, coincident with an area of elevated human exposure (Rope Swing/Hot Spot Area); and,
- Area C (i.e., background locations) consisting of Sample IDs DEP-11, T-22-3, DEP-10, T-20-7-A, and DEP-8.

4.0 BASELINE HUMAN HEALTH RISK ASSESSMENT

4.1 Introduction

The purpose of this supplemental Baseline Human Health Risk Assessment (BHHRA) is to evaluate the contamination in Site sediment and fish tissue and to estimate the potential risks (cancer and noncancer) associated with human contact with these media for current and reasonably anticipated future uses. In addition, while not a primary focus of the supplemental BHHRA, the potential risks associated with exposure to surface water, bank soil, and sandbar soil were also evaluated.

The primary sources of contamination of the Souhegan River in the vicinity of the Site include historical manufacturing and agricultural activities that have occurred, including the improper storage of drums and other compounds, releases to the ground, and runoff from the Elm Street and Mill Street areas of the Site. As discussed in Section 3.2.3, for the purpose of this supplemental BHHRA, the Souhegan River portion of OU-2 at the Site has been divided into three exposure areas:

- **Area A/B -** Area A is directly across from the Elm Street area, downstream of the footbridge at Keyes Field; Area B is located downstream of the Elm Street area to the Goldman Dam impoundment;
- **Area C** - background area, located upstream of Area A; and
- **Rope Swing/Hot Spot Area** – An area of statistically elevated PCB concentrations in Area A that includes a deep pool across from the Elm Street area where a rope swing is located.

Exposure areas A and B were combined into one exposure area (Area A/B) for sample grouping and exposure calculations because these areas were determined to represent a single exposure point, and the high variability in the data prevented delineation of the boundary between the two areas based on sediment chemical and physical characteristics. In addition, an area of more frequent exposure was identified where a rope swing is located. This rope swing area coincides with a hot spot near the former source of PCBs to the Souhegan River, where a statistical analysis determined that PCB concentrations are significantly elevated compared to nearby samples.

The potentially contaminated media at the Site include bank soil, sediment, sandbar soil, fish tissue, and surface water. The potential exposure scenarios consist of child, adult, and adolescent recreational users who are hypothetically engaged in sediment contact activities such as angling/wading, swimming, swinging on the rope swing, and ingesting fish (specifically redbreast sunfish) caught from the Souhegan River. Potential risks as a result of exposure to bank soils, subsurface sediment (6 to 56 inches bgs), sandbar soil, and surface water exposure, as well as other sportfish (i.e., bullhead) ingestion are qualitatively evaluated.

Figures 1 and 2 present the location of the Site. Section 2.0 presents a detailed description of the Site along with its history and the activities that have contributed to the bank soil, sediment, sandbar soil, fish tissue, and surface water contamination.

The goals of this supplemental BHHRA are to:

1) estimate the potential risks to exposed individuals if no actions are taken (i.e., baseline conditions);
2) assist in determining the need for remedial action; and
3) provide a basis for determining cleanup goals.

This supplemental BHHRA was conducted following the approved work plan (Battelle, 2007) and in general accordance with the various guidance documents for human health risk assessment under CERCLA, including:

- USEPA Risk Assessment Guidance for Superfund (RAGS) Volume I, Human Health Evaluation Manual (Part A) (1989);
- USEPA RAGS, Volume I: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Assumptions (1991);
- USEPA Exposure Factors Handbook (1997b);
- USEPA Child-Specific Exposure Factors Handbook (2002a);
- USEPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (2002b);
- USEPA RAGS Part E (2004a);
- USEPA ProUCL Version 4.0 (2007b);
- USEPA Region 6 Human Health Medium-Specific Screening Levels (2007c);
- USEPA Region 3 Risk-Based Concentration (RBC) Table (2007d);
- USACE Risk Assessment Handbook, Volume I: Human Health Evaluation (1999); and
- NHDES Risk Characterization and Management Policy (2007a).

There are five major components of the supplemental BHHRA:

1) **Hazard Identification (Section 4.2)** – The Site Description (Section 2.0) and Data Assessment (Section 3.0) sections describe the available Site data, the data usability and validation process, the guidelines for data reduction for risk assessment purposes, and the data evaluation approach. Therefore, the Hazard Identification begins with the identification of the COPCs;
2) **Exposure Assessment (Section 4.3)** – Describes the exposure setting and local land and water uses. Presents a conceptual site model (CSM) for human exposures that describes the source of contamination, the affected media, and the exposure scenarios and their associated exposure pathways. Methods for estimating the exposure point concentrations (EPCs) are also presented along with the scenario-specific exposure parameters;
3) **Toxicity Assessment (Section 4.4)** – Describes the toxicity factors that were used to estimate cancer risks and noncancer hazards. Tabulates the toxicity values that were used to evaluate the COPCs;
4) **Risk Characterization (Section 4.5)** – Integrates the toxicity assessment and the exposure assessment to characterize both potential cancer risks and noncancer health effects; and
5) **Uncertainty Analysis (Section 4.6)** – Identifies the important uncertainties in the risk assessment process and describes the potential impact of these uncertainties on the overall estimate of risk. Provides a qualitative discussion of potential risk due to subsurface sediment and surface water exposure and ingestion of bullhead fish tissue.

4.2 Hazard Identification

As previously mentioned, the Hazard Identification presents the COPC selection process. Other components that are traditionally discussed in this section (e.g., available site data, data usability and validation, and data evaluation) are presented in Section 3.0.

4.2.1 Selection of Contaminants of Potential Concern

The COPC selection process was conducted to identify a subset of analytes that could pose a potential risk to hypothetical human receptors who might contact surficial sediment and ingest redbreast sunfish fish tissue. The criteria that were used to determine if an analyte was a COPC include:

- Non-detects - if an analyte was not detected in any samples in a given medium, it was not evaluated as a COPC. Note that for analytes detected at least once, frequency of detection was not used as a criterion for eliminating an analyte as a COPC;
- A comparison of the maximum detected concentrations to conservative health-based screening criteria; and
- Metals considered to be essential nutrients to human health (i.e., calcium, magnesium, potassium, and sodium) were eliminated from consideration as COPCs.

COPCs in surficial sediment and fish tissue were determined by comparing the maximum detected concentrations for each analyte to medium-specific human health benchmarks. The benchmarks that were used for COPC screening include ORNL residential soil regional screening levels (RSLs; USEPA, 2009), the Region 3 RBCs (USEPA, 2007d), and New Hampshire Method 1 Direct Contact Category S-1 Soil Standards (NHDES, 2007a).

For those instances where a screening value was not available for a particular analyte, an attempt was made to identify a surrogate analyte. If a suitable surrogate was found, the screening value for the surrogate compound was used and noted in the screening tables. For screening purposes, a target hazard quotient (THQ) for noncancer-based criteria of 0.1 and a target risk (TR) for cancer-based criteria of one-in-one-million (expressed as 1E-06) were used. A THQ of 0.1 was used to account for the potential additive effects of multiple contaminants impacting similar target organs. In cases where an analyte had both cancer and noncancer screening values, the lower (i.e., more stringent) of the two values was used for screening. There were no screening criteria for human health exposure to contaminated sediment. Therefore, in order to select COPCs in sediment, the maximum concentrations in sediment were compared to the residential soil criteria (i.e., the lower of RSL and the NHDES Direct Contact S-1 level) modified to obtain values based on a TR of 1E-05 and a THQ of 1.0. For fish tissue, USEPA Region 3 Fish RBCs were used without a modifying factor for screening (i.e., TR of 1E-06; THQ of 0.1). The maximum detected lead concentrations in sediment were compared with the residential soil screening level of 400 mg/kg (USEPA, 1994).

If the maximum detected medium-specific concentration for an analyte was less than its screening criteria, that particular analyte was eliminated from consideration as a COPC in that medium and was not evaluated further. Analytes that exceeded their respective screening criteria were retained as COPCs and were further evaluated in the supplemental BHHRA.

Although background concentrations were not used to select or eliminate compounds as COPCs, screening tables for background Area C are presented in Appendix C with the Site-specific screening tables to determine the potential for chemical concentrations in the background area to contribute to risks. The results of the comparison to background levels are presented in the Uncertainty Analysis (Section 4.6).

4.2.1.1 Selection of Sediment COPCs

Tables C-1 and C-2 in Appendix C present the COPC selection process for the analytes that were detected in surface sediment samples from Area A/B and the Rope Swing/Hot Spot Area; the results for Area C are presented in Table C-3. Surface sediment (defined as the top 0 to 6 inches) was quantitatively evaluated

because the sediments at these depths are those to which humans are most likely to be exposed, either directly on the river bed or through entrainment resulting from recreational activities.

Area A/B

The maximum detected surficial sediment concentrations in Area A/B for six non-PCB analytes exceeded the modified residential soil screening criteria: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

The maximum detected concentration of each individual detected Aroclor exceeded the screening value. In addition, the maximum detected concentration of total Aroclors exceeded the total PCB screening value. Individual Aroclors were considered COPCs and evaluated as total Aroclors.

Ten individual PCB congeners, plus one coeluting pair (i.e., PCB 107/123) were detected in surface sediment. Screening values are not available for the individual congeners so congeners were screened using the maximum Site-specific total PCB congener concentration against the total PCB screening value. The maximum concentration exceeded the screening level. In addition, some of the individual PCB congeners that exhibit dioxin-like activity (i.e., TEQs) (see Section 3.2.1) were compared to 2,3,7,8-TCDD screening criteria. Although the maximum TEQ concentration did not exceed the screening value, dioxin-like PCB congeners (as TEQs) were retained as COPCs to provide information regarding the Site-specific carcinogenic potential of dioxin-like PCBs versus non-dioxin-like PCBs.

In addition, estimated PCB data including total PCB congeners, TEQs (based on the mean Aroclor ratio), and measured total PCB congeners minus measured TEQ congener concentrations were calculated (see Appendix B). These variations on PCB-related compounds were calculated to provide additional information regarding the variability of the exposure estimate.

The remaining analytes were either detected at concentrations below the screening concentrations or were not detected, and were therefore eliminated from consideration as COPCs.

Rope Swing/Hot Spot Area

The maximum detected surficial sediment concentrations in the Rope Swing/Hot Spot Area for two non-PCB analytes (benzo(a)pyrene and arsenic) exceeded the modified residential soil screening criteria.

The maximum detected concentration of each individually detected Aroclor exceeded the screening value. In addition, the maximum detected concentration of total Aroclors exceeded its screening value. Individual Aroclors were considered COPCs and evaluated as total Aroclors.

Ten individual PCB congeners, plus one coeluting pair (i.e., PCB 107/123) were detected in surface sediment. As noted previously, congeners were screened using the maximum total PCB congener concentration against the total PCB screening value. This maximum value exceeded the screening concentration. Although the maximum TEQ concentration did not exceed the screening value, dioxin-like PCB congeners were retained as COPCs and were evaluated as TEQs to account for the carcinogenic potential of dioxin-like PCBs versus non-dioxin-like PCBs.

In addition, total PCB congeners minus TEQ congener concentration was included in the summary tables for information purposes and carried through this supplemental BHHRA.

The remaining analytes were either detected at concentrations below the screening concentrations or were not detected, and were therefore eliminated from consideration as COPCs.

4.2.1.2 Selection of Fish Tissue COPCs

Tables C-4 and C-5 in Appendix C present the COPC selection process for the analytes that were detected in fish tissue from Area A/B.

Area A/B

The maximum detected redbreast sunfish tissue concentrations in Area A/B exceeded the Region 3 fish RBCs for two non-PCB analytes, 4,4'-DDE and mercury, and they were retained as COPCs.

The maximum detected concentrations for Aroclors 1248 and 1254 exceeded the screening value. In addition, the maximum detected concentration for total Aroclors exceeded the total PCB screening value. Individual Aroclors were therefore considered COPCs and evaluated as total Aroclors.

Nine individual PCB congeners, plus one coeluting pair (i.e., PCB 107/123) were detected. Screening values were not available for individual congeners so the congeners were screened using the maximum concentration for total PCB congeners against the total PCB screening value. This maximum value exceeded the screening concentration. The TEQ value also exceeded the screening concentration, and dioxin-like PCB congeners (as TEQs) were retained as COPCs to provide information regarding the Site-specific carcinogenic potential of dioxin-like PCBs versus non-dioxin-like PCBs.

Summary statistics for total PCB congeners minus TEQ congener concentrations were calculated. This variation on PCB-related compounds provided additional information around the variability of the exposure estimate. It was included in the summary tables for informational purposes and carried through the risk assessment.

The remaining analytes were either detected at concentrations below the screening concentrations or were not detected, and were therefore eliminated from consideration as COPCs.

4.3 Human Health Exposure Assessment

The objective of the exposure assessment is to estimate the nature, extent, and magnitude of potential exposure of human receptors to COPCs in sediment and fish tissue considering the current and reasonably anticipated future uses of the Site. The exposure assessment involves several steps:

- evaluating the exposure setting, which includes describing the local land and water uses and identifying the potentially exposed human populations;
- developing the CSM for human exposures, which includes identifying the source of contamination, the contaminant transport and release mechanisms, the exposure media, the exposure routes, and the potentially exposed populations;
- calculating the EPCs for each COPC;
- identifying the exposure models and parameters used to calculate the exposure doses; and,
- calculating the exposure doses.

4.3.1 Exposure Setting

The following subsections briefly describe the exposure setting for the Site and surrounding area.

4.3.1.1 Local Land and Water Uses

As described in Sections 1.0 and 2.0, the Site is situated in a densely populated residential and commercial area, located approximately one-eighth of a mile from the downtown Milford area. Approximately 11,400 people living within three miles of the Site obtain their drinking water from public and private wells; however, no private wells are used as a drinking water supply in the study area (USEPA, 2007a).

The Souhegan River in the vicinity of the Site is adjacent to Keyes Field, which includes soccer fields, baseball fields, walking paths, and picnic areas that are currently used by people who engage in recreational activities. A footbridge is located adjacent to the tennis courts and provides access from Keyes Field to the opposite side of the river, where the local Boys and Girls Club is situated. The river is easily accessible in this area and there is evidence, both physical (rope swing) and anecdotal (stories about people sitting in lawn chairs in the river) that recreational use of the river is occurring and is expected to continue into the future. Area A is likely the most attractive area to the highest number of recreational users.

4.3.1.2 Identification of Potentially Exposed Human Populations

Based on the current and the plausible future land and water uses, and the types of Site activities occurring at the present time and assumed to occur in the future, the following populations were identified for evaluation in the supplemental BHHRA:

- Current/future recreational Angler/Wader (children and adults);
- Current/future recreational Swimmer (children and adults);
- Current/future recreational Rope Swinger (adolescent child; 10-18 years); and,
- Current/future recreational Fish Consumer (children and adults).

4.3.2 Conceptual Site Model for Human Exposures

A CSM describes the contaminant sources, the contaminant release and transport mechanisms, the exposure media, the exposure routes, and the potentially exposed human populations. The primary objective of the CSM is to identify the complete and incomplete exposure pathways. A complete pathway has all of the components listed above, whereas an incomplete pathway is missing one or more. Figure 7 presents the CSM. Each element is described in detail in the following sections.

4.3.2.1 Sources of Contamination

As noted previously, primary sources of contamination of the Souhegan River in the vicinity of the Site include historical manufacturing activities that have occurred, including the improper storage of drums and runoff from the Mill Street area of the Site. Runoff flows through a drainage ditch that extends from the Mill Street pond to the Mobil Gas Station, where it then flows through a stormwater drainage culvert under Elm Street and the Elm Street Area to the river. Currently, there is no temporary cover on the banks of the river at the Elm Street Area of the Site and PCB-contaminated soils can migrate via runoff directly into the river. A plume of contaminated groundwater exists from the Mill Street area to the Elm Street Area. Regional flow indicates that groundwater discharges into the Souhegan River.

4.3.2.2 Release and Transport Mechanisms

There are four primary mechanisms that can release and transport COPCs at the Site:

- Soil runoff;
- Surface water runoff;

- Drainage ditch discharge; and,
- Groundwater recharge.

Chemicals such as VOCs, PCBs, and metals were transported through an open channel to a culvert at the nearby gas station, and then passed under the Elm Street Area before discharging to the Souhegan River. Note that the leaching of chemicals to groundwater and subsequent groundwater contamination exposure pathway has been evaluated separately in the OU-2 RI Report and are not the focus of this supplemental BHHRA.

4.3.2.3 Exposure Media and Routes of Exposure

The potentially contaminated media include bank soil, sediment, sandbar soil, fish tissue, and surface water. Table 4-1 presents the CSM for human receptors, including the media and routes of exposure. Figure 7 is a graphical presentation of the CSM for human health. Exposures are summarized below:

- **Sediment** – COPCs in Souhegan River surface sediment may be ingested and absorbed through the skin. Inhalation of sediment is not expected to be a significant source of exposure since the sediment is expected to be underwater the majority of the time and when exposed, given the large size of the substrate, high winds would be necessary to mobilize the sediment.
- **Fish Fillets** – Consumption of fish fillets was quantitatively evaluated.
- **Soil** – Contact with bank soil was evaluated qualitatively because this area is being evaluated in-depth in OU1. In addition, contact with sandbar soil was qualitatively evaluated based on the small extent of the area available for exposure and the limited number of samples available (2 samples).
- **Surface Water** – Surface water sampling was not conducted during the most recent sampling efforts because historical data indicate that the main COPCs (i.e., PCBs) are not detected in this medium. Contact with surface water was qualitatively evaluated using historical data. Note that there is a low likelihood of PCBs being present in the water column (as opposed to being bound to sediment or organic matter).

4.3.2.4 Potentially Exposed Populations

As previously mentioned, this supplemental BHHRA focuses on human populations likely to be exposed to the potentially contaminated Site media currently and/or in the future. The potentially exposed populations that were evaluated are summarized below:

- **Adult Recreational User** – an adult recreational user (7-30 years old) could contact Site sediments, soils, and surface water while engaging in angling/wading or swimming activities; and could ingest fish caught in the Souhegan River.
- **Child Recreational User** – a child recreational user (1-6 years old) could contact Site sediments, soils, and surface water while engaging in angling/wading or swimming activities; and could ingest fish caught in the Souhegan River.
- **Adolescent Recreational User** – an adolescent recreational user (10-18 years old) could contact Site sediments, soils, and surface water while using the rope swing hung for plunging into a deep pool in the Souhegan River across from the Elm Street Area. Fish ingestion was not evaluated for the adolescent, because it is covered for the life of an individual by the child and adult exposures. Note that this scenario addresses a specific current scenario and does not necessarily provide a range of risks. Because Area A/B is evaluated in its entirety using adult and child wading and swimming scenarios, the evaluation of these receptors is expected to cover the range of risks for potential receptors using the Rope Swing Area, which is a subarea of Area A.

4.3.3 Calculation of Exposure Point Concentrations

Estimates of chemical concentrations at points of potential exposure are necessary for evaluating chemical intakes by potentially exposed receptors. The concentrations of chemicals in the exposure medium (either sediment or fish tissue) at the exposure point are termed "exposure point concentrations" (EPC). USEPA guidance uses an average concentration to represent "a reasonable estimate of the concentration likely to be contacted over time" and recommends that the 95% upper confidence limit (95% UCL) on the average be used "because of the uncertainty associated with estimating the true average concentration at a site" (USEPA, 1989). The EPC used to estimate human exposures was calculated as either the 95% UCL or the maximum detected concentration, whichever was lower.

Calculation of EPCs followed guidance provided by USEPA (2002c), using distribution shift tests to determine the underlying population distribution. Specifically, the ProUCL software package (Version 4.0) developed by USEPA (2007b) was used to determine the underlying distributions and to determine the most applicable EPC for a given contaminant based on the characteristics of the data. All ProUCL output files are provided in Appendix D; input files are provided on CD-ROM.

The distribution of detected data was determined by goodness-of-fit (GOF) tests (e.g., normal, lognormal, and gamma) for each dataset. For redbreast sunfish tissue data, full datasets were identified in Area A/B for DDE, measured PCB congeners, PCB Aroclors, and mercury. The 95% UCLs for these parameters with non-censored datasets were calculated based on the recommendations from the ProUCL output files (Appendix D).

The remaining parameters in the sediment and redbreast sunfish datasets all contained censored data (i.e., non-detects). ProUCL does not recommend using one-half the detection limit as a substitution for non-detect data to calculate EPCs. Instead, for the datasets that contained at least ten detected values, non-detect values were extrapolated using ProUCL's regression on order statistical (ROS) methods (e.g., normal ROS, gamma ROS, and lognormal ROS [robust ROS]). This is consistent with the guidance provided with ProUCL. For datasets with less than ten detected values, a value of one-half the MDL was generally substituted for the non-detects. Although ProUCL cautions against using one-half the MDL as a surrogate value for non-detects, the more robust methods of dealing with censored data are not appropriate for smaller data sets. For PAHs, however, non-detects were not estimated using ProUCL or with a substitution of one-half the MDL because either individual PAHs did not have enough detects to estimate the non-detects or there were too few non-detects to warrant using a different method of handling them (refer to Section 3.2.1 to see how non-detected PAHs were handled).

For measured PCB congeners, the concentrations of each sample-specific dioxin-like WHO PCB congeners were subtracted from the total PCB (sum congeners) to obtain a concentration of the non-dioxin-like congeners. The 95% UCL was then calculated to assess non-dioxin-like cancer effects from PCBs. Based on performance of the various calculations for Area A/B and the Rope Swing Area, the EPC was based on the statistical recommendation provided by ProUCL or the maximum detected concentration, whichever was lower (USEPA, 2002c).

Background Area C had a limited number of available samples (five sampling locations) and low detection frequencies. For example, only one sediment sampling location (T-20-7-A) had PCB congener data and only one of 12 congeners (PCB 118) was actually detected in the sample. In redbreast sunfish tissue data, only one of 12 congeners (PCB 118) was detected in each of the six samples. 95% UCLs could therefore not be calculated for either sediment or fish tissue in background Area C and mean and maximum values were used as the EPCs instead.

Exposure point concentrations were also calculated for the Rope Swing Area for benzo(a)pyrene, arsenic, and PCBs. This area is defined by 26 sediment samples that have the potential for recreational human exposure (Table 3-2). A summary of the EPCs along with the data distribution and calculation method are presented in Tables 4-2 through 4-6.

4.3.4 Human Health Exposure Equations and Parameters

This section presents the equations and parameters that were used to estimate the chronic daily intakes (CDIs; i.e., exposure doses) of the COPCs for each receptor through the applicable exposure pathways. Many of the exposure parameters that were used are standard values recommended by USEPA. Where a standard value could not be obtained or was inappropriate, Site-specific information and professional judgment was used.

Exposure doses are dependent upon the magnitude, frequency, and duration of exposure. They are estimated by combining the COPC concentration (i.e., the EPC) and the exposure parameters. The exposure doses are expressed as intakes in milligrams of COPC per kilogram of body weight per day (mg/kg-day). Two types of doses were calculated in this supplemental BHHRA. The first, the lifetime average daily dose (LADD) is averaged over a 70-year life span and used to estimate cancer risk. The second, the average daily dose (ADD), is averaged over the actual exposure duration for each receptor and used to estimate noncancer health effects.

The following list presents the exposure parameters that were used to estimate COPC intakes:

- **Exposure frequency (EF)** – represents the number of days per year (days/year) that a human receptor is engaged in a particular activity that could result in exposure;
- **Exposure duration (ED)** – represents the total length of time in years that a receptor engages in an activity that could result in exposure;
- **Body weight (BW)** – represents the average receptor body weight over the exposure period, expressed in kilograms (kg);
- **Averaging time (AT)** – represents the period over which exposure is averaged, expressed in days. Averaging time is dependent on the type of evaluation: cancer or noncancer. The cancer AT (AT_c)is based on a 70-year life span for all age groups, which equals 25,550 days (i.e., 70 years x 365 days/year). The noncancer AT (AT_{nc}) equals the receptor-specific ED multiplied by 365 days/year;
- **Sediment ingestion rate (IR_{SED})** – represents the amount of sediment that is incidentally ingested on a daily basis, expressed in units of mg/day. In the absence of sediment ingestion rates, soil ingestion rates were conservatively used for sediment ingestion;
- **Fish ingestion rate (IR_F)** – represents the amount of fish that is ingested on a daily basis, expressed in units of grams per day (g/day);
- **Fraction ingested (FI)** – represents the fraction of sediment or fish that is ingested from the contaminated source (unitless);
- **Exposed skin surface area (SA)** – represents the amount of skin exposed to contaminated sediment, expressed in units of square centimeters per day (cm^2/day);
- **Soil-to-skin adherence factor (AF)** – describes the amount of sediment that adheres to the skin per surface area unit, expressed as milligrams per square centimeter (mg/cm^2); and,
- **Dermal absorption factor (ABS)** – represents the fraction of COPC that is assumed to penetrate the skin after dermal exposure with contaminated sediments (unitless). The ABS factors were obtained from USEPA's dermal risk assessment guidance (USEPA, 2004).

To ensure that risk estimates are conservative and protective of human health, intakes based on upper-end (typically the upper 90th or 95th percentile) termed the reasonable maximum exposure (RME), were calculated (USEPA, 1992). In addition, central tendency exposure (CTE) doses and risks were calculated. The CTE risks provide additional insight into the degree of uncertainty associated with the conservative risk estimates by using average or 50th percentile exposure factors, where appropriate. Exposure factors for both the RME and CTE scenarios are presented in the following sections and in Appendix E.

4.3.4.1 Recreational Users

Recreational exposure to surficial sediment (0-6 inches bgs) and fish consumption was evaluated in Areas A/B and C for children (age 0-6) and adult (> age 6) receptors. The Rope Swing Area, which is assumed to be used primarily by adolescents (age 10-18) was also evaluated for exposure to surficial sediment. Tables E-1 through E-9 present the exposure parameters and models that were used to estimate direct contact (i.e., ingestion and dermal contact) to sediment. Tables E-10 and E-11 present the exposure parameters and models that were used to estimate fish consumption.

Angler/Wader

Anglers/waders in the Souhegan River in the vicinity of the Site were assumed to be exposed for 6 months of the year (i.e., April through September). During these months, exposure was assumed to occur 2 days/week based on professional judgment. This equates to an EF of 52 days/year (assuming 4.33 weeks/month) for the RME scenario. The CTE EF was assumed to be 26 days/year (1 day/week, 4.33 weeks/month, 6 months/year). The anglers/waders were assumed to be nearby residents. Therefore, the EDs for residential exposure were used for the RME scenario (child ED of 6 years; adult ED of 24 years). For the CTE scenario, the child ED was assumed to remain 6 years but the adult ED was assumed to 9 years (USEPA, 1997b). The child BW was assumed to be 15 kg, consistent with a 1 to 6 year old, and the adult BW was assumed to be 70 kg (USEPA, 1997b). The AT_c was based on a 70-year lifetime (25,550 days) (USEPA, 1989). The RME AT_{nc} for the child and adult were assumed to be 2,190 days and 8,760 days, respectively (i.e., ED multiplied by 365 days/year). The CTE AT_{nc} for the child and adult were assumed to be 2,190 days and 3,285 days, respectively.

Currently, there are no incidental sediment ingestion rates available. In the absence of sediment-specific data, soil ingestion rates were used. The USEPA recommended soil residential exposure ingestion rates of 200 mg/day and 100 mg/day were used for the child and adult recreational user, respectively. The CTE child and adult soil ingestion rates were assumed to be 100 mg/day and 50 mg/day, respectively. The RME FI was assumed to be 0.5 to reflect the likelihood that approximately 50% of the daily ingested amount of sediment was from the Souhegan River while angling/wading. The CTE FI was assumed to be 0.25.

The SA was assumed to be 5,700 cm^2 for the adult (head, hands, forearms and lower legs), and 2,800 cm^2 for the child (head, hands, forearms, lower legs, and feet). These values were used for both the RME and CTE scenarios. For the RME scenario, geometric mean soil-to-skin AFs of 0.2 mg/cm^2 (children playing in wet soil) and 0.3 mg/cm^2 (reed gatherers) were used for the child and adult, respectively (USEPA, 2004). The CTE AF for the child was equal to the RME value as "children playing in wet soil." The CTE adult AF was based on the geometric mean value for the adult residential gardener (0.07 mg/cm^2) (USEPA, 2004).

Estimated intakes (LADD and ADD) for the Angler/Wader are presented in Tables F-1 through F-12 (Appendix F).

Swimmer

Individuals swimming in the Souhegan River in the vicinity of the Site were assumed to be exposed during the three summer months (i.e., June through August). During these months, exposure was assumed to occur 3 days/week based on professional judgment. This equates to an EF of 39 days/year (assuming 4.33 weeks/month) for the RME scenario. The CTE EF was assumed to be 13 days/year (1 day/week, 4.33 weeks/month, 3 months/year). Swimmers were assumed to be nearby residents. Therefore, the EDs for residential exposure were used for the RME scenario (child ED of 6 years; adult ED of 24 years). For the CTE scenario, the child ED was assumed to remain 6 years but the adult ED was assumed to be 9 years (USEPA, 1997b). The child BW was assumed to be 15 kg, consistent with a 1 to 6 year old, and the adult BW was assumed to be 70 kg (USEPA, 1997b). The AT_c was based on a 70-year lifetime (25,550 days) (USEPA, 1989). The RME AT_{nc} for the child and adult were assumed to be 2,190 days and 8,760 days, respectively. The CTE AT_{nc} for the child and adult were assumed to be 2,190 days and 3,285 days, respectively.

Currently, there are no incidental sediment ingestion rates available. In the absence of sediment-specific data, soil ingestion rates were used. The USEPA recommended soil residential exposure ingestion rates of 200 mg/day and 100 mg/day were used for the child and adult recreational user, respectively. The CTE child and adult soil ingestion rates were assumed to be 100 mg/day and 50 mg/day, respectively. The RME FI was assumed to be 0.5 to reflect the likelihood that approximately 50% of the daily ingested amount of sediment was from the Souhegan River sediments while swimming. The CTE FI was assumed to be 0.25.

Because the Swimmer is expected to be fully immersed, the whole body is potentially exposed to sediment. Thus, the SA was based on exposure to the whole body and was assumed to be 18,000 cm^2 for the adult and 6,600 cm^2 for the child. Whole body values were used because data are not available to subtract out the surface area that may be covered by swimsuits or underwear/shorts. These values were used for both the RME and CTE scenarios. For the RME, geometric mean soil-to-skin AFs of 0.2 mg/cm^2 (children playing in wet soil) and 0.3 mg/cm^2 (reed gatherers) were used for the child and adult, respectively (USEPA, 2004). The CTE AF for the child was equal to the RME value as "children playing in wet soil." The CTE adult AF was based on the geometric mean value for the adult residential gardener (0.07 mg/cm^2) (USEPA, 2004).

Estimated intakes (LADD and ADD) for the Swimmer are presented in Tables F-13 through F-24 (Appendix F).

Rope Swinger

The Rope Swinger was assumed to be an adolescent receptor (10 through 18 years of age) that was exposed to Site COPCs in sediment while using the rope swing in Hot Spot Area. The adolescent was selected for evaluation because this receptor was assumed to be the primary receptor using the rope swing and therefore would be exposed more frequently to COPCs in this area than a young child or an adult.

For sediment exposure, it was conservatively assumed that an adolescent uses the rope swing during the summer (June through August). During these months, exposure was assumed to occur 3 days/week. This equates to an EF of 39 days/year for the RME scenario. For the CTE scenario, an EF value of 13 days/year (1 day/week) was assumed.

The Rope Swinger was assumed to be an adolescent, 10 through 18 years. This equates to an ED of 8 years. The AT_c was assumed to be 25,550 days. The AT_{nc} was assumed to 2,920 days. The adolescent BW was assumed to be 52 kg. This value was calculated by obtaining the 50th percentile BW values for

male and female children aged 10 through 18 from USEPA's Exposure Factors Handbook (USEPA, 1997b).

Currently, there are no incidental sediment ingestion rates available. In the absence of sediment-specific data, a soil ingestion rate was used. The USEPA recommended soil residential exposure adult ingestion rate of 100 mg/day was used. For the CTE scenario, the sediment ingestion rate was assumed to be 50 mg/day. An FI value of 0.5 was assumed for the RME scenario indicating that the Rope Swinger ingests one-half (50%) of their daily sediment intake from the Site. A value of 0.25 was assumed for the CTE scenario.

Because the Rope Swinger is expected to be fully immersed, the whole body is potentially exposed to sediment. As for the Swimmer, whole body values were used because data are not available to subtract out surface area that may be covered by swimsuits or underwear/shorts. Thus, the exposed SA for the Rope Swinger was 15,000 cm^2 (USEPA, 2004) for both the RME and CTE scenarios. For the RME scenario, a geometric mean soil-to-skin AF of 0.3 mg/cm^2 (reed gatherers) was assumed (USEPA, 2004). The CTE AF was based on the geometric mean value for the residential gardener (0.07 mg/cm^2) (USEPA, 2004).

Estimated intakes (LADD and ADD) for the Rope Swinger are presented in Tables F-25 and F-26 (Appendix F).

4.3.4.2 Fish Consumer

People consuming fish caught in the Souhegan River in the vicinity of the Site were assumed to be exposed for 350 days/year for both the RME and CTE scenarios. This value assumed that the consumer is a nearby resident that is at home for all but two-weeks per year. Because the consumer was assumed to be a nearby resident, the EDs for residential exposure were used for the RME scenario (child ED of 6 years; adult ED of 24 years). For the CTE scenario, the child ED was assumed to remain 6 years but the adult ED was assumed to be 9 years (USEPA, 1997b). The child BW was assumed to be 15 kg, consistent with a 1 to 6 year old, and the adult BW was assumed to be 70 kg (USEPA, 1997b). The AT_c was based on a 70-year lifetime (25,550 days) (USEPA, 1989). The RME AT_{nc} for the child and adult were assumed to be 2,190 days and 8,760 days, respectively. The CTE AT_{nc} for the child and adult were assumed to be 2,190 days and 3,285 days, respectively.

For the recreational angler, the absence of creel data for the Souhegan River made it necessary to look to other sources for fish ingestion rates. The Maine Angler Survey (Ebert et al., 1993; ChemRisk, 1992) was selected as the most appropriate basis for the fish consumption rate. Ebert et al. (1993) estimated adult consumption rates of recreationally caught freshwater fish in Maine based on data from a statewide mail survey of licensed resident anglers (n = 2,500). Less than 1% of riverine environments in Maine were subject to fish consumption advisories at the time of the survey; therefore, the consumption rates calculated from this study should not be biased low due to reduced angling. Ebert et al. (1993) calculated the consumption rate of fish for each of three consumption patterns for fish caught in various flow regimes:

<u>Consumption Patterns</u>

- All household fish consumers eat an equal share of consumed fish.
- Only adults in the household consume fish.
- Only the angler consumes fish.

Flow Regimes

- **Rivers and streams** – characterized by waters with moderate to fast-flowing waters; shallow to moderate depth.
- **Lakes and ponds** – characterized by waters with little to no flow; depth varies.
- **All waters** – water stretches that incorporate elements of both regimes described above.

Adult ingestion rates were based on the assumption that anglers consume all of their catch rather than share it with others. A child consumption rate for sport-caught freshwater fish was not available from Ebert et al. (1993). Instead, the child ingestion rates were assumed to be equal to that indicated by "all household consumers share."

The flow regime that best characterizes each of the three areas to be evaluated is "river and stream." As such, using the 90th percentile values for the RME scenario, ingestion rates assumed were 6.1 and 14 g/day for the child and adult, respectively. Using the mean values for the CTE scenario, ingestion rates assumed were 3.7 and 8.9 g/day for the child and adult, respectively.

New Hampshire fish consumption advisories indicate that people age 7 and over can safely eat four 8-oz (227 g) meals per month of freshwater fish and that children under age 7 can safely eat one 3-oz (38 g) meal per month of freshwater fish. Potential risks associated with these values were discussed in the Uncertainty Analysis (Section 4.6).

The FI represents the fraction of fish consumed that is obtained from the contaminated source. In the absence of other areas available for recreational fishing, the contaminated water body is generally assumed to be the source of 100% of the recreationally caught fish, which equates to an FI of 1. When other fishable waters are available from which to catch fish, the FI is generally less than 1.

The Souhegan River is the major waterbody in Milford, with relatively few fishable waters in the vicinity of the town. However, results from the last fish collection effort show that the species primarily targeted by anglers are not found in the vicinity of the Site; with secondary species being sparse, particularly in the desired size class. For these reasons, it is highly unlikely that all fish caught and consumed by an angler over a duration of several years would come exclusively from the Souhegan River. In addition, according to Ebert et al. (1993), 80% of anglers fish from at least two bodies of water. Based on this data and the availability of other fishing locations in the area, an estimated FI from the Souhegan River in the vicinity of the Site was assumed to be 0.5 for the RME scenario and 0.25 for the CTE scenario.

Estimated intakes (LADD and ADD) for the Fish Consumer are presented in Tables F-27 through F-38 (Appendix F).

4.4 Human Health Toxicity Assessment

The primary purpose of the toxicity assessment is to describe and identify the toxicity values for the COPCs used in the estimation of potential cancer risks and noncancer health effects. A description of the terms used to estimate toxic effects along with the data sources is provided below. Tables 4-7 and 4-8 present the available toxicity values for each COPC, as well as the source, the USEPA weight-of evidence category, the route of administration, and the critical effect.

4.4.1 Cancer effects

For cancer effects, the toxicity values are expressed as oral cancer slope factors (CSF_o) in units of milligrams of COPC per kilogram of body weight per day $(mg/kg\text{-}day)^{-1}$. The use of a toxicity value

depends on the route of exposure being evaluated. The CSF_o is used to evaluate exposure from ingestion routes (e.g., fish ingestion).

If adequate data exists, USEPA has assigned each COPC a "weight-of-evidence" category that represents the likelihood of it being a human carcinogen (USEPA, 1989). Six weight-of-evidence categories exist:

- A – Human carcinogen;
- B1 – Probable human carcinogen, limited human data are available;
- B2 – Probable human carcinogen, sufficient evidence in animals and inadequate or no evidence in humans;
- C – Possible human carcinogen;
- D – Not classifiable as to human carcinogenicity; and,
- E – Evidence of non-carcinogenicity for humans.

As of 2005, USEPA revised the weight-of-evidence categories (USEPA, 2005a). The revised scheme addresses only five cancer descriptors (USEPA, 2005a):

- Carcinogenic to humans;
- Likely to be carcinogenic to humans;
- Suggestive evidence of carcinogenic potential;
- Inadequate information to assess carcinogenic potential; and,
- Not likely to be carcinogenic in humans.

COPCs that are classified in categories A through C following the 1989 weight-of-evidence classification and in the first three categories according to the 2005 classification system are generally carried through the risk characterization step if CSFs have been developed.

4.4.2 Noncancer Effects

Noncancer effects can include, for example, central nervous system damage, reproductive effects, and other systemic effects. For noncancer effects, the toxicity values are expressed as oral reference doses (RfD_o) in units of mg/kg-day. The premise of noncancer toxicity values is that there is an exposure level below which deleterious noncancer effects are not expected to occur. As with the cancer toxicity values, the use of a noncancer toxicity value depends on the route of exposure being evaluated and the RfD is used to evaluate exposure from ingestion routes.

4.4.3 Sources of Toxicity Values

The toxicity values used in this supplemental BHHRA were obtained from the following sources in the order presented (USEPA, 2003a):

- **Tier 1** – Integrated Risk Information System (IRIS) (USEPA, 2008).
- **Tier 2** – USEPA's Provisional Peer Review Toxicity Values (PPRTVs) as presented in the USEPA Region 6 MSL Table (USEPA, 2007c).
- **Tier 3** – Other Toxicity Values (can include, for example, the Health Effects Assessment Summary Tables (HEAST), National Center for Environmental Assessment (NCEA) values as presented in the USEPA Region 3 RBC Table, and ATSDR Minimal Risk Levels (MRLs).

4.4.4 Dermal Exposure

Toxicity values have not been developed for the dermal absorption pathway. Dermal toxicity values were derived from the oral toxicity values as described in USEPA dermal risk assessment guidance (USEPA, 2004). In general, the oral CSFs and oral RfDs are expressed as administered doses (i.e., the amount of a contaminant administered per unit time and weight). Conversely, exposures resulting from the dermal pathway are expressed as absorbed doses. Therefore, it is necessary to make an adjustment to the oral toxicity value to account for the contaminant-specific absorption efficiency.

The fraction of a COPC that is absorbed in the gastrointestinal tract, also known as ABS_{GI}, is a critical factor when adjusting from an administered to an absorbed dose. The ABS_{GI} values used in this supplemental BHHRA were obtained from USEPA (2004a). The oral CSFs and oral RfDs were adjusted to an absorbed dose using different methods. The dermal CSF (CSF_d) was derived by dividing the oral CSF by the ABS_{GI} as shown below in Equation 4-1:

$$CSF_d = \frac{CSF_o}{ABS_{GI}} \qquad \text{(Equation 4-1)}$$

Where:

CSF_d = Dermal cancer slope factor $(mg/kg\text{-}day)^{-1}$

CSF_o = Oral cancer slope factor $(mg/kg\text{-}day)^{-1}$

ABS_{GI} = Fraction of contaminant absorbed in the gastrointestinal tract (unitless).

The dermal reference dose (RfD_d) will be derived by multiplying the oral RfD by the ABS_{GI} as shown below in Equation 4-2:

$$RfD_d = RfD_o \times ABS_{GI} \qquad \text{(Equation 4-2)}$$

Where:

RfD_d = Dermal reference dose (mg/kg-day).

RfD_o = Oral reference dose (mg/kg-day).

ABS_{GI} = Fraction of contaminant absorbed in the gastrointestinal tract (unitless).

4.4.5 Polychlorinated Biphenyls

Several variations of PCB-related COPCs were carried through the supplemental BHHRA. Depending upon the data available for an area/medium, EPCs were calculated for the following:

- Total PCBs Aroclors
- Total PCBs congeners (measured)
- TEQ (measured)
- Total PCBs congeners minus TEQ congener concentration (measured)

Cancer risk for total PCBs (Aroclors, PCB congeners [measured], and total PCBs minus TEQ congeners) was estimated by multiplying the LADD by the oral CSF_o for high risk and persistence PCBs of 2.0E+00 $(mg/kg\text{-}day)^{-1}$ (USEPA, 2008). Cancer risk for dioxin-like PCBs was estimated by multiplying the LADD

for TEQs by the CSF_o for 2,3,7,8-TCDD of 1.5E+05 $(mg/kg\text{-}day)^{-1}$ (USEPA, 1997b). Total PCB-related cancer risk was calculated using different approaches, as data allowed. The first approach was to sum "total PCB minus TEQ congeners" cancer risk and TEQ cancer risk. This approach has the advantage of correcting for the potential overestimate of cancer potency that is associated with "double-counting" the TEQs. The second approach was to present cancer risk from total PCBs and TEQs separately.

The non-cancer risk was calculated by dividing the LADD for total PCBs by the RfD_o for Aroclor 1254 of 2E-05 mg/kg/day (USEPA, 2008). Only two Aroclors have had RfDs developed – Aroclor 1016 and Aroclor 1254. The RfD for Aroclor 1254 was selected as the surrogate for Aroclor 1260 because it is closer in the chlorination level and is a more conservative value.

4.5 Human Health Risk Characterization

The objective of the risk characterization is to integrate the information developed in the exposure assessment and the toxicity assessment into an evaluation of the potential risks associated with hypothetical exposure to the COPCs in sediment and fish tissue. Both cancer risks and noncancer hazard quotients (HQs) are calculated.

4.5.1 Cancer Risk

Potential cancer risk was calculated by multiplying the estimated LADD that was calculated for a COPC through an exposure route by the exposure route-specific CSF, as shown in Equation 4-3:

$$Cancer\ Risk = LADD * CSF \qquad \text{(Equation 4-3)}$$

Where:

LADD = Lifetime average daily dose; intake averaged over a 70-year lifetime as mg COPC/kg-body weight per day.

CSF = COPC- and route-specific cancer slope factor $(mg/kg\text{-}day)^{-1}$.

Cancer risks were summed across all relevant pathways for a given receptor and exposure scenario to yield a cumulative lifetime risk. USEPA's cancer risk range is an increased risk of developing cancer, based on a plausible upper-bound estimate of risk, of approximately 1 in 1,000,000 (1E-06) to 1 in 10,000 (1E-04). Risks that exceed this range typically require some type of remedial action, while risks within or below this range typically do not. Total cancer risks were summed as follows:

- PCB-related cancer risk was evaluated as total PCBs
  - Non-PCB/TEQ COPCs and total PCB Aroclors
  - Non-PCB/TEQ COPCs and total PCB congeners (measured)

- PCB-related cancer risk was evaluated as TEQ
  - Non-PCB/TEQ COPCs and TEQ (measured)

- PCB-related cancer risk was evaluated as non-dioxin-like PCBs (total PCB minus TEQ congeners) plus dioxin-like congeners (as TEQ congeners)
  - Non-PCB/TEQ COPCs, total PCB congeners minus TEQ congeners, and TEQ (measured)

Ranges of risks are presented in the following subsections based on the total PCB variations, the TEQ variations, and the non-dioxin-like plus dioxin-like variation.

4.5.2 Noncancer Effects

Potential noncancer effects were evaluated by the calculation of HQs and hazard indices (HIs). The HQ is the ratio of the ADD through a given exposure route to the COPC- and route-specific RfD. The HQ-RfD relationship is illustrated in Equation 4-4.

$$HQ = ADD / RfD \qquad \text{(Equation 4-4)}$$

Where:

HQ = Hazard quotient.

ADD = Average daily dose; estimated daily intake averaged over the exposure duration (mg/kg-day).

RfD = Reference dose (mg/kg-day).

For each COPC, the HQs were summed to calculate a COPC-specific HI. In addition, HIs were calculated for each exposure route, and a total HI was calculated based on exposure to all COPCs from all exposure routes for each receptor. HIs of less than one indicate that adverse health effects associated with the exposure scenario are unlikely to occur and that remedial action is not warranted. HIs greater than one do not necessarily indicate that adverse health effects will occur. The HQs were also segregated by COPC-specific target organ and summed to yield organ-specific HIs.

Potential non-cancer-related effects of dioxin-like versus non-dioxin-like congeners cannot be separated. In addition, there is no RfD for 2,3,7,8-TCDD to evaluate the potential for noncancer health effects from dioxin-like PCBs (as TEQ). Therefore, only total PCBs were considered when calculating HIs. Total HIs were calculated for the following total PCB permutations:

- Non-PCB/TEQ COPCs and total PCB Aroclors
- Non-PCB/TEQ COPCs and total PCB congeners (measured)

Ranges of HIs are presented in the following subsections based on these permutations.

4.5.3 Human Health Risk Results

Tables F-39 through F-57 (Appendix F) present the sediment and fish tissue cancer risks and HQs for the RME scenario. The CTE sediment and fish tissue cancer risks and HQs are presented in Tables F-58 through F-82.

4.5.3.1 RME Sediment Exposure

<u>Area A/B</u>

Angler/Wader

The total cancer risks for the Angler/Wader from sediment exposure (Table F-39) ranged from 4.8E-06 to 6.2E-06 when considering risks from non-PCB/TEQ COPCs plus the individual total PCB permutations (i.e., total PCB Aroclors and measured total PCB congeners). Total cancer risks when considering risks from non-PCB/TEQ COPCs plus TEQs (i.e., measured TEQ) was 2.6E-06. The total cancer risk when considering non-PCB/TEQ COPCs plus non-dioxin-like and dioxin-like congeners was 5.9E-06. Cancer risks were below 1E-06 for all of the non-PCB/TEQ COPCs with the exception of arsenic, which had a total cancer risk of 2.0E-06 (ingestion route = 1.4E-06; dermal route = 5.9E-07).

The total HIs for the child and adult Angler/Wader exposed to sediment (Tables F-40 and F-41) were less than one (maximum of 0.54 and 0.17, respectively).

Swimmer
The total cancer risks for the Swimmer from sediment exposure (Table F-42) ranged from 7.2E-06 to 9.6E-06 when considering risks from non-PCB/TEQ COPCs plus the individual total PCB permutations (i.e., total PCB Aroclors and measured total PCB congeners). Total cancer risks when considering risks from non-PCB/TEQ COPCs plus TEQs (i.e., measured TEQ) was 3.3E-06. The total cancer risk when considering non-PCB/TEQ COPCs plus non-dioxin-like and dioxin-like congeners was 9.0E-06. Cancer risks were below 1E-06 for all non-PCB/TEQ COPCs with the exception of arsenic, which had a cancer risk of 2.3E-06 (ingestion route = 1.0E-06; dermal route = 1.3E-06).

The total HIs for the child and adult Swimmer exposed to sediment (Tables F-43 and F-44) were less than one (maximum of 0.61 and 0.34, respectively).

Rope Swinger
The total cancer risks for the Rope Swinger from sediment exposure (Table F-45) ranged from 1.7E-06 to 4.0E-06 when considering risks from non-PCB/TEQ COPCs plus the individual total PCB permutations (i.e., total PCB Aroclors and measured total PCB congeners). Total cancer risks when considering risks from non-PCB/TEQ COPCs plus TEQs (i.e., measured TEQ) was 4.8E-07. The total cancer risk when considering non-PCB/TEQ COPCs plus non-dioxin-like and dioxin-like congeners was 4.0E-06. Cancer risks were below 1E-06 for all of the non-PCB/TEQ COPCs.

The total HIs for the Rope Swinger exposed to sediment (Table F-45) were less than one (maximum of 0.77).

Area C

Angler/Wader
For the RME scenario, the various permutations of total cancer risk for the Angler/Wader were all approximately equal to 2.9E-06, primarily because the risks were not driven by PCBs (Table F-46). Arsenic contributed approximately 78% of the total cancer risk, and was the only COPC with a cancer risk greater than 1E-06 (total = 2.3E-06; ingestion route =1.6E-06; dermal route = 6.8E-07).

The total HIs for the child and adult Angler/Wader exposed to sediment (Tables F-47 and F-48) were less than one (maximum of 0.037 and 0.0072, respectively).

Swimmer
The various permutations of total cancer risks for the Swimmer (Table F-49) from sediment exposure were all approximately 3.8E-06, primarily because the risks were not driven by PCBs. Arsenic contributed approximately 71% of the total cancer risk, and was the only COPC with a cancer risk greater than 1E-06 (total = 2.7E-06; ingestion route = 1.2E-06; dermal route = 1.5E-06).

The total HIs for the child and adult Swimmer exposed to sediment (Tables F-50 and F-51) were less than one (maximum of 0.034 and 0.012, respectively).

4.5.3.2 RME Fish Tissue Exposure

Area A/B

The total cancer risks from fish ingestion ranged (Table F-52) from 2.0E-04 to 3.1E-04 when considering risks from non-PCB/TEQ COPCs plus the individual total PCB permutations (i.e., total PCB Aroclors and measured total PCB congeners). The total cancer risk when considering risk from non-PCB/TEQ COPCs plus TEQs (i.e., measured TEQ) was 1.9E-05. The total cancer risk when considering non-PCB/TEQ COPCs plus non-dioxin-like and dioxin-like congeners was 3.6E-04. Cancer risks were below 1E-06 for all of the non-PCB/TEQ COPCs.

The total HIs for the child and adult who ingest fish (Tables F-53 and F-54) ranged from 20 to 31 for the child and from 9.9 to 15 for the adult. Only PCBs had HQs greater than one.

Area C

The total cancer risks from fish ingestion (Table F-55) ranged from 2.5E-06 to 6.3E-06 when considering risks from non-PCB/TEQ COPCs plus the individual total PCB permutations (i.e., total PCB Aroclors and measured total PCB congeners). The total cancer risk when considering risk from non-PCB/TEQ COPCs plus TEQs (i.e., measured TEQ) was 4.2E-07. The total cancer risk when considering non-PCB/TEQ COPCs plus non-dioxin-like and dioxin-like congeners was 2.7E-06.

The total HIs for the child and adult who ingest fish (Table F-56 and F-57) were less than one (maximum of 0.80 and 0.39, respectively).

4.5.3.3 CTE Sediment Exposure

Area A/B

Angler/Wader
The various permutations of total cancer risks for the Angler/Wader from sediment exposure (Table F-58) were all below 1E-06 (i.e., maximum of 8.6E-07). The total HIs for the child and adult were less than one (maximum of 0.14 and 0.020, respectively) (Tables F-59 and F-60).

Swimmer
The various permutations of total cancer risks for the Swimmer from sediment exposure (Table F-61) were all below 1E-06 (i.e., maximum of 8.7E-07). The total HIs for the child and adult were less than one (maximum of 0.14 and 0.027, respectively) (Tables F-62 and F-63).

Rope Swinger
The various permutations of total cancer risks for the Rope Swinger from sediment exposure (Table F-64) were all below 1E-06 (i.e., maximum of 3.1E-07). The total HIs for the Rope Swinger exposed to sediment were less than one (maximum of 0.061) (Table F-64).

Area C

Angler/Wader
The various permutations of total cancer risks for the Angler/Wader from sediment exposure (Table F-65) were all below 1E-06 (i.e., maximum of 2.4E-07). The total HIs for the child and adult were less than one (maximum of 0.0046 and 0.00059, respectively) (Tables F-66 and F-67).

Swimmer
The various permutations of total cancer risks for the Swimmer from sediment exposure (Table F-68) were all below 1E-06 (i.e., maximum of 2.1E-07). The total HIs for the child and adult were less than one (maximum of 0.0037 and 0.00062, respectively) (Tables F-69 and F-70).

4.5.3.4 CTE Fish Tissue Exposure

Area A/B

The total cancer risks from fish ingestion (Table F-71) ranged from 3.7E-05 to 5.7E-05 when considering risks from non-PCB/TEQ COPCs plus the individual total PCB permutations (i.e., total PCB Aroclors and measured total PCB congeners). The total cancer risk when considering risk from non-PCB/TEQ COPCs plus TEQs (i.e., measured TEQ) was 3.4E-06. Total cancer risk when considering non-PCB/TEQ COPCs plus non-dioxin-like and dioxin-like congeners was 6.6E-05. Cancer risks were below 1E-06 for all of the non-PCB/TEQ COPCs.

The total HIs for the child and adult who ingest fish (Tables F-72 and F-73) ranged from 6.1 to 9.4 for the child and from 3.2 to 4.8 for the adult. Only PCBs had HQs greater than one.

Area C

The various permutations of total cancer risks for individuals ingesting fish (Table F-74) were all below 1E-06 (i.e., maximum of 4.8E-07). The total HIs for the child and adult who ingest fish were less than one (maximum of 0.11 and 0.056, respectively) (Tables F-75 and E-76).

4.5.3.5 Cumulative Exposures

Area A/B

It was assumed that the Angler/Wader could also ingest fish caught from the Souhegan River in the vicinity of the Site. Cumulative risks for the sum of non-PCB/TEQ COPCs plus the variations of PCB/TEQ COPCs common to sediment and fish in Area A/B are presented in Tables F-77 through F-79. These tables also present the potential risks for Swimmers that could also ingest fish caught in the vicinity of the Site and for an individual that could angle/wade, swim, and ingest fish in the Souhegan River in the vicinity of the site. The Rope Swinger was not considered in this exercise because fish ingestion for that age group (10-18 years) was not evaluated separately from the adult exposure and sediment contact risks/HIs were lower for the Rope Swinger than for the Swimmer in Area A/B.

For the RME scenarios, the various non-PCB/TEQ COPCs plus the variations of PCB/TEQ COPCs sediment contact cancer risks ranged from 3E-06 to 1E-05; whereas, fish ingestion risks ranged from 2E-05 to 4E-04. When combining the sediment contact with the fish ingestion risks, total cancer risk (rounded to one significant figure) were not different from the fish ingestion risks. Fish ingestion contributed 76% to 88% of the total non-PCB plus TEQ risks. For the other categories (i.e., non-PCB/TEQ plus total PCB Aroclors, total PCB Congeners, or total PCB congeners minus TEQ congeners and measured TEQ), fish ingestion contributed 94% to 98% of the total risks.

The CTE scenarios followed the same patterns as the RME, but the total cumulative risks were much lower.

For noncancer effects, non-PCB/TEQ COPCs plus either the total PCB Aroclors or measured total PCB congeners were considered in the summary tables (Tables F-78 and F-79) for the child and adult

receptors, respectively. For the RME angling/wading and swimming scenarios, sediment contact HIs were below one and ranged from 0.37 to 0.61 for the child and 0.11 to 0.34 for the adult; whereas fish ingestion HIs were 20 and 31 (child; PCB Aroclors and congeners, respectively) and 10 and 15 (adult; PCB Aroclors and congeners, respectively). When combining the sediment contact with the fish ingestion HIs, total cumulative HIs (rounded to two significant figures) were essentially equal or similar to the fish ingestion HIs. Fish ingestion contributed 96% to 99% of the total HIs.

Area C

As in Area A/B, it was assumed that the Angler/Wader could also ingest fish caught from the Souhegan River in the vicinity of the Site. Cumulative risks for the sum of non-PCB/TEQ COPCs plus the variations of PCB/TEQ COPCs common to sediment and fish in Area C are presented in Tables F-80 through F-82. These tables also present the potential risks for Swimmers that could ingest fish caught in the vicinity of the Site and for an individual that could angle/wade, swim, and ingest fish in the Souhegan River in the vicinity of the Site.

For the RME scenarios, the various non-PCB/TEQ COPCs plus the variations of PCB/TEQ COPCs sediment contact cancer risks ranged from 3E-06 to 4E-06; and fish ingestion risks ranged from 4E-07 to 6E-06. When combining the sediment contact with the fish ingestion risks, the total cancer risks (rounded to one significant figure) ranged from 3E-06 to 1E-05. Fish ingestion contributed 6% to 13% of the total non-PCB plus TEQ risks. For the other categories (i.e., non-PCB/TEQ plus total PCB Aroclors, total PCB congeners, or total PCB congeners minus TEQ congeners and measured TEQ), fish ingestion contributed 27% to 68% of the total risks.

The CTE scenarios followed the same patterns as the RME, but the total cumulative risks were much lower.

For noncancer effects, non-PCB/TEQ COPCs plus either the total PCB Aroclors or measured total PCB congeners were considered in the summary tables (Tables F-81 and F-82) for child and adult receptors, respectively. For the RME scenarios, all individual scenario HIs were below one. When combining the sediment contact with the fish ingestion scenarios, HIs were also below one (range 0.21 to 0.87). Fish ingestion contributed from 86% to 98% of the total HIs.

4.5.4 Qualitative Human Health Risk Evaluation

Available datasets containing surface sediment data and redbreast sunfish data collected in 2004, 2006, and 2007 were quantitatively evaluated in this supplemental BHHRA. Primary exposure pathways include direct contact and ingestion of these media from the Souhegan River. Additional media associated with the Souhegan River to which an individual may be exposed currently or in the future include subsurface sediments, bank soil, sandbar soil, and other species of fish. Each is evaluated qualitatively in the following section.

4.5.4.1 Bank Soil

Bank soil could provide an exposure medium to individuals traversing the riverbank when moving from upland areas to the river and back. Human exposure to bank soils would be different from exposures to sediment contact, and would likely be intermittent and less intense (i.e., transient exposure).

To assess the potential risks to individuals from contacting bank soil, a conservative evaluation was performed using the limited bank soil data collected in 2007. Concentrations of PCBs and TEQs from dioxin-like PCBs were compared with ORNL RSLs for residential soil exposures. The results are as follows:

COPC	Frequency of Detection	Bank Soil Concentration (mg/kg)		Residential Soil MSL (mg/kg)	Ratio Soil Concentration: MSL Maximum/Average
		Maximum	Average		
Total PCB (Aroclor)	5/24	0.463	0.089	2.0	0.23/0.045
Total PCB (Congener)	16/24	0.380	0.056	2.0	0.19/0.028
TEQ	15/24	3E-05	1.2E-05	4.5E-05	0.67/0.27

The ratios of the Site-specific maxima and averages to the residential soil RSL were less than 1. Additionally, the RSLs were based on exposure associated with typical backyard residential activities. It is expected that any exposure to bank soils would be of limited frequency and duration. Therefore, based on the available data, it is unlikely that exposures to bank soils would lead to unacceptable adverse health effects.

4.5.4.2 Surface Water

Surface water data were not collected in the most recent sampling efforts (2004 through 2007) because PCBs, the main focus of the OU-2 investigation, were generally not detected in surface water in previous sampling efforts (i.e., 1991, 1993, and 1994). Only one Aroclor (Aroclor 1248) from prior sampling events was detected in one surface water sample at a value of 0.41 µg/L (ARCADIS, 2007). This sample was used in a conservative evaluation to assess the potential risks to individuals from incidentally ingesting surface water while wading or swimming.

The concentration of Aroclor 1248 (i.e., 0.41 µg/L) was compared with the ORNL RSLs for residential water exposures (i.e., 0.034 µg/L). The Site concentration in the one detected sample was 12 times higher than the screening level. However, this lone value exceeding a tap water screening value is not likely to be a concern. The RSLs were based on exposure associated with typical residential tap water uses (e.g., drinking, cooking, showering) and it is expected that any incidental ingestion of Souhegan River surface water would be of limited volume, frequency, and duration. Therefore, based on the available data, it is unlikely that exposure to surface water would lead to unacceptable adverse health effects.

4.5.4.3 Subsurface Sediment

Exposure point concentrations for sediment were based on surface (i.e., 0-6 inch bgs) data. Recently collected data also exist for subsurface sediment (6 to 56 inches bgs). A qualitative analysis of the subsurface data was performed in Area A/B and the Rope Swing Area in the event that scouring events expose the underlying sediment. Tables F-83 and F-84 show the maximum total PCB (Aroclor and congener), TEQ, and total PCB minus TEQ concentrations at various depths compared with the EPCs for surface sediment. As will be detailed further in the following paragraphs, the EPCs developed for the subsurface sediments are greater than those in the uppermost sediment layer.

<u>Area A/B</u>

For total PCBs (Aroclor and congener-based) in Area A/B, the maximum concentrations were greatest at the 6 to 14 inch depth interval, followed by the 36 to 56 inch, 12 to 27 inch, and the 24 to 39 inch depth intervals. The ratios of the maximum concentrations at depth to the surficial EPC ranged from 2 to 56. Therefore, assuming the most conservative sediment contact exposure scenario in Area A/B (i.e., the Swimmer), total cancer risk ranges would increase from 2E-06 to 6E-06 (surficial sediment) to 1E-05 to 2E-04 (at depth). Risks equal to or greater than 1E-04 were found at the 6 to 14 inch depth interval. HIs

would increase from 0.34 to 0.55 (surficial sediment) to approximately 19 for the child and from 0.21 to 0.33 to approximately 12 for adult Swimmer.

For TEQ in Area A/B, the maximum concentrations were greatest at the 12 to 27 inch depth interval, followed by the 6 to 14 inch, 36 to 56 inch, and the 24 to 39 inch depth intervals. The ratios of the maximum concentrations at depth to the surficial EPC ranged from 4 to 99. Therefore, assuming the most conservative sediment contact exposure scenario in Area A/B (i.e., Swimmer), the total cancer risk ranges would increase from 1E-07 to 4E-07 (surficial sediment) to 6E-07 to 1E-05 (at depth).

For total PCBs minus TEQ congeners in Area A/B, the maximum concentrations were greatest at the 6 to 14 inch depth interval, followed by the 36 to 56 inch, 12 to 27 inch, and the 24 to 39 inch depth intervals. The ratios of the maximum concentrations at depth to the surficial EPC ranged from 2 to 38. Therefore, assuming the most conservative sediment contact exposure scenario in Area A/B (i.e., Swimmer), the total cancer risk ranges would increase from 6E-06 (surficial sediment) to 1E-05 to 2E-04 (at depth). The risks equal to or greater than 1E-04 would be at the 6 to 14 inch depth interval. Summing the total cancer risk for total PCBs minus Congeners and TEQ at similar depths, total cancer risks would increase from 6E-06 (surficial sediment) to 1E-05 to 2E-04 (at depth).

Rope Swing/Hot Spot Area

For total PCBs (Aroclor and congener-based) in the Rope Swing/Hot Spot Area, the maximum concentrations were greatest at the 6 to 14 inch depth interval, followed by the 36 to 56 inch, 12 to 27 inch, and the 24 to 39 inch depth intervals. The ratios of the maximum concentrations at depth to the surficial EPC ranged from 1 to 44. Therefore, the total cancer risk ranges for the Rope Swinger would increase from 1E-06 to 4E-06 (surficial sediment) to 5E-05 (at depth). Hazard indices would increase from 0.27 to 0.77 (surficial sediment) to approximately 12.

For TEQ in the Rope Swing Area, the maximum concentrations were greatest at the 12 to 27 inch depth interval, followed by the 36 to 56 inch, 6 to 14 inch, and the 24 to 39 inch depth intervals. The ratios of the maximum concentrations at depth to the surficial EPC ranged from 4 to 99. Therefore, the total cancer risk for the Rope Swinger would increase from 3E-08 (surficial sediment) to 3E-06 (at depth).

For total PCBs minus TEQ congeners in the Rope Swing Area, the maximum concentrations were greatest at the 6 to 14 inch depth interval, followed by the 36 to 56 inch, 12 to 27 inch, and the 24 to 39 inch depth intervals. The ratios of the maximum concentrations at depth to the surficial EPC ranged from 1 to 15. Therefore, the total cancer risk ranges for the Rope Swinger would increase from 3E-06 (surficial sediment) to 5E-05 (at depth). Summing the cancer risk for total PCBs minus congeners and TEQ at similar depths, the total cancer risks would increase from 4E-06 (surficial sediment) to 6E-05 (at depth).

4.5.4.4 Sandbar Soil

EPCs for the sediment contact pathways did not include samples from the island sandbar in the vicinity of the Site in Area A. During times of potentially high water, the sandbar could be covered, and therefore result in the same type of exposure as sediments. Table F-85 shows the maximum total PCB (congener), TEQ, and total PCB minus TEQ concentrations at various depths compared with the EPCs used in the quantitative evaluation. Concentrations in the sandbar were no more than 0.2% of the EPC. Because sediment contact cancer risks for the most conservative receptor (i.e., the Swimmer) did not exceed 1E-05, cancer risks due to submerged sandbar soil exposure are expected to be negligible. Likewise, sediment contact HQs for the Swimmer did not exceed one, therefore decreasing the EPC would only decrease the HQs.

In addition, to assess the potential risks to individuals from contacting the sandbar soil when it is not flooded, the maximum concentrations of PCBs and TEQs from dioxin-like PCBs were compared with ORNL RSLs for residential soil exposures. The results are as follows:

COPC	Depth (inches bgs)	Maximum Sandbar Soil Concentration (mg/kg)	Residential Soil RSL (mg/kg)	Ratio Soil Concentration: MSL
Total PCB (Congener)	0-12	0.00165	2.0	0.00083
TEQ	12-24	8.70E-09	4.5E-05	0.00019

The ratios of the sandbar soil maxima to the residential soil RSLs were less than one. As noted in the bank soil discussion above, the RSLs were based on exposure associated with typical backyard residential activities. It is expected that any exposure to sandbar soils would be of limited frequency and duration. Therefore, based on the available data, it is unlikely that exposures to submerged sandbar soils would lead to unacceptable adverse health effects.

4.5.4.5 Alternative Fish Species

EPCs for the fish ingestion pathway were developed for redbreast sunfish because the concentrations in this fish tended to be somewhat higher than the other sportfish caught (i.e., bullhead). Some individuals fishing at the Site may target non-sunfish species or eat a combination of fish species. To estimate the relative potential risks for people that may eat fish other than redbreast sunfish, Table EF-86 shows the bullhead to redbreast sunfish EPC ratios for various PCB-related COPCs.

Bullhead PCB and TEQ maximum concentrations were equal to or lower than the redbreast sunfish EPCs (ratios of bullhead to sunfish = 0.5 to 1 for total PCB-Aroclor, total PCB-congeners, TEQ, and PCB minus TEQ congeners). Therefore, if the maximum bullhead fillet concentration were used to estimate health hazards, HQs and cancer risks would be no higher than those calculated using the redbreast sunfish EPC. However, using redbreast sunfish alone does not significantly impact the risk estimates.

Fish tissue data were also collected in 1994 to support the Baseline Ecological Risk Assessment (BERA) (ADL, 1997). Concentrations of Aroclor 1248 and 1260 were available in brown and yellow bullhead. Table F-87 shows the historical bullhead maximum Aroclor concentrations to current redbreast sunfish total PCB Aroclor EPC ratios. Ratios ranged from 0.02 to 0.3, indicating that, based on the available data, PCB concentrations in skin-off fish fillets from the 2004 sampling effort are higher than the fillet samples from the 1994 sampling effort. In general, COPC concentrations will vary based on concentrations in the sediment; season; fish species, size, and lipid content. Given that the PCB concentrations in the sunfish dataset used in this BHHRA are higher than those in the 1994 bullhead samples, risks calculated in this BHHRA may be overestimated for individuals historically exposed to PCBs in fish tissue. However, these data also show no indication that levels in fish are decreasing over time. To the contrary, while reliable inferences cannot be made of such a small dataset, the concentrations increased over this time period.

4.6 Human Health Uncertainty Analysis

The results of this assessment are estimates of potential human health risks that were based on a number of assumptions about predicted exposure and toxicity. A principal component of any risk assessment is the identification of the assumptions, limitations, and uncertainties associated with the estimates of health effects. The uncertainties incorporated in this risk assessment may have resulted in an increase or decrease in the estimated potential for adverse effects; however, conservative, yet realistic, approaches were used when specific data or information were not available. While this approach to handling

uncertainty may somewhat overestimate the risks, only those conservative assumptions compatible with sound scientific evidence or processes were used.

This uncertainty analysis focuses on those issues that were specific to this assessment and, at the same time, had the greatest potential impact on the overall estimation of health effects. Presented below are the principal assumptions/uncertainties in the estimates of health effects for the scenarios evaluated in this assessment.

4.6.1 Data Gaps

Some of the most significant uncertainties in this supplemental BHHRA pertain to limitations and gaps in the available data. The available data are the basis for the exposure estimates and, depending on the underlying uncertainties and assumptions, have the ability to over- or under-estimate the potential risk results. The uncertainties associated with the data collected along the Souhegan River include the limited sediment and fish tissue data which are described in the following section.

4.6.1.1 Sediment

As discussed in Section 3.2.2, there are only 15 sediment samples with measured PCB congeners, 13 of which are located in Area A/B. Only Aroclor data were available for the majority of the samples. Aroclor analysis is useful as a screening tool to identify the presence of PCBs and for estimating total PCBs. However, in order to determine the potential ecological effects from dioxin-like PCB congeners (i.e., TEQs), individual PCB congener data are necessary. In addition, the weathering of Site-related Aroclors reduces the ability to accurately estimate congener concentrations from individual Aroclors. To overcome these issues, PCB congener concentrations, in samples where they were lacking, were estimated using regression equations. This allowed for a more robust spatial coverage of the PCB congener data. However, the methodology used to estimate the PCB congener concentrations brings with it several uncertainties based on both the underlying statistical assumptions and with the approach itself; and therefore, were not presented as part of the main text, but are presented in Appendix B.

4.6.1.2 Fish Tissue

Fish ingestion risks from PCBs were based on redbreast sunfish fillets with the skin removed. Normally, skin-on sunfish data are used for human health risk assessments because sunfish are generally cooked with the skin-on, and chemical concentrations tend to be higher in the skin-on versus skin-off fillets. In addition, because lipophilic compounds, such as PCBs, tend to sequester in the fat of an organism, the analysis of skin-off samples underestimates the concentration of PCBs in fillets of fish generally prepared skin-on (such as sunfish). However, according to ARCADIS (2007), the redbreast sunfish samples sent for PCB analysis were mistakenly processed by AWHL as skin-off fillets. After homogenization, AWHL extracted the tissue for PCB congener analysis and sent a portion of the extract to NEA for analysis of PCB Aroclors. Only the redbreast sunfish sent directly from the field for non-PCB analyses were processed as skin-on fillets. Therefore, TEQ, total PCB congener and Aroclor data were only available for the skin-off samples. This leads to a potential underestimate of exposure and risk.

4.6.2 Receptor Populations

Although recreational angling was evaluated in this supplemental BHHRA, the potential for a substantial population of anglers obtaining a significant portion of their consumed recreationally-caught fish from this stretch of the Souhegan River is unlikely. As noted in the Souhegan River Supplemental Investigation Data Summary Report (ARCADIS, 2007), some of the sport fish target species identified in the Final Work Plan (ARCADIS, 2006) were not available. The primary target species for sport fish were yellow perch and yellow bullhead greater than or equal to 6 inches in length. If the availability of yellow perch were limited, smallmouth or largemouth bass were identified as secondary fish collection species.

If the availability of yellow bullhead were limited, brown bullhead or white sucker were identified as an alternate species.

After initial collection activities in Area A via electrofishing, adult redbreast sunfish were substituted for yellow perch due to the lack of adult yellow perch, smallmouth bass, and largemouth bass in Area A. Additional yellow bullhead were needed to either replace smaller bullhead samples or provide greater tissue mass for chemical analysis. Finally, brown bullhead and adult whole-body weight suckers were added to the target list as potential alternates for sport fish. Given the lack of the more desired sport fish (e.g., yellow perch and bass) and the fact that electrofishing is a more efficient catch means than angling, it is likely that recreationally-caught fish consumed from the Souhegan River in the vicinity of the Site is limited by the species and biomass available in that reach. Therefore, the assumptions used in this supplemental BHHRA could overestimate risk to a relatively significant degree.

Subsistence fishing was not evaluated in this supplemental BHHRA. There have been no anecdotal reports of subsistence fishing occurring in this area of the Souhegan River and the lack of biomass noted above is unlikely to support subsistence fishing. It is unlikely that the decision not to evaluate subsistence fishing would lead to an underestimate of risk to any actual receptor.

4.6.3 Exposure Parameters

A matrix of the exposure parameter values and the likely direction of uncertainty (i.e., under- or overestimate) is presented in Table 4-9. A quantitative estimation of the uncertainty is provided where possible. More detailed explanations are presented below:

- **Sediment Ingestion Rates** – Sediment ingestion rates are currently not available; therefore, residential soil ingestion rates were used. The number of studies on soil ingestion in children and in adults is limited, and the receptor activities are generally limited to residential exposures. However, because sediment ingestion rates are likely lower than residential incidental soil ingestion rates, the values used likely overestimate risk.
- **Fish Ingestion Rate** – The "all household consumers share" values (i.e., approximately 40% of catch) were used as the child fish ingestion rates for the various flow regimes. These were calculated by Ebert et al. (1993) by dividing the amount of fish consumed by the number of individuals within a household (approximately 2.5). This assumption requires that all household members ingest the same amount. Given that studies suggest that a child 6 years old and under ingests approximately 33-50% that of an adult (as opposed to approximately 40% of the catch), the ingestion rate is likely overestimated. NHDES (2007b) fish advisories note that people under age 7 can safely eat one 3-oz (85 g) meal per month and people age 7 and over can safely eat four 8-oz (227 g) meals per month of freshwater fish. This would equate to ingestion rates of approximately 2.8 g/day and 30 g/day for the child and adult, respectively (11 g/day age-adjusted). This equates to approximately one-half and twice that which would be consumed under the evaluated RME scenario for the child and adult, respectively. The age-adjusted value is approximately 1.5 times that used in the RME scenario. These exposure parameters would lead to an increase in cancer risks to a maximum of 5E-04 for total PCBs (based on congeners), 3E-05 for TEQ, and 5E-04 for the non-dioxin like PCBs plus the dioxin-like PCBs. Child HQs would decrease to a maximum of 15 for total PCBs; whereas adult HQs would increase to a maximum of 30.
- **Fraction Sediment Ingested** – It was assumed receptors ingest 0.5 and 0.25 of their incidentally ingested sediment from their activity in the Souhegan River (RME and CTE scenarios, respectively). These values are based on best professional judgment and the direction of the uncertainty is unknown.

- **Fraction Fish Ingested** – The RME fraction ingested was assumed to be 0.5 based on results of the Ebert et al. (1993) survey indicating that 80% of anglers fish in at least two areas. However, if more than 50% of the mass of the fish an individual consumes was obtained within the Site-impacted area of the Souhegan, their overall potential for experiencing adverse health effects from the ingestion of COPCs would be underestimated. Conversely, if less than 50% of the mass of the fish an individual consumes was obtained within the Site-impacted area, the potential for adverse health effects would be overestimated.
- **Exposed Skin Surface Area; Angler/Wader** – The SA (both RME and CTE scenarios) was assumed to be 5,700 cm^2 for the adult (head, hands, forearms, and lower legs), and 2,800 cm^2 for the child (head, hands, forearms, lower legs, and feet). These values represent what should be a realistic exposure for the type of activity in which the receptor is involved. However, for times during early spring and fall, these values can overestimate exposure since individuals could be wearing protective gear against the cold water (e.g., angler wearing waders). These values are likely to have little impact on the overall risk.
- **Exposed Skin Surface Area; Swimmer/Rope Swinger** – Because the Swimmer and Rope Swinger are expected to be fully immersed, for sediment contact, the whole body is expected to be exposed (both RME and CTE scenarios). Whole body values were used because data are not available to subtract out surface area that may be covered by swimsuits or underwear/shorts. These values might overestimate risk to a small degree.
- **Soil-to-Skin Adherence Factors** – For the RME and CTE scenarios, the child values were based on the "children playing in wet soil" activity, which is the most similar exposure to wading from the available values. This is expected to have a minor impact on the exposure estimates. For adolescents and adults, "reed gatherer" and "adult residential gardener" activity values were used for the RME and CTE exposures, respectively. The RME value was based on an activity with exposure expected to be more intense than wading or angling and therefore may overestimate exposure. Differences between the CTE value and actual exposure are likely to have a minor impact on the exposure estimate.
- **Exposure Frequency; Angler/Wader** – Anglers/waders in the Souhegan River in the vicinity of the Site were assumed to be exposed for 6 months of the year (i.e., April through September). During these months, exposure was assumed to occur 2 days/week based on professional judgment. This equates to an EF of 52 days/year (assuming 4.33 weeks/month) for the RME scenario. The CTE EF was assumed to be 26 days/year (1 day/week, 4.33 weeks/month, 6 months/year). Because of the climate in the geographical area of the Site, it was assumed that these values are conservative, but whether these values would tend to under- or overestimate exposure is not known. Either way, the impact on the risk results would be expected to be minimal.
- **Exposure Frequency; Swimmer and Rope Swinger**– Individuals swimming in the Souhegan River in the vicinity of the Site and using the rope swing were assumed to be exposed during the three summer months (i.e., June through August). During these months, exposure was assumed to occur 3 days/week based on professional judgment. This equates to an EF of 39 days/year (assuming 4.33 weeks/month) for the RME scenario. The CTE EF was assumed to be 13 days/year (1 day/week, 4.33 weeks/month, 3 months/year). Because of the climate in the geographical area of the Site, it was assumed that these values are realistic, but whether these values would tend to under- or overestimate exposure is unknown.
- **Exposure Frequency; Fish Ingestion** – The ingestion rates used in this risk assessment were average daily ingestion rates (likely calculated based on a total mass consumed per year divided by 365 days per year). Using an exposure frequency of 350 days/year may slightly underestimate the overall consumption of fish; and therefore, the potential for health effects. This is expected to have a minor impact on the risks.

- **Body Weight** – A 15 kg (~33 lb) body weight was used for the child. Depending upon a child's age, this value could lead to an under- or overestimate of exposure, with an overestimate being more likely with older children. This is expected to have a minor impact on the risks.
  - A 52 kg (~114 lb) body weight was used for the adolescent based on the 50th percentile BW values for male and female children aged 10 through 18 (USEPA, 1997b). Depending upon an adolescent's age, this value could lead to an under- or overestimate of exposure, with an overestimate being more likely with older adolescents. This is expected to have a minor impact on the risks.
  - A 70 kg (~154 lb) body weight was used for the adult. This value likely underestimates exposure for receptors aged 7 through late adolescence, and underestimates exposure for many women. This is expected to have a minor impact on the risks.
- **Cooking Loss** – Note that cooking loss of COPCs was not accounted for in the fish ingestion average daily dose estimates. This leads to an overestimate of exposure.

4.6.4 Toxicity Assessment

PCBs and 2,3,7,8-TCDD TEQ from dioxin-like PCB congeners were the two main COPCs evaluated in this risk assessment. The toxicity values used in this risk assessment for these COPCs are the most current values available in USEPA databases and reports (USEPA, 2008; 1997b). The following sections provide a brief discussion of some of the principal uncertainties related to the toxicity of these contaminants.

4.6.4.1 Cancer Slope Factors (CSFs)

CSFs are plausible upper-bound estimates of carcinogenic potency used to calculate cancer risk from exposure to carcinogens by relating estimates of lifetime average contaminant intake to the incremental probability of an individual developing cancer over a lifetime. Because the CSFs developed by USEPA are plausible upper-bound estimates, USEPA is reasonably confident that the actual cancer risks are likely to be less than the risks estimated with the upper-bound slope factor. It is not possible to estimate how much less, but risks to some individuals could be zero.

PCB CSF
The PCB CSF is based on animal studies using commercial mixtures of PCBs (Aroclors). USEPA has developed both high-end and central tendency estimates of the PCB CSF. The upper-bound and central estimate slope factors for highly chlorinated PCB mixtures, such as those detected in sediment and fish sampled in the Souhegan River, differ only by a factor of two.

There are a number of uncertainties associated with the use of animal studies to predict cancer risk in humans, both qualitatively and quantitatively, through the CSF. Qualitatively, PCBs have been classified as probable human carcinogens (former USEPA category B2) based on clear evidence of carcinogenicity in animal experiments and suggestive studies in human populations. Quantitatively, major sources of uncertainty in the application of experimental information to human exposure are the extrapolation of animal studies to human populations, the extrapolation of the high experimental doses to the lower doses from environmental exposures, extrapolation to less than lifetime doses (including the impact of early life exposures), and extrapolation of results from commercial mixtures to environmental mixtures. The first three uncertainties are common to the derivation of many CSFs derived by USEPA. The extrapolation from commercial to environmental mixtures is specific to mixtures such as PCBs.

Dioxin-like PCBs
Cancer risks from dioxin-like PCBs were characterized using the TEQ methodology. Toxic equivalency factors (TEFs) developed by WHO (Van den Berg et al., 2006) were used to calculate the TEQ for these contaminants. TEFs are order of magnitude estimates that do not include expressions of uncertainty in

predicted dioxin-like toxicity. Some TEFs are based on cancer-related effects, and others are based on noncancer-related effects. The TEQ approach assumes that the effects of the individual congeners are additive and does not address possible antagonism or synergism. The result of the TEQ methodology is a concentration or dose that has a potency that is expressed in terms of its equivalency to 2,3,7,8-TCDD. Cancer risks are characterized by multiplying the TEQ, expressed as a lifetime average daily dose, with the CSF for 2,3,7,8-TCDD.

The weight of the evidence that dioxins are human carcinogens has been evaluated by several national and international organizations. USEPA has withdrawn its evaluation of TCDD carcinogenicity from IRIS, which is currently under review. The USEPA evaluation in HEAST (USEPA, 1997c), which was based on an evaluation conducted in 1985, gave a weight of evidence classification of B2, probable human carcinogen. More recently, the International Agency for Research on Cancer (IARC, 1997) evaluated the weight of evidence that 2,3,7,8-TCDD is a human carcinogen and concluded it was a Group 1 human carcinogen, indicating that there was adequate evidence based on human studies to consider it carcinogenic to humans.

USEPA reviewed available epidemiology and toxicity studies on 2,3,7,8-TCDD and other dioxin-like compounds. A preliminary draft document (USEPA, 2000a) presents USEPA's scientific reassessment of the health risks resulting from exposure to dioxin and dioxin-like compounds. This document has undergone review by the public as well as USEPA's Science Advisory Board (SAB) (SAB, 2001). Based on its review of epidemiology, animal toxicology and mechanistic studies, USEPA concluded that 2,3,7,8-TCDD met the criteria of human carcinogen, as set forth in the cancer assessment guidelines (USEPA, 1999). USEPA, along with other members of an Interagency Workgroup, asked the National Academy of Sciences (NAS) to provide an additional review to ensure that the risk estimates contained in the draft report are scientifically robust and that there is a clear delineation of all associated uncertainties (USEPA, 2003b).

One of the main uncertainties that USEPA is reassessing is the appropriate CSF for TCDD. The CSF derived by USEPA (1985) and published in HEAST (USEPA, 1997c), 1.5E+05 $(mg/kg\text{-}day)^{-1}$, was used in this assessment. The CSF was derived from liver tumor incidence data in female Sprague-Dawley rats in a 2-year feeding study and extrapolated from the experimental doses given to the animals to lower doses typical of environmental exposed using a linearized multistage model. Species extrapolation from animals to humans was calculated based on a body weight ratio to the ¾ power. In the dioxin reassessment, USEPA recommends a revised CSF of 1E+06 $(mg/kg\text{-}day)^{-1}$ to estimate upper-bound cancer risk for background intakes and incremental intakes above background, of 2,3,7,8-TCDD and other dioxin-like compounds. Use of this recommended CSF in this supplemental BHHRA would result in an approximately six-times increase in the cancer risk estimates associated with 2,3,7,8-TCDD and other dioxin-like compounds (i.e., TEQs). Thus, the current CSF for 2,3,7,8-TCDD used in this assessment may underestimate potential risks. However, as with all upper-bound slope factors used to calculate cancer risks, the true risks are likely to be less than the risks estimated with the upper-bound slope factor. It is not possible to estimate how much less, but risks to some individuals could be zero.

4.6.4.2 Chronic Reference Doses (RfDs)

Total PCBs

The RfD for PCBs used in this assessment is based on immunological effects observed in rhesus monkeys exposed to Aroclor 1254. An uncertainty factor of 300, which accounts for sensitive members of the population and for extrapolating from animal data to human data, is incorporated into the RfD. USEPA is currently reviewing new studies on noncancer effects of PCBs as part of the ongoing IRIS review process. These studies report possible associations between developmental and neurotoxic effects in children from

pre-natal or post-natal exposures to PCBs. Major sources of uncertainty associated with the PCB RfDs include:

- The selection of uncertainty factors in the derivation of the RfDs, including the length of the study, the critical effect, the quality of the dataset, and the variability of the human population, including sensitive subpopulations.
- The assumption that the critical effects in animal studies are the critical effects in humans.
- The dose metric of average daily dose is applicable to bioaccumulative compounds.
- Toxicity changes resulting from alterations in PCB mixtures ("weathering") following release to the environment.

In addition to the uncertainties with the chronic RfD, there is additional uncertainty associated with toxic effects that may result from shorter exposure durations. The critical period of exposure for developmental effects associated with *in utero* exposure may be days or weeks instead of the long-term exposure assessed in this report. The potential impact of these acute (short-term) exposures was not evaluated in this assessment, which could lead to an underestimate of the risk associated with PCBs.

Dioxin-like PCBs
Exposure to dioxin-like PCBs (dioxin-like compounds) has been shown to result in adverse effects on multiple organ systems in many animal species. The spectrum of effects observed depends upon dose, exposure duration, developmental stage of the organism, and the animal species (and strain). These studies suggest that, following oral exposure to dioxin-like compounds, the most sensitive effects (effects that occur at the lowest doses) are those to the immune, endocrine, and developmental systems (USEPA, 2000a; IARC, 1997). The science associated with noncancer effects of dioxin is under review by NAS.

An RfD for dioxin-like compounds has not been developed. Furthermore, USEPA (2000a) concluded that a reference dose for dioxin calculated in the manner typical of the way USEPA determines RfDs would result in a dose that is significantly lower than current average background doses. RfDs are used primarily to evaluate incremental exposure from specific sources when background exposures are low and insignificant, and background exposures for dioxin-like compounds are not insignificant.

Because an RfD has not been developed for 2,3,7,8-TCDD, the potential for noncancer effects from exposure to dioxin-like compounds (evaluated as TEQ) was not evaluated quantitatively in this assessment. This represents an underestimate of the risk associated with exposure to the dioxin-like compounds at the Site.

4.6.5 Risk Characterization

PCB cancer risk was quantified by multiplying total PCB doses by the PCB CSF, and TEQ cancer risk was quantified by multiplying TEQ doses from dioxin-like PCB congeners by the CSF for 2,3,7,8-TCDD. However, estimating total cancer risk from total PCBs and TEQ is not straightforward for several reasons:

1) Aroclors are complex commercial mixtures that contain many individual PCB congeners as well as a small component of chlorinated furans (Cogliano, 1998).
2) The fate and transport properties of individual congeners differ, and PCB mixtures in the environment can differ significantly from the original commercial products.
3) The cancer bioassays used to derive the PCB CSF were conducted using commercial Aroclors as test materials rather than the environmental PCB mixtures to which people are exposed.

Because of the potential differences between the commercial Aroclor mixtures that were tested and the PCB mixture in the environment, there is uncertainty associated with applying the PCB CSF to

environmental mixtures. For example, if the relative proportion of carcinogenic PCB congeners is higher in the environmental mixture than in the Aroclor used in the cancer bioassays that form the basis of the PCB CSF, use of the PCB CSF alone may underestimate cancer risk from total PCBs.

It is possible that one or more of the 12 dioxin-like PCB congeners (and the furans that compose a small fraction of the Aroclor mixture) might be present in environmental mixtures in higher proportions than in the commercial Aroclors. These PCB congeners were evaluated as TEQ using the approach developed for chlorinated dioxins and furans. Although the carcinogenic potency of these PCB congeners (and the furans that compose a small fraction of the Aroclor mixture) is already accounted for in the PCB CSF to the extent that they were present in the Aroclor mixture tested in the animal bioassay(s), assessing risks for total PCBs may not capture the full extent of risks from dioxin-like PCBs. Environmental mixtures, particularly those found in the food chain (in fish, for example), may have enhanced concentrations of these and other highly persistent congeners.

Although PCB cancer risk can be quantified as TEQ, this approach alone may not fully account for PCB carcinogenicity because PCBs have been associated with carcinogenic mechanisms other than dioxin-like effects. For example, USEPA's SAB cited the van der Plas et al. (2000) study of rats exposed to Aroclor 1260, which suggests that most of the tumor promotion potential of PCB mixtures is attributable to the nondioxin-like fraction (SAB, 2001). Because this fraction is not included in the TEQ calculation, van der Plas et al. (2000) concluded that the tumor promotion potential of PCBs might be underestimated by the TEQ approach alone.

To address the concern that dioxin-like PCBs in environmental mixtures may pose a health risk that is not predicted by the PCB CSF or as TEQ, and that summing the cancer risk from total PCBs and from TEQ potentially overestimates the total cancer risk (i.e., double-counting of the TEQ), the following approaches were used for expressing total cancer risk:

1) Sum total PCB cancer risk and TEQ cancer risk from all congeners after subtracting the amount of TEQ accounted for by the PCB CSF for commercial Aroclors. This approach has the advantage of correcting for the potential overestimate of cancer potency that is associated with "double-counting" TEQ. This option has the disadvantage that there is uncertainty associated with quantifying the amount of TEQ that should be subtracted from the estimate of TEQ from dioxin-like PCB congeners.
2) Present cancer risk from total PCBs and TEQ separately, and describe the potential underestimate of total cancer risk that results from considering them individually. This approach has the advantage of fully presenting cancer risks from two toxicological evaluations, and avoids potential "double-counting" that may result from summing the two risk values. However, either individual risk estimate alone may not fully quantify the carcinogenic risk of the PCB, dioxin, and furan mixture at the Site. Although the best approach to evaluating total cancer risk would be to appropriately account for the potential enrichment of dioxin-like congeners in the environmental mixture, the uncertainties associated with this approach decrease the usability of the information.

4.6.6 Site-Related Risks vs. Background-Related Risks

Tables F-88 through F-99 are RAGS D risk summary tables that show only COPCs that have cancer risks of 1E-06 and greater, and HIs of 1.0 and greater. For the Angler/Wader and Swimmer sediment contact scenarios (see Tables F-88 through F-91), Site cancer risks exceeded 1E-06 only for total PCBs (based on various calculations) and arsenic and only for the RME scenarios. Background risks (i.e., Area C) only exceeded 1E-06 for arsenic and were greater than those for the Site. It is likely that risks from arsenic are due solely to concentrations found either naturally in the area or from an upstream source. The Area C RME values (based on maximum detected concentrations) for the various permutations of PCB-related

COPCs were between 2 and 3 orders of magnitude lower than the Site-related EPC values. Considering this, and the fact that Site cancer risks based on sediment contact (including for the Rope Swinger) were always less than 1E-05, subtracting background from Site risks would result in a negligible change in the cancer risks.

HIs did not exceed one for any of the sediment contact scenarios; therefore, a comparison to background was not conducted.

Fish ingestion summaries are presented in Tables F-92 through F-99. RME Site-related cancer risks exceeded 1E-06 only for PCB-related COPCs. Background risks (i.e., Area C) only exceeded 1E-06 for total PCBs (Aroclors and congeners) and total PCBs minus TEQ congener concentrations. Background risks for the various permutations of PCB-related COPCs were between 1 and 2 orders of magnitude lower than the Site-related values. Considering this, and the fact that RME Site-related cancer risks for PCB-related COPCs for fish ingestion ranged from 2E-05 to 4E-04, subtracting background from Site risks would result in a negligible change in the cancer risks. Background HIs for RME fish ingestion were less than one, whereas Site HIs were 20 to 31 for the child and 10 to 15 for the adult, depending upon how total PCBs were calculated (i.e., Aroclors or congeners).

Similar patterns were observed for the CTE scenarios.

4.7 Human Health Risk Assessment Summary

The following section summarizes the results of the supplemental BHHRA.

4.7.1 Summary of Approach

The purpose of this investigation was to evaluate the contamination, principally PCBs, in the Souhegan River in the vicinity of the Fletcher's Paint Site and to estimate the potential risks (cancer and noncancer) associated with human contact for current and reasonably anticipated future uses.

The Site was divided into three exposure areas of concern:

- Area A/B;
- Area C (background); and,
- Rope Swing/Hot Spot Area.

Only exposures to surficial (i.e., 0-6 inch bgs) sediments and fish tissue were quantitatively evaluated. The exposure scenarios evaluated consisted of child, adult, and adolescent recreational users engaged in sediment contact activities that included angling/wading, swimming, rope swing use, and ingesting fish (specifically the fillet portion of redbreast sunfish) caught from the Souhegan River. Exposures to other media (i.e., subsurface sediment, bank soil, sandbar soil, and surface water) were qualitatively evaluated.

Different sampling events, each with different chemical analyses, were combined for use in this supplemental BHHRA to make the best use of a limited amount of data. The majority of sediment data were analyzed as total PCB (Aroclors), a small number of samples were analyzed as total PCB congeners, and some samples had data for both (refer to Table 3-1). Therefore, health effects from total PCBs were estimated as follows:

- Total PCB (Aroclors); and,
- Total PCB congeners (measured).

For sediment samples with congener analyses, 2,3,7,8-TCDD TEQ concentrations were estimated for dioxin-like congeners.

Lastly, to address the concern that dioxin-like PCBs in environmental mixtures may pose a health risk that is not predicted by the PCB CSF alone or as TEQ alone, and that summing the cancer risk from total PCBs and from TEQ potentially overestimates the total cancer risk (i.e., double-counting of the TEQ), the non-dioxin-like total PCB concentration was estimated by subtracting the concentration of the dioxin-like congeners from total PCB congener concentrations (for the measured samples only). Cancer risk estimates were then calculated for total PCB as the risks for non-dioxin-like PCB risks plus the risks for dioxin-like PCBs (i.e., TEQ risk).

Given the various permutations of PCB calculations and combinations, cancer risks and HIs were summed as noted below.

Cancer Risks

- PCB-related cancer risk as total PCBs
  - Non-PCB/TEQ COPCs and total PCB Aroclors
  - Non-PCB/TEQ COPCs and total PCB congeners (measured)
- PCB-related cancer risk as TEQ
  - Non-PCB/TEQ COPCs and TEQ (measured)
- PCB-related cancer risk as non-dioxin-like PCBs (as total PCB minus TEQ congeners) plus dioxin-like congeners (as TEQ congeners)
  - Non-PCB/TEQ COPCs, total PCB congeners minus TEQ Congeners, and TEQ (measured)

Hazard Indices

- Non-PCB/TEQ COPCs and total PCB Aroclors
- Non-PCB/TEQ COPCs and total PCB congeners (measured)

4.7.2 Results Summary

4.7.2.1 Quantitative Evaluation

With the exception of cancer risk from arsenic due to direct sediment contact exposures, only PCB-related (e.g., total PCB, dioxin-like PCB TEQ, and non-dioxin-like PCB plus dioxin-like PCB) exposures resulted in cancer risks greater than 1E-06 and HIs greater than one and therefore exceeded EPA's risk criteria. Given that arsenic cancer risks estimated for Area C were greater than those for Area A/B, it is likely that risks from arsenic are due to background conditions or can be attributed to an upstream source. Therefore, this section focuses on cancer risks and HIs from PCB-related COPCs only.

RME cancer risks from PCB-related COPCs in the vicinity of the site (i.e., Areas A/B and Rope Swing Area) are summarized below.

	PCB-related Cancer Risks – RME Case			
	Sediment Contact (0-6 inches bgs)			
COPC	**Angler/Wader**	**Swimmer**	**Rope Swinger**	**Fish Consumer**
Total PCBs	2E-06 to 4E-06	4E-06 to 6E-06	1E-06 to 4E-06	2E-04 to 3E-04
TEQ	1E-07	1E-07	3E-06	2E-05
Non-dioxin-like PCBs plus dioxin-like PCBs	3E-06	6E-06	7E-06	4E-04

Cancer risks for the different permutations of total PCBs were within a factor of four for all scenarios and were all within the same order of magnitude (i.e., 10^{-6} for sediments and 10^{-4} for fish).

Background (i.e., Area C) RME cancer risks (based on maximum detected concentrations) for the various permutations of PCB-related COPCs were between 2 and 3 orders of magnitude lower than the Site-related EPC values for sediment and between 1 and 2 orders of magnitude lower than the Site-related EPC values for fish. Subtracting background risks from Site risks would result in a negligible change in the cancer risks. RME HIs from total PCBs in the vicinity of the Site (i.e., Area A/B and Rope Swing Area) are summarized below.

	Total PCB Hazard Quotients/Indices – RME Case			
	Sediment Contact (0-6 inches bgs)			
Receptor	**Angler/Wader**	**Swimmer**	**Rope Swinger**	**Fish Consumer**
Child	0.3 to 0.5	0.3 to 0.5	NE	20 to 31
Adolescent	NE	NE	0.3 to 0.8	NE
Adult	0.1 to 0.2	0.2 to 0.3	NE	10 to 15

The HQs and HIs for the different permutations of total PCBs were within a factor of 2 and only fish ingestion HQs were greater than one.

HIs did not exceed one for any of the sediment contact scenarios; therefore, a comparison to background was not undertaken. Background HIs for RME fish ingestion were less than one, whereas Site HIs were 20 to 31 for the child and 10 to 15 for the adult, depending upon how total PCBs were calculated (i.e., Aroclors or congeners). Again, subtracting background risk contributions from Site risks would result in a negligible change in the risk results.

CTE results followed the same patterns as the RME, but direct sediment contact cancer risks were all below 1E-06 and total HIs for the child and adult were less than one. For fish ingestion, the CTE total cancer risks for total PCBs ranged from 4E-05 to 6E-05, for TEQ was 3E-06, and for non-dioxin-like PCBs plus dioxin-like PCB congeners the cancer risk was 7E-05. The total PCB HQs for the child and adult Fish Consumers ranged from 6.1 to 9.4 for the child and from 3.1 to 4.8 for the adult.

4.7.2.2 Qualitative Evaluations

Qualitative evaluations were performed for the following media in Area A/B:

- Bank soil
- Sandbar soil
- Surface water
- Alternative fish species/data
- Subsurface sediment

Each is summarized in the following section.

4.7.2.3 Bank Soil, Sandbar Soil, and Surface Water

Bank and sandbar soil were compared with Region 6 RSLs. The ratios of the Site-specific maxima to the residential soil RSL were less than one for bank and sandbar soil. Historical surface water PCB data indicated nondetects for all but one Aroclor in one sample. The Site concentration of Aroclor 1248 in the one detected sample was 12 times higher than the Region 6 RSL for residential water exposures. The

RSLs for soil were based on exposure associated with typical backyard residential activities and the RSLs for water were based on exposure associated with typical residential tap water uses (e.g., drinking, cooking, showering). It is expected that any exposure to bank soils, sandbar soils, and surface water would be of limited frequency and duration. Therefore, based on the available data, it is unlikely that exposures to bank or sandbar soils or surface water would lead to unacceptable adverse health effects from PCB-related COPCs.

In addition, sandbar soil concentrations were compared with EPCs developed for Area A/B to determine the potential for risks from sediment exposure when the sandbar is inundated with river water. Concentrations in sandbar soil were no more than 0.2% of the EPC. Because sediment contact cancer risks for the most conservative receptor (i.e., Swimmer) did not exceed 1E-05, cancer risks due to sandbar soil exposure are expected to be negligible. Likewise, sediment contact HQs for the Swimmer did not exceed one and decreasing the EPC would only decrease the HQs.

4.7.2.4 Alternative Fish Tissue Data

EPCs for the fish ingestion pathway were developed for redbreast sunfish because COPC concentrations in this species tended to be higher than the other sportfish species with available data (i.e., bullhead). However, some individuals fishing at the Site may target non-sunfish species or eat a combination of fish species. Bullhead PCB and TEQ maximum concentrations were equal to or lower than the redbreast sunfish EPCs (ratios of bullhead to sunfish = 0.5 to 1 for total PCB-Aroclor, total PCB-congeners, TEQ, and PCB minus congeners). Therefore, if the maximum bullhead fillet concentration was used to estimate health hazards, HQs and cancer risks would be no higher than those calculated using the redbreast sunfish EPC.

Fish tissue data were also collected in 1994 to support the BERA. Concentrations for Aroclor 1248 and 1260 were available for brown and yellow bullhead. Ratios ranged from 0.02 to 0.3, indicating that, based on the available data, PCB concentrations in fish fillets from the 2004 sampling effort are higher than those from the 1994 sampling effort. Given that the PCB concentrations in the sunfish dataset used in this BHHRA are higher than those in the 1994 bullhead samples, risks calculated in this BHHRA may be overestimated for individuals historically exposed to PCBs in fish tissue. However, these data also show no indication that levels in fish are decreasing over time, and in fact, the PCB concentrations increased between the 1994 and 2004 sampling events.

4.7.2.5 Subsurface Sediment

A qualitative analysis of the subsurface sediment (intervals 6 to 14, 12 to 27, 27 to 39, and 36 to 56 inches bgs) was performed to account for the possibility that scouring events expose the underlying sediment. Maximum detected concentrations of PCB-related COPC concentrations at depth were equal to or greater than the surficial sediment EPCs used in this BHHRA. Maximum concentrations at depth for total PCBs were up to 44 times higher than the surficial EPC. For TEQ, maximum concentrations at depth ranged from 4 to 99 times higher than the surficial EPC. For total PCBs minus congeners, the ratios of the maximum concentrations at depth to the surficial EPC ranged from 1 to 15. The table below summarizes the potential cancer risks and noncancer health hazards from the maximum concentrations at the various depth intervals.

COPC	PCB-related RME Cancer Risks for Sediment at Depth (6-56 inches bgs)	
	Total Cancer Risk	**HI (child/adult where applicable)**
Area A/B – Swimmer		
Total PCBs	1E-05 to 2E-04	19/12
TEQ	6E-07 to 1E-05	---
Non-dioxin-like PCBs plus dioxin-like PCBs	1E-05 to 2E-04	---
Rope Swing Area – Rope Swinger		
Total PCBs	5E-05	12
TEQ	3E-06	---
Non-dioxin-like PCBs plus dioxin-like PCBs	6E-05	---

The HIs are over one, with most of the estimated cancer risks falling within the 1E-07 to 1E-04 range. Cancer risks for the Swimmer are greater than 1E-04 from the maximum concentration in the 6 to 14 inch depth interval.

5.0 BASELINE ECOLOGICAL RISK ASSESSMENT

This supplemental Baseline Ecological Risk Assessment (BERA) follows the eight-step Ecological Risk Assessment Process for Superfund, as described in USEPA (1997a). The first two steps of the ERA process have been completed by the two ecological risk assessments conducted in the 1990s: the Preliminary Ecological Assessment (ADL, 1994b) and the Draft Final Fletcher's Paint Ecological Risk Assessment for the Souhegan River (ADL, 1997), the results of which are discussed in the following section. USEPA completed Steps 4 and 5 as part of the planning process which culminated in the acquisition of the 2007 sampling data. The Work Plan for this risk assessment finalized Step 3 (Baseline Risk Assessment Problem Formulation) and this document completes Steps 6 and 7, the Site Investigation and Analysis and the Risk Characterization Phases, respectively. USEPA will complete the ecological risk assessment process when the results of this analysis are considered as part of risk management decision making (Step 8).

As discussed in Section 3.2.3, for the purpose of this supplemental BHHRA, the Site has been divided into three exposure areas:

- **Area A/B -** Area A is directly across from the Elm Street Area, downstream of the footbridge at Keyes Field; Area B is located downstream of the Elm Street area to the Goldman Dam impoundment;
- **Area C** - background area, located upstream of Area A; and
- **Hot Spot Area** – An area of statistically elevated PCB concentrations in Area A across from the Elm Street area.

This supplemental BERA includes the following components:

- A refinement of preliminary contaminants of concern;
- A description of contaminant fate and transport, ecosystems potentially at risk, and complete exposure pathways;
- Selection of assessment endpoints;
- Development of a conceptual site model (CSM) and risk questions; and,
- The contribution of the supplemental BERA results to the scientific management decision points.

The primary exposure pathways that were evaluated in this supplemental BERA were exposures to contaminated surface sediment and prey tissue. However, additional exposure may also occur from contact with contaminated soil, subsurface sediment, and surface water, which may also present potential risks to ecological receptors. Potential risks from exposure to contaminants in these media are likely to be relatively minor compared to risks from exposures through sediment and prey.

Subsurface sediment, soil, and surface water data were not quantitatively evaluated; however, a qualitative evaluation for each of these media was performed. Generally, exposure of ecological receptors to sediment below the biologically active zone (BAZ) does not occur. However, during high river flow events, sediments may be reworked, potentially exposing receptors to previously buried contaminated sediments. Therefore measured PCB data (congeners and Aroclors) in subsurface sediments (6 to 56 inches) were qualitatively evaluated in the event that PCBs in these sediments become bioavailable. Similarly, high river flow events can erode contaminated bank soil, resulting in suspension and subsequent deposition of contaminated soil in the Souhegan River and resulting in exposure of

aquatic ecological receptors. These risks are also discussed qualitatively. Lastly, recent surface water data were not collected for this investigation because risks for exposure to contaminants in surface water are relatively minor in comparison to exposure to contaminants in sediment and prey. However, potential risks from contaminants in surface water based on historical surface water data are also discussed qualitatively.

5.1 Results of the Baseline Ecological Risk Assessment

Results of *The Fletcher's Paint Ecological Risk Assessment for the Souhegan River* (ADL, 1997) indicated elevated risk to the benthic and pelagic biota from exposure to PCBs and pesticides. In addition, there was an indication of risk to wildlife known to inhabit and forage along the river corridor, such as mink, belted kingfisher, and green and great blue heron. The downstream area of the river showed elevated risk from exposure to chemicals in sediment and surface water compared to the upstream area. Although adult fish would not likely suffer from any acute toxicity from the levels of total PCBs measured in tissues, the eggs and fry of Atlantic salmon and several trout species are sensitive to PCBs, and maternal transfer of these contaminants could jeopardize populations of juvenile Atlantic salmon over the long-term. The study recommended "some degree of sediment remediation" to reduce the average and maximum sediment and surface water risks to benthic biota, aquatic species that feed on them, and/or resident wildlife that forage on aquatic prey (ADL, 1997).

5.2 Screening for Contaminants of Potential Concern

For this supplemental BERA, a COPC selection process was conducted to identify the analytes detected in sediment and fish tissue at levels that could pose a potential risk to ecological receptors. As discussed in Section 1.1, although PCBs are anticipated to be the primary risk driver at the Site, the entire dataset was screened and only those contaminants that exceeded screening benchmarks were retained and evaluated. The criteria used to determine COPCs included the following:

- For non-detects, if a chemical was not detected in any sample for a given medium, it was not evaluated as a COPC for that medium;
- Chemicals considered to be common salts or nutrients (calcium, magnesium, sodium, potassium, and iron) and are not toxic at anticipated environmental concentrations were eliminated from further evaluation;
- Maximum detected chemical concentrations in sediment were compared to risk-based screening benchmarks and those exceeding the benchmarks were retained as COPCs; and,
- If no screening benchmark was available but the chemical was detected in at least one sample, it was retained as a COPC.

Ecological screening benchmarks for sediment were obtained from various literature sources and used in the following order of preference for the COPC selection:

1. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. *Arch. Environ. Contam. Toxicol.* 39: 20-31.
2. USEPA. 1996b. ECO Update: Ecotox Thresholds. EPA 540/F-95/038. January, 1996.
3. Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects with ranges of chemical concentrations in marine and estuarine sediments. *Environ. Manag.* 19:81-97.
4. Persuad, D. R. Jaagumagi, and A. Hayton. 1993. Guidelines for the protection and management of aquatic sediment quality in Ontario. Ontario Ministry of Environment and Energy.

5. Jones, D.S., G.W. Suter, and R.N. Hull. 1997. Toxicological benchmarks for screening contaminants of potential concern for effects on sediment-associated biota: 1997 revision. Oak Ridge National Laboratory. ES/ER/TM-95/R4.

The summarized sediment data were compared to the benchmarks, and all detected contaminants whose maximum concentrations exceeded their selected screening benchmarks were retained for further analysis in the BERA (Table C-6). Contaminants below invertebrate benchmarks that are considered bioaccumulative (USEPA, 2000b) were also carried forward to assess risk to upper-trophic level wildlife receptors that could experience greater exposure because of bioaccumulation.

For fish tissue, all detected chemicals that are not considered essential nutrients were included for further evaluation (Table C-7).

5.3 Problem Formulation

The problem formulation establishes the goals, breadth, and focus of the BERA. It establishes the CSM, potential receptors, and primary pathways of concern. The problem formulation phase also establishes the assessment and measurement endpoints, which are the specific ecological values to be protected and the specific information that will be used to evaluate them, respectively.

5.3.1 Conceptual Site Model

The contaminant sources and release and transport mechanisms at the Site were described in the CSM for human health in Section 4.0. Although the receptors are obviously different, the CSM for the ecological risk assessment is similar to that identified for human health. The ecological CSM is provided in Figure 8.

5.3.2 Exposure Media and Routes of Exposure

The potentially contaminated media at the Site include soil, sediment, surface water, and fish tissue. Exposure media are summarized below:

- **Soil –** contact with riverbank soil is qualitatively evaluated in the supplemental BERA based on the limited data available (Table A-13).
- **Sediment –** COPCs in Souhegan River sediment may be ingested by aquatic invertebrates who reside directly within or on top of the sediment. In addition, fish and wildlife regularly contact and ingest sediment from the river. Surface sediment from the top 6 inches is quantitatively evaluated in the supplemental BERA; subsurface sediment is qualitatively evaluated (Tables A-10 through A-12).
- **Surface Water –** contact with surface water is qualitatively evaluated based on the lack of recent data, the low likelihood of COPCs present in the water column (as opposed to being bound to sediment or organic matter), and the relatively minor risk from this pathway (as compared to sediment and prey ingestion).
- **Fish Tissue –** contaminants may have bioaccumulated into fish which are available to upper-trophic level receptors that may feed on them. White sucker tissue and redbreast sunfish data are quantitatively evaluated in the supplemental BERA (Tables A-5 through A-9). Although redbreast sunfish data were collected for muscle tissue only (fillet data) and are more appropriate for assessing human exposure risk, these data were included in the ecological risk assessment for the following reasons:
    - Redbreast sunfish are representative of pelagic fish that do not have direct contact with contaminated sediment, unlike white sucker which are more closely associated with the benthos.

- Redbreast sunfish have a smaller home range than the breeding range of the white sucker, which was collected during its breeding period, and are more suitable for making comparisons between different areas of the river that are not separated by any physical barriers.

5.3.3 Ecological Receptors of Concern and Exposure Pathways

Benthic aquatic invertebrates observed in the Souhegan River include insects (mainly larval and nymphal life stages), mollusks, and crayfish. These organisms are an important link in the aquatic food-chain transport of sediment contaminants to upper-trophic level wildlife.

Resident fish species in the Souhegan River include bluegill, pumpkinseed, redbreast sunfish, brown and yellow bullhead, yellow perch, largemouth bass, and white suckers. Early life stages of the Atlantic salmon, an anadromous fish, utilize the river and the smolt may be exposed in the reach of the Souhegan adjacent to the Elm Street site before migrating downriver. All fish are potentially exposed to contaminants from direct contact with contaminated sediments and from ingestion of contaminated sediment and prey.

A variety of mammal and bird species were identified in the preliminary ecological risk assessment (ADL, 1997). Examples of wildlife that could utilize the river for foraging habitat include the belted kingfisher, green heron, great blue heron, mink, and raccoon. In the 1993 Biota and Ecological Survey Wildlife Analysis conducted by Baystate Environmental Consultants (BEC; 1993) both the green heron and belted kingfisher were observed foraging and breeding along the Souhegan River corridor, which was determined to provide adequate habitat cover for both species. While the riparian habitat near Area A and just downgradient of the area is not ideal mink habitat, it contains the basic habitat characteristics that are required by the species (BEC, 1993). In addition, mink are known to be sensitive to PCBs, allowing for conservative estimates of risk. Upper trophic level wildlife may be exposed to contaminants that have bioaccumulated in the local aquatic food web. In addition, wildlife may also ingest contaminated sediment incidentally while foraging or preening. Although dermal contact with contaminated sediments is a potential exposure route, such exposures are considered minimal because animal fur and feathers will limit sediment contact with the skin and wildlife dermal absorption factors are generally not available to quantitatively assess this exposure pathway.

Based on the potential ecological receptors in the area and the CSM, the exposure pathways that were quantitatively evaluated in this report include direct contact with and incidental ingestion of sediment and ingestion of contaminated prey. Additional exposure pathways, such as direct contact with and ingestion of surface water, floodplain soil, and deeper sediments are qualitatively evaluated. A quantitative evaluation of risk was performed on the benthic invertebrate community, resident fish (represented by the white sucker), anadromous fish (represented by early life stages of Atlantic salmon), piscivorous mammals (represented by mink), and piscivorous birds (represented by the belted kingfisher and green heron) White sucker were selected for evaluation of ecological risks because the white sucker data are available in whole body form and are more closely associated with the benthos than redbreast sunfish, for which only fillet data are available. In addition, there are more recent analytical data available for white sucker compared to either yellow or brown bullhead, and white sucker are frequently used as a monitoring species (Doherty et al., 2004). A summary of the receptors and their exposure pathways is presented in Table 5-1.

5.3.4 Assessment Endpoints and Measures of Effect

Assessment endpoints are explicit expressions of the actual environmental values (i.e., ecological resources) that are to be protected at the Site (USEPA, 1997a; Suter, 1993). Valuable ecological resources are those resources that if adversely affected could impair overall ecosystem function from

either a biological or social perspective. Appropriate selection and definition of assessment endpoints is critical to the utility of a risk assessment because they focus the risk assessment design and analysis. Four principal criteria are used to select ecological values that may be appropriate for assessment endpoints: 1) ecological relevance, 2) susceptibility to known or potential stressors, 3) commercial or social value, and 4) relevance to management goals (USEPA, 1998).

Adverse risks to assessment endpoints drive any potentially necessary risk management decisions; however, because it is not practical, or possible, to directly evaluate potential risks to all of the individual components of the ecosystem at the Site, assessment endpoints are used to focus the risk assessment to particular components of the ecosystem that could be adversely affected by the contaminants release to the Site. Assessment endpoints are generally populations, communities, or trophic guilds (e.g., insectivorous birds). Populations or trophic guilds may be deemed at risk if reproduction or survival of individuals is determined to be significantly impacted. The general types of effects of concern include:

- Mortality, growth, or reproductive effects resulting from direct exposure to contaminants that adversely affect a receptor population;
- Mortality, growth, or reproductive effects resulting from exposure to contaminants that have bioaccumulated in the ecological food chain that affect a significant proportion of a (higher trophic level) receptor population; and,
- Indirect effects associated with a substantial reduction in abundance of prey populations.

The assessment endpoints selected for the supplemental BERA consist of the following:

1. Protection and maintenance (i.e., survival, growth, reproduction) of benthic invertebrate communities which represent a forage base for fish and wildlife;
2. Protection and maintenance of local, residential fish populations as a forage base or sport fishery;
3. Protection and maintenance of migratory fish populations with sensitive early life stages;
4. Protection and maintenance of piscivorous bird populations; and,
5. Protection and maintenance of piscivorous mammal populations.

Measures of effect are quantifiable ecological characteristics, through laboratory or field experimentation, that are related to the valued characteristic chosen as the assessment endpoint (USEPA, 1992; 1998). The measures of effect are sensitive and represent the same exposure pathway and mechanisms of toxicity as the assessment endpoint that it represents. Measures of effect used in the risk assessment process generally fall into three categories: 1) comparison of estimated or measured exposure levels of COPCs to levels known to cause adverse effects, 2) bioassay testing of site media, and 3) comparison of observed population- and community-level effects in areas downstream of the source area with those observed at background or reference areas. The selected assessment endpoints (AE) and corresponding measures of effect (ME) for the supplemental BERA are listed below:

AE (1): Protection of aquatic benthic invertebrate communities that serve as a forage base for fish and wildlife.
ME (1): Comparison of sediment COPC concentrations to literature-based benchmarks.

AE (2): Protection of local, resident fish populations that serve as a forage base for sportfish and wildlife (as represented by the white sucker).
ME (2): Comparison of COPC concentrations in fish tissue to toxicity-based critical body residue (CBR) values from the literature.

AE (3): Protection and maintenance of migratory fish populations with sensitive early life stages (e.g., Atlantic salmon fry).
ME (3): Comparison of COPC estimated concentrations in salmon fry fish tissue to toxicity-based CBR values from the literature.

AE (4): Protection and maintenance of piscivorous wildlife populations.
ME (4): Comparison of estimated daily dietary ingestion dose of COPCs for piscivorous wildlife (mink, belted kingfisher, and green heron) with literature-based toxicity reference values (TRVs).

5.4 Ecological Exposure Assessment

The ecological exposure assessment is one component of the analysis phase of the ecological risk assessment process. Here, analytical results are presented and the potential ecological exposures are characterized.

5.4.1 Calculation of Exposure Point Concentrations

Calculation of EPCs for the ecological risk assessment followed guidance provided by USEPA (2002c), specifically, the ProUCL software package (Version 4.0) developed by USEPA (2007b) was used. Goodness-of-Fit tests for normal, lognormal, and gamma distribution were performed to determine the underlying data distribution of each COPC. If possible, non-detect data were estimated using ROS methods. ProUCL does not recommend using one-half the MDL as a substitution for non-detect data because this method is more likely to over- or underestimate exposure concentrations that fall below MDLs. Following ROS, the 95% UCLs were calculated using the measured and estimated data, and the most applicable EPC for a given contaminant based on the characteristics of the data was determined. All ProUCL output files are provided in Appendix D; input files are provided on CD-ROM.

For the sediment COPCs, full datasets without non-detects were identified for aluminum, barium, cobalt, copper, chromium, manganese, nickel, and zinc. For redbreast sunfish tissue data, full datasets were identified for manganese, mercury, zinc, and Total PCBs. For white sucker tissue data, full datasets were identified for barium, copper, mercury, manganese, and zinc. These datasets did not require ROS to fill data gaps because there were no non-detect data (Appendix A).

The remaining COPCs in the sediment and white sucker tissue datasets all contained censored data (i.e., non-detects). For the datasets that contained at least ten detected values, non-detect values were estimated using ROS methods (e.g., normal ROS, gamma ROS, and lognormal ROS [robust ROS]). For datasets with less than ten detect values, a value of one-half the detection limit was substituted for the non-detects. Based on performance of the various calculations, EPCs were recommended by ProUCL for sediment and fish data in Area A/B.

Background Area C had limited sediment and fish tissue data (five sediment sampling locations) and low detection frequencies for most COPCs. For example, only one sediment sampling location (T-20-7-A) had PCB congener data and only one of 12 congeners (PCB 118) was actually detected in the sample. In white sucker tissue data, only one of the six collected samples had all 12 congeners detected. The other samples ranged from detections of two to eight congeners. Therefore, the UCLs could not be calculated for either sediment or fish tissue in background Area C and mean values were used as the EPCs instead.

Exposure point concentrations were also calculated for the Hot Spot Area for PCBs only. Most of these samples were statistically different from neighboring samples at the 0.05 level of significance. The Hot Spot Area includes a total of 26 sediment samples and is identified in Figure 6; the sample locations are identified in Table 3-2. All EPCs are presented by medium and exposure area in Table 5-2.

5.4.2 Calculation of BSAFs

A biota-sediment accumulation factor (BSAFs) is the ratio of a contaminant concentration in tissue to the contaminant concentration in sediment. Because of their hydrophobic characteristics, nonpolar organic compounds, such as PCBs, tend to accumulate in lipid-rich fish tissues and generally associate more strongly with the organic fraction of the sediment than with the inorganic fraction. The fraction of a contaminant that is associated with the organic fraction of the sediment is thought to be less biologically available than the fraction that is associated with inorganic material, as contaminants become bound by organic material. Consequently, when calculating the BSAF, contaminant concentrations in tissue and sediment are normalized to the lipid and TOC content of tissue and sediment, respectively (USEPA, 1995 and Burkhard et al., 2003). This normalization is done to eliminate the influence of lipid- or TOC-covariation among samples (Hebert and Keenleyside, 1995).

BSAFs were calculated to determine the uptake of PCBs from Souhegan River sediment into fish tissue along the Site. BSAFs were derived for the entire exposure Area A/B for measured total PCB Aroclors and total PCB congeners. Average data for sediment concentrations, white sucker or redbreast sunfish tissue concentrations, TOC, and percent lipids were used in the following equation:

$$BSAF = \frac{C_{fish} \times \%TOC}{C_{sed} \times \%Lipid} \qquad \text{(Equation 5-1)}$$

The BSAFs for total PCB congeners for white sucker and redbreast sunfish in Area A/B are 0.86 and 0.29, respectively; for total PCB Aroclors, the BSAFs for white sucker and redbreast sunfish are 0.79 and 0.72, respectively (Table 5-3). To determine if the BSAFs are reasonable, comparisons were made with the BSAF dataset available on USEPA's website (http://www.epa.gov/med/Prods_Pubs/bsaf.htm). A total of 19 BSAF values for Total PCBs using whole body white sucker data, 3 BSAF values for redbreast sunfish, and 29 values for all sunfish species were available. An additional 4 BSAF values for Total PCBs using white perch fillet data were also available, and may be more comparable with the BSAF values calculated using redbreast sunfish fillet data for this study. Overall, the BSAFs derived for Area A/B based on total PCB congeners are lower than those derived for total PCBs at the other Superfund sites (Table 5-4), indicating a lower potential for PCBs to bioaccumulate in fish at the Fletcher's Paint Site relative to other Superfund sites.

BSAFs could not be calculated in background Area C because, for the Aroclor data, four of the seven Aroclors measured were not detected in any samples, and one of the five samples did not have any Aroclor detections. Substituting ½ DL values for the non-detects would likely result in an overestimate of sediment Aroclor concentrations. Also, 20% of the samples had non-detect values and BSAFs should only be calculated if the means have less than 20% non-detects (Berthouex and Brown, 1994). For the congeners, only one PCB congener was detected in background Area C; therefore, BSAFs could not be calculated for congeners.

Using the BSAF for total PCB congeners in white sucker, concentrations of PCBs in salmon fry in Area A/B were estimated using a percent lipid of 3.65, based on an average early-life stage lipid content of Chinook salmon (Milston et al., 2003). The BSAF equation (Equation 5-1) was rearranged as follows:

$$C_{fish} = \frac{BSAF \times C_{sed} \times \%Lipid}{\%TOC} \qquad \text{(Equation 5-2)}$$

The resulting fish tissue concentration for salmon fry is 6,862 µg/kg. This estimate was then compared to literature-based CBRs to determine the potential for adverse effects on salmon fry in Area A/B of the Souhegan River from the uptake of PCBs (Section 5.5.2.2).

5.4.3 Wildlife Dose Model

The fish tissue and sediment EPCs were used in a dose model (Equation 5-3) to estimate the daily intake of COPCs by upper-trophic level receptors (i.e., belted kingfisher, mink, and green heron). Risk estimates were evaluated for exposure Area A/B and background Area C. Specific exposure parameters for each receptor are provided in Tables 5-5 through 5-7.

$$Dose = \frac{\left[(C_{sed} \times DI_{sed}) + (C_{invert} \times DI_{invert}) + (C_{fish} \times DI_{fish})\right] \times SUF}{BW} \qquad \text{(Equation 5-3)}$$

where:

Dose	=	average daily dose of COPC (mg/kg-d)
C_{sed}	=	concentration of a COPC in the sediment (mg/kg)
DI_{sed}	=	daily incidental ingestion rate of sediment (kg/d)
C_{invert}	=	concentration of a COPC in invertebrate tissue (mg/kg)
DI_{invert}	=	daily ingestion of invertebrate tissue (kg/d)
C_{fish}	=	concentration of a COPC in fish tissue (mg/kg)
DI_{fish}	=	daily ingestion of fish (kg/d)
SUF	=	site use factor (unitless)
BW	=	body weight (kg)

The site use factor (SUF) is term that is used to represent the portion of a wildlife receptor's foraging range that is encompassed by the Site; daily exposures are reduced by the extent that an organism consumes prey that have not been exposed to Site media. This factor can range from 0 to 1. A value of 1 implies that the receptor spends 100% of its time in the exposure area and is generally used in screening-level ecological risk assessments (SLERA), but more realistic SUFs are applied in the BERA. SUFs are calculated as the area of the Site divided by the receptor's home range.

5.5 Ecological Effects Assessment

The ecological effects assessment is the the phase of the ecological risk assessment that describes the potential for adverse effects in ecological receptor populations from exposure to the identfied COPCs. Measures of effects are estimated for each of the assessment endpoints selected. These measures of effects are based on comparisons of estimated exposures with ecological benchmarks, CBRs, and TRVs.

5.5.1 Ecological Benchmarks

As discussed in Section 5.2, ecological screening benchmarks were derived from five primary literature sources. These benchmarks were compared to the average and maximum concentrations of chemicals in sediment to determine potential risk to benthic invertebrates, as represented by a HQ. Average and mean sediment concentrations that exceed screening benchmarks (i.e., HQ >1) are considered to have the potential for adverse effects on ecological receptor populations. Results are characterized and discussed in Section 5.6.1.

5.5.2 Critical Body Residues

A chemical residue based approach, variously termed a critical body residue (CBR) or lethal body burden (LBB), was used to evaluate potential hazards posed by COPCs to fish. A CBR is a contaminant- and taxon-specific threshold concentration measured in biological tissue above which adverse effects of ecological relevance would be anticipated to occur. CBRs were developed for fish tissue, for comparison with white sucker and redbreast sunfish body burdens, and salmon fry to assess whether measured and estimated PCB residues in fish tissue at the Site would result in adverse effects.

5.5.2.1 Fish Tissue

The majority of the toxicological data used to develop CBRs for the white sucker and redbreast sunfish was obtained from downloads from the Army Corps of Engineers' Environmental Residue-Effects Database (ERED, available at http://el.erdc.usace.army.mil/ered; queried on 10 January 2008). This information was supplemented with data obtained from other compilations of residue effects data (e.g., Jarvinen and Ankley, 1999) as well as journal articles and the USEPA PCB residue database, available at http://www.epa.gov/med/Prods_Pubs/pcbres.htm. The availability of relevant toxicological data appropriate for developing CBRs varies among the COPCs. In general the datasets are considered adequate; however only limited data are available for barium, manganese, and nickel. No relevant data were obtained for cobalt. It was also noted that the majority of tissue effects data for freshwater fish are based on salmonid tissue and information for other typical freshwater species is limited. In fact, no study results for white sucker or redbreast sunfish were located.

To develop CBRs for this analysis, database output files for similar chemical parameters were combined as follows:

1. Chromium – records for both "chromium" and "hexavalent chromium";
2. Mercury – records for "mercury", "methylmercury (MeHg)", and "mercuric chloride" although no records for mercuric chloride were available following filtering operations as described next;
3. DDE – only records for the para-substituted isomer (4,4'-DDE);
4. PCBs – records for "PCBs" and Aroclor-1254 and Aroclor-1260 although no records for Aroclor 1260 were available following filtering operations.
5. TCDD – records for 2,3,7,8-TCDD.

The combined datasets for each COPC were then filtered for certain parameters in order to select appropriate study results:

1. Species – only freshwater fish or those whose life histories include a freshwater phase (i.e., salmonids, eels) were selected;
2. Effect – only growth, mortality/survival and reproduction effects were selected; and,
3. Body Part – primarily whole body tissue only; however, available muscle tissue were also included in the cases of nickel and lindane because there was little (lindane) or no (nickel) whole body data available.

The final step was to identify a tissue effects threshold for each COPC. Where available, the threshold was established as the lowest bounded (i.e., including both a "no observed adverse effect" and "lowest observed adverse effect" levels or NOAELs and LOAELs, respectively) study results. Bounded study results were available only for zinc and 2,3,7,8-TCDD (Table 5-8). In the case of the remaining COPCs, the lowest tissue concentration associated with an adverse effect (growth, survival or reproduction) was selected and a 10-fold extrapolation factor used to estimate a no effect concentration. For lindane, a 10-fold extrapolation factor was applied to a No Observed Effect Dose (NOED) to estimate a LOED value.

A total of 396 records were selected including the derived values based on application of the extrapolation factors.

Table 5-8 presents a summary of the CBRs and the entire dataset based on the filtering process described above is provided in Table G-1 in Appendix G. Based on this analysis, freshwater fish species are expected to be relatively sensitive to the following subset of COPCs: barium, mercury, DDx, PCBs, and TCDD.

5.5.2.2 Salmon Fry

The PCB Residue Effects Database, available on USEPA's website http://www.epa.gov/med/Prods_Pubs/pcbres.htm was also queried for the literature-based CBRs for salmon fry. The fry stage is one of the more sensitive life history stages, but is of short duration, only lasting approximately until the end of June of the year stocked. Parr is the life history stage immediately following the fry stage until the beginning of migration to the sea as smolts, and parr will remain in the river for two to six years depending on water temperature and food availability. No parr were collected from the Souhegan during the 2006 sampling effort.

Only two studies had available data for mixtures of PCBs in juvenile (parr to 1 year old) Coho salmon (Gruger et al., 1975; 1976); only one of these studies (Gruger et al., 1976) reported a bounded NOAEL and LOAEL value effects measurement, based on adverse effects to growth (relative growth rate). A NOAEL effect level for mortality was also reported.

Another study (Fisher et al., 1994) had available paired NOAEL/LOAEL data for mixtures of PCBs in Atlantic salmon embryos based on adverse effects to behavior (predator vulnerability). None of the Atlantic salmon studies, however, showed bounded effects to endpoints of mortality, growth, or reproduction, which are most relevant for estimating the potential for adverse population-level effects. Rather, the available bounded studies all involved a demonstration of sublethal effects (growth, predator vulnerability) in this species. A summary of the available tissue threshold values for PCB effects on Coho and Atlantic salmon is presented in Appendix G, Table G-2.

5.5.3 Toxicity Reference Values

In general, a TRV is defined as a dose level (based on laboratory toxicological investigations) above which a particular ecologically relevant effect may be expected to occur in an organism following chronic dietary exposure, and below which it is reasonably expected that such effects will not occur (USEPA, 2005b). Rather than deriving a single point-estimate associated with specific adverse biological effects, both high and low TRVs are derived for each wildlife receptor and each COPC to better characterize the effect threshold level range. The low TRV is a conservative value consistent with a chronic NOAEL. It represents a no-effects level at which adverse effects are unlikely to occur, and is used to identify chemical concentrations posing little or no risk. Conversely, the high TRV is a less conservative estimator of potential adverse effects, representing lowest level at which adverse effects have been observed and are more likely to occur, and is consistent with a chronic LOAEL.

In USEPA's Eco-SSL documents, TRVs have been developed for 17 metals and four organic compounds. The TRV is equal to the geometric mean of the NOAEL values for growth and reproductive effects. In cases where the geometric mean NOAEL is higher than the lowest bounded (paired) LOAEL for growth, reproduction, or mortality, the TRV is equal to the highest bounded NOAEL below the lowest bounded LOAEL (USEPA, 2005b). This value represents the highest dose that did not cause any adverse effects in any test species. Because this value is consistent with a NOAEL, for the purposes of this assessment, LOAELs were selected from the same study from which the NOAEL was selected. TRVs for barium, chromium, cobalt, copper, manganese, nickel, zinc, and DDx were obtained from USEPA Eco-SSL

documents. No TRV was available for aluminum because USEPA guidance suggests that aluminum is not likely bioavailable to ecological receptors (i.e., mammals and birds) at sites where the soil or sediment pH is greater than 5.5 (USEPA, 1993a). According to information presented in the BERA (ADL, 1997), the pH of Site sediments ranges from 5.5 to 6.6. Therefore, it was concluded that aluminum is not a contaminant of concern for birds and mammals at the Site.

Additional TRVs were obtained from various literature sources. TRVs for birds and mammals are provided in Tables 5-9 and 5-10, respectively.

5.6 Ecological Risk Characterization

The final step in the ecological risk assessment process is to characterize the risk. This step uses the various measurement endpoints to make conclusions about the likelihood of risk to the selected receptors. Risks generally are characterized by the magnitude that they exceed an HQ of 1such that,

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average and maximum concentrations are 2.0 and 10, respectively. Contribution of each of the major groups of chemicals is summarized in Figure 10.

To further characterize risk to benthic invertebrates at the Site, EPCs for PCBs from the Hot Spot Area were also compared to ecological screening benchmarks. 95% UCLs could not be developed for the measured PCB congeners because there were too few samples in the Hot Spot Area and the mean concentration was used instead. 95% UCLs were, however, developed for the Aroclor data. Results for Total PCB congeners and Total Aroclors in the Hot Spot Area are 3560 µg/kg and 3820 µg/kg, respectively (Table 5-2). When compared to the sediment benchmark of 59.8 µg/kg, HQs were 59.5 and 82.2. Results indicate a moderate level of risk to benthic invertebrates in the Hot Spot Area. Because of the high spatial variability in sediment concentrations of PCBs, risk to benthic invertebrates from exposure to sediment PCBs in the Hot Spot Area alone are not elevated as compared with Area A/B in its entirety. Some sample locations that fall within the Hot Spot Area do not have statistically significantly elevated concentrations of PCBs and lower exposure concentrations. Also, sediment concentrations of PCBs at several locations outside of the Hot Spot Area are not much lower than concentrations within the Hot Spot Area, although the differences are statistically significant.

In background Area C, most of the detected COPCs were below the available screening benchmarks. The only COPCs that had HQs exceeding 1 were the total LMW and HMW PAHs; HQs ranged from 1.1 to 3.3 (Table H-2). Overall, results indicate there is low risk to benthic invertebrates in background Area C.

5.6.2 Fish Risk Estimates

5.6.2.1 Risks to White Sucker

Potential risks to benthic fish, represented by the white sucker, were determined by comparing white sucker tissue residue data for Area A/B, the Hot Spot Area, and background Area C to CBRs from various databases and literature sources. Results are presented below and in Tables H-3 through H-5.

In Area A/B, results indicate a potential for adverse effects to benthic fish populations from all metals except for nickel (Table H-3). Although there are no CBRs available for cobalt, it was only detected in one of the 12 samples analyzed and, therefore, is unlikely to be present at concentrations that would cause adverse effects. Of the metals, manganese and barium have the highest HQs with NOAEL-based HQs (HQ_{NOAEL}) of 130 and 110, respectively and LOAEL-based HQs (HQ_{LOAEL}) of 13 and 11, respectively. PCB exposure poses elevated risk based on this analysis, with a HQ_{NOAEL} of 1,600 and a HQ_{LOAEL} of 160 (congeners) and a HQ_{NOAEL} of 1,800 and a HQ_{LOAEL} of 180 (Aroclors). Exposure to dioxin-like congeners does not pose a risk. Pesticides were not detected in white sucker tissue are concentrations that pose risk to these organisms. Overall hazards are shown in Figure 11.

Risks to benthic fish were also evaluated for the Hot Spot Area using fish collected from Area A only (Table A-9). Because there were only six white sucker samples collected from Area A, 95% UCLs could not be developed for this area. Rather, the CBRs were compared to the mean concentrations of contaminants in white sucker tissue for each of the COPCs identified in the tissue screen (Table H-4). Results indicate that risk from body burdens of metals, PCBs, and pesticides related to the Hot Spot Area is similar to or slightly lower than that in Area A/B (Figure11).

To provide a comparison to background conditions, average concentrations of contaminants in white sucker from background Area C were also compared to literature-based CBRs (Table H-5; Figure 11). Results indicate the same COPCs had HQs above 1 as those in the Hot Spot Area and in Area A/B. The potential for risk, however, is lower than in either of the other areas. For instance, the greatest risk is from manganese, which has a HQ_{NOAEL} of 110 and a HQ_{LOAEL} of 11. This is followed by barium,

aluminum, mercury, and zinc. The HQs for PCB congeners are elevated (HQ_{NOAEL} of 79 and a HQ_{LOAEL} of 7.9) but are much lower than the values for Areas A/B and the Hot Spot Area. Exposure to dioxin-like congeners does not pose a risk.

5.6.2.2 Risks to Redbreast Sunfish

Risks to pelagic fish, represented by the redbreast sunfish, were determined by comparing redbreast sunfish muscle tissue residue data for Area A/B, the Hot Spot Area, and background Area C to CBRs from various databases and literature sources. Results are presented below and in Tables H-6 through H-8.

In Area A/B, results indicate a potential for adverse effects to benthic fish populations from all detected metals (Table H-6). Of the metals, mercury has the highest HQs with a HQ_{NOAEL} of 23 and a HQ_{LOAEL} of 2.3. Zinc was the only other metal detected in sunfish tissue in which the average concentration exceeds both NOAEL- and LOAEL-based CBR values. PCB exposures pose an elevated risk in this analysis, with a HQ_{NOAEL} of 230 and a HQ_{LOAEL} of 23 (congeners) and a HQ_{NOAEL} of 150 and a HQ_{LOAEL} of 15 (Aroclors). Exposure to dioxin-like congeners in redbreast sunfish tissue does not pose a risk. As with the white sucker evaluation for Area A/B, pesticides were not detected in sunfish tissue at concentrations that pose risk to these organisms. Overall hazards are shown in Figure 11.

Risks to benthic fish were also evaluated for the Hot Spot Area using fish collected from Area A only (Table A-9). The CBRs were compared to the average concentrations of contaminants in red breast sunfish tissue for each of the COPCs identified in the tissue screen (Table H-7). Results indicate that risk from body burdens of metals, PCBs, and pesticides related to the Hot Spot Area is similar to or slightly lower than that in Area A/B (Figure 11).

Average concentrations of contaminants in red breast sunfish tissue from background Area C were also compared to literature-based CBRs (Table H-8; Figure 11). In general, the same COPCs had HQs above 1 as those in the Hot Spot Area and in Area A/B although several metals (e.g., barium, chromium, and nickel) were only detected in Area C fish. The potential for risk associated with metal exposure is comparable to those for Area A/B, with the greatest risk from mercury, which has a HQ_{NOAEL} of 25 and a HQ_{LOAEL} of 2.5. This is followed by manganese, barium, aluminum, chromium, copper, and zinc. HQs for PCB congeners, PCB TEQ_{fish} and pesticides are all less than 1, although the HQ_{NOAEL} for PCBs (Aroclors) slightly exceeds one (Table H-8).

5.6.2.3 Predicted Risks to Salmon Fry

Risks to salmon fry from PCBs were determined by comparing an estimated PCB tissue concentration in salmon fry to CBRs from tissue effect data specific to salmon species. This comparison is only discussed qualitatively because there is a high level of uncertainty since fish body burdens have not been measured or directly related to sediment concentrations, therefore uptake at the site could not be estimated and could only be predicted based on literature values. Therefore, HQs were not calculated. The estimated PCB concentration of 6,862 µg/kg in salmon fry (Section 5.4.2) at the Site indicates a potential for adverse effects (reduced growth) to this receptor. A value of 3,990 µg/kg PCBs caused adverse growth effects on Coho salmon (Gruger et al., 1976) and the estimated PCB concentration in Site salmon fry is one and one-half times that value. Furthermore, Fisher et. al (1994) showed adverse behavioral effects (predator vulnerability) on Atlantic salmon at even lower tissue concentrations (3,000 µg/kg). The NOAELs for these studies were 977 µg/kg and 1,000 µg/kg, respectively (Table G-2).

5.6.3 Wildlife Risk Estimates

Risks to piscivorous wildlife (i.e., belted kingfisher, mink, and green heron) were determined by comparing the calculated daily dose of a COPC to the receptor-specific TRV established for that COPC. Daily doses were calculated for each receptor from ingestion of both white sucker and redbreast sunfish. The ingestion of white sucker provided a more realistic dose estimate than redbreast sunfish because white sucker chemistry data were for whole body fish tissue residues and redbreast sunfish tissue residues were for muscle tissue (fillets) only. Daily dose estimates from consumption of white sucker are also likely to be more conservative than those for redbreast sunfish because benthic feeding and dwelling habits of white sucker and higher fat content (5.6% as compared with 0.9% for redbreast sunfish) are likely to result in higher body burdens of sediment-related contaminants. However, fish were collected during a period of time when white sucker are more active because of their breeding activity, and dose estimates from ingestion of redbreast sunfish are more likely to show higher site fidelity and, consequently, differences between Site-related and upstream background exposures. Risks from exposure to redbreast sunfish were used solely for the purpose of more effectively comparing wildlife risks estimated for site exposures with wildlife risks at an upstream reference areal. Risk from exposure to each of the fish species is not comparable because body burdens for white sucker are based on whole body data and body burdens for redbreast sunfish are based on fillet data. Risks were evaluated for the entire exposure Area A/B and for background Area C for comparison. In background Area C, limited measured congener and Aroclor data were available and used in the assessment. The risks for each receptor, expressed as a HQ, are characterized below, calculated in Appendix I, and displayed graphically in Figures 12 through 14. Hazard quotients are also summarized in Table 5-11.

5.6.3.1 Risks to the Belted Kingfisher

Risks to the belted kingfisher are based solely on the fish ingestion pathway, as it was assumed that the foraging technique for kingfishers (feeding on fish that swim near the surface and only catching fish in the upper 12 to 15 centimeters of the water column [USEPA, 1993b]) typically results in no incidental ingestion of sediment. Analytical data for PCB Aroclors, PCB congeners, and TEQs were included (along with the other COPCs) to see the relative contribution of each toward the overall risk. Results are presented in Appendix I and Figure 12, and HQs are summarized in Table 5-11.

There is risk to this receptor from exposure to PCBs in which sucker. There is low risk from exposure to Total PCBs, with HQs ranging from 7.0 to 10, and low to moderate risk from the dioxin-like congeners (bird TEQ HQs = 66 and 6.6 for the HQ_{NOAEL} and HQ_{LOAEL}, respectively). There may only be low risk from exposure to Total PCBs in redbreast sunfish, with HQs ranging from 0.66 (no unacceptable risk) to 1.3. There is low to moderate risk from exposure to the dioxin-like congeners in redbreast sunfish tissue, and bird TEQs range from 1.5 to 15.

To provide a comparison to background conditions, risk estimates were also calculated for the kingfisher in background Area C (Figure 12). The HQs from exposure to COPCs in white sucker were below 1.0 for all COPCs except the PCB TEQ, which was marginally greater than 1.0 (HQ_{NOAEL} = 4.2). There was no unacceptable risk from exposure to COPCs in redbreast sunfish. The PCB risk estimates for background Area C are lower than those estimated for Area A/B by one or two orders of magnitude for exposures to COPCs in white sucker and redbreast sunfish tissue, respectively.

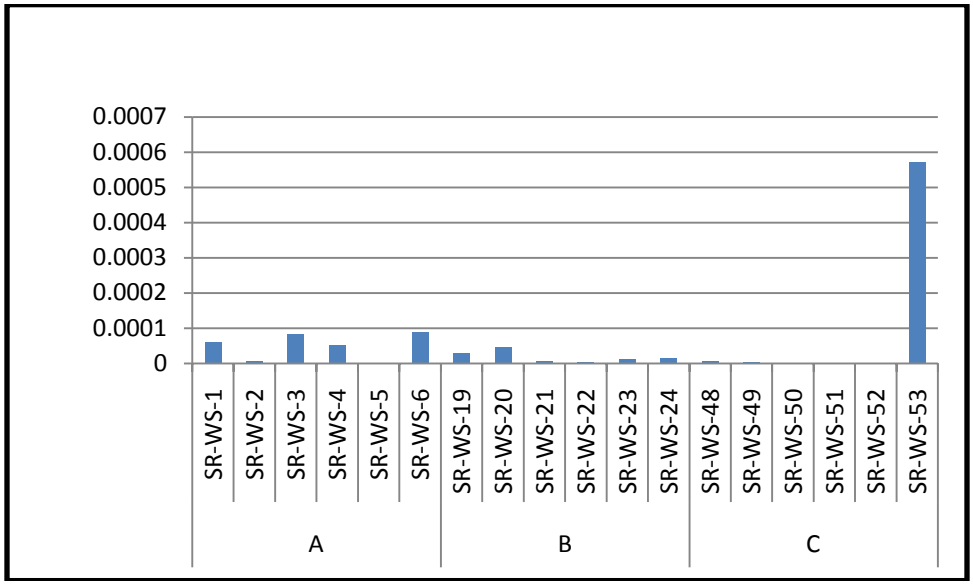
5.6.3.2 Risks to Mink

Risks to the mink were calculated using both fish tissue and sediment data. Risks were calculated for the Site (Area A/B) and for background Area C. Results are presented in Appendix I and Figure 13, and HQs are summarized in Table 5-11.

Results for Area A/B indicate a range of low to high risk from exposure to PCBs in white sucker tissue, with risk from exposure to dioxin-like PCBs being greatest. Risk from exposure to Total PCBs is moderate, with HQs ranging from 38 to 53. Risk from exposure to the dioxin-like PCBs ranges from low to high, with mammal TEQ HQs ranging from 5.9 for the HQ_{LOAEL} to 160 for the HQ_{NOAEL}. Risks from exposure to PCBs in redbreast sunfish tissue are one to two orders of magnitude lower, with HQs ranging from 3.7 to 6.8. Risk from exposure to the dioxin-like PCBs are low, with mammal TEQ HQs ranging from 0.2 (HQ_{LOAEL}) to 5.5 (HQ_{NOAEL}). All risks are attributed to the fish ingestion pathway and to PCBs, and risk from incidental ingestion of sediment is negligible.

To provide a comparison to background conditions, risk estimates were calculated for the mink in background Area C. Risks from exposure to COPCs in white sucker are similar to or slightly higher than those for Area A/B, with HQ_{NOAEL} values for Total PCBs ranging from 2.3 to 5.1 and a HQ_{LOAEL} values ranging from 1.9 to 4.2. Again, the majority of the risk is attributed to the dioxin-like PCBs, with mammal TEQ HQs ranging from 12 for the HQ_{LOAEL} to 340 for the HQ_{NOAEL}. One-hundred percent of the risk is attributed to the fish ingestion pathway. Risks from exposure to COPCs in redbreast sunfish are one to two orders of magnitude lower for background Area C than for Area A/B, and there is no unacceptable risk to the mink.

The apparent elevated risk to mink in background Area C from exposure to COPCs in white sucker was unexpected and assessed further. A review of the fish tissue PCB congener data collected in 2006, which were the basis for the white sucker fish tissue EPCs determined that one sample (Sample SR-WS-53) collected in background Area C had a unique dioxin-like congener signature relative to all other fish samples. PCB congeners 126 and 169 were only detected in this sample, which also weighed the least (i.e., 310 grams) of all white sucker samples collected in background Area C; weights for the other samples ranged from 524 to 1,063 grams (Arcadis, 2007). SR-WS-53 was also one of 2 samples that were collected from the upstream portion of Area C, which was separated from the lower portion by a shallow riffle/run reach (Arcadis, 2007). The mammalian TEFs for the two unique PCB congeners in Sample SR-WS-53, 126 and 169 are the largest of all mammalian TEFs for dioxin-like PCBs, 0.1 and 0.01, respectively, and account for approximately 92% of the TEQ based on mammalian TEFs calculated for this sample. Thus, these two compounds detected in this single sample account for the elevated risk in



background Area C for dioxin-like PCBs. It is noted that these two congeners were not detected in surficial sediments from either background Area A/B or Area C (Table A-1 and A-2, respectively). Consequently, although the source of these two compounds in sample SR-WS-53 is unknown, they do not appear to be associated with the site. Recalculation of the fish tissue EPC for background Area C with PCB congeners 126 and 169 eliminated from the data set would result in the mink risks associated with exposure to dioxin-like congeners consistent with the findings for other COPCs.

5.6.3.3 Risks to Green Heron

Risks to the green heron were also calculated using both sediment and fish tissue data collected from Area A/B and background Area C. The green heron ingests more sediment than either the kingfisher or the mink, and approximately 20% of its diet consists of invertebrates (Table 5-7). Exposure estimates using an aquatic invertebrate ingestion factor and associated bioaccumulation factors (BAFs) were incorporated into the dose model for the heron (Table I-41). Results are presented in Appendix I and Figure 14, and HQs are summarized in Table 5-11.

Risk estimates for exposure of green heron to COPCs in white sucker, invertebrates, and sediment in Area A/B indicate low to moderate risk from exposure to PCBs. The HQs for Total PCBs range from 6.8 to 10, and HQs for the dioxin-like congeners are somewhat higher, ranging from 6.8 to 68. Risk estimates for exposure of green heron to COPCs in redbreast sunfish, invertebrates, and sediment in Area A/B also indicate low to moderate risk from exposure to PCBs. Risk from exposure to Total PCBs is low, with HQs ranging from 0.63 (no unacceptable risk) to 1.5 (risk estimates only marginally exceeding 1.0). Risk from exposure to the dioxin-like PCBs is low to moderate, with HQs ranging from 2.8 for the HQ_{LOAEL} to 28 for the HQ_{NOAEL}. Approximately 1-14% of exposure risk is from exposure to PCBs in sediment, 2 – 33% is from exposure to PCBs in invertebrates, and the majority of risk is from exposure to PCBs in fish tissue, with fish tissue having a greater percent contribution (83 – 97%) for heron that consume white sucker as compared with heron that consume redbreast sunfish (53 – 81%).

To provide a comparison to background conditions, risk estimates were calculated for the green heron in background Area C. All individual HQs for exposure to white sucker, invertebrates, and sediment are below 1.0 except for the TEQ which was slightly above one for the HQ_{NOAEL} (3.9) and was driven by the fish ingestion pathway. All HQs for exposure to redbreast sunfish, invertebrates, and sediment are below 1.0. Risk estimates for background Area C are one to three orders of magnitude lower than for Area A/B, with the greatest differences between areas observed for exposures to COPCs in redbreast sunfish.

5.6.4 Qualitative Ecological Risk Evaluation

The major exposure pathways that were evaluated in this supplemental BERA were exposures to contaminated surface sediment and prey tissue. However, additional exposure pathways such as contact with soil, subsurface sediment, and surface water may also present risks to ecological receptors. Risks from exposure to contaminants in these media are likely to be relatively minor compared to the media that were already evaluated. Subsurface sediment, soil, and surface water data were not quantitatively evaluated; however, results of a qualitative evaluation for each medium are presented below. Limited data were available for the subsurface sediments and soil; no recent surface water data were available so the evaluation relied upon surface water data collected to support the BERA (ADL, 1997). Although it is important to consider these additional environmental components in the analysis, their evaluation below supports the focus on contaminated surface sediments as the primary exposure medium of interest.

5.6.4.1 Subsurface Sediment

Generally, sediments below the biologically active zone (BAZ) are less available to ecological receptors and fish than are sediments within the BAZ. However, during high river flow events, sediments may be

reworked, potentially exposing previously buried contaminated sediments. Therefore measured PCB data (congeners and Aroclors) in subsurface sediments (6 to 56 inches) were qualitatively evaluated in the event that PCBs in these sediments become bioavailable.

Vertical profiles of PCB concentrations in subsurface sediments in Area A/B and in the Hot Spot Area indicate an increase of PCB concentrations in the 6 to 14 inch-layer, with the highest concentration at sample location SD-27 (180,000 µg/kg total PCB congeners) (Tables A-10 through A-12). Concentrations in subsurface sediments appear to decrease with depth, although the maximum concentration in deeper sediments occurs at sampling location T-15-7-A, where total PCB congeners had a concentration of 45,000 µg/kg at 36 inches. These values are significantly higher than any of the surface sediment PCB concentrations, which had a maximum concentration of 11,000 µg/kg for congeners (14,860 µg/kg for Aroclors). In the rare event that sediments are significantly reworked and deeper sediments were to become bioavailable to ecological receptors, there is the potential for significant ecological risks associated with exposure to elevated PCB concentrations in these sediments.

Some weathering of Aroclors may be observed in Area A/B where the frequency of detection drops from 76% in the 6 to 14 inch-interval to 50% in the 36 to 56 inch-interval. In the Hot Spot Area, the frequency of detection for Aroclors drops from 86% in the 6 to 14 inch interval to 80% in the 12 to 27 inch interval. It then increases to 100% in the remaining intervals. There were, however, only a few samples taken in these lowest intervals (four and two, respectively) and therefore it is unclear how generally representative these results are.

There were only a few samples collected from subsurface sediments in Area C (Table A-11), but PCBs were detected in most samples. The background concentrations were significantly lower than in either Area A/B or the Hot Spot Area and ranged from a maximum of 20 µg/kg in the 6 to 14 inch interval to a maximum concentration of 239 µg/kg in the deepest interval (36 to 56 inches). Although the deepest sediment interval showed slightly elevated PCB concentrations, it is unlikely that scouring events would be able to rework sediments located 3 feet below ground surface (bgs). The sediments closest to the surface sediments (6 to 24 inches) show low levels of contamination with averages of 20 to 55 µg/kg total PCBs, which are unlikely to cause ecological effects even if they were reworked to the surface.

5.6.4.2 Soil

In addition to exposure of subsurface sediments, bank soils can also be exposed to contaminants during similar high river flow events. Such was the case in April 2007 when the Souhegan River last flooded, potentially stirring up and depositing contaminated river bed sediments onto the river banks. After the waters had subsided, 24 samples were collected from the top foot of river bank soil in Area A/B. Total PCBs were detected in 16 of the samples (67%); concentrations ranged from 0.79 to 380 µg/kg, with a mean concentration of 55 µg/kg (Table A-13). Although there are no current soil benchmarks available for effects of PCBs on terrestrial invertebrates (e.g., earthworms), the mean concentration is below the sediment benchmark of 59.8 µg/kg and indicates no potential for adverse effects to benthic invertebrates. The maximum concentration (380 µg/kg) results in an HQ of 6.4, indicating a low potential for adverse effects to benthic invertebrates. Two samples were also collected from the island sandbar in Area A (Table A-14) and had concentrations of total PCBs below sediment benchmarks (0.25 to 1.65 µg/kg).

5.6.4.3 Surface Water

Since surface water data were not collected in any of the 2004, 2006, or 2007 sampling events, unfiltered surface water data collected during the 1990s were qualitatively evaluated. Analytical results collected for the BERA (ADL, 1997) indicate low potential risks from ingestion of surface water because only a few relatively non-toxic contaminants were detected in the surface water samples. Although several metals were detected in all the surface water samples, maximum HQs only exceeded 1 for aluminum,

iron, and lead. For PCBs, only Aroclor-1248 was analyzed, but it was only detected in one of the 13 samples collected. For pesticides, dieldrin was detected in about half the samples and the maximum HQ was 5.3. Alpha-chlordane was detected in two samples and had elevated HQs for both the maximum and average concentrations. The evaluations in this report indicate that neither a-chlordane nor dieldrin present the potential for unacceptable risks based on ingestion of sediment or fish tissue. The only other contaminant detected in more than one surface water sample was tetrachloroethene which was detected in 13 of 19 samples; however, the HQs for both the average and maximum concentrations were well below 1. While the available surface water data were collected more than a decade ago, the review of the previous analysis supports a conclusion that existing surface water exposures are unlikely to pose a significant risk to ecological receptors.

5.7 Ecological Risk Assessment Uncertainty Analysis

This section discusses the major limitations of the ecological risk assessment and sources of uncertainties; it also assesses whether these uncertainties and limitations may have resulted in an over- or under-estimation of risk. Uncertainties associated with the available data, the selection of exposure parameters, the estimation of BSAFs, and the literature-based TRVs and CBRs are discussed in the following section.

5.7.1 Available Data

The most significant uncertainties in this supplemental BERA pertain to limitations and gaps in the available data. The available data are the basis for the exposure estimates and, depending on the underlying uncertainties and assumptions, have the ability to over- or under-estimate the potential risk results. The uncertainties associated with the data collected along the Souhegan River include potential data gaps, the PCB data approach, and the use of white sucker data.

5.7.1.1 Potential Data Gaps

The data used for this supplemental BERA include sediment and white sucker fish tissue data collected in 2004, 2006, and 2007 from Areas A, B, and C. Some data gaps were identified in the datasets, including a lack of spatial coverage of sediment data in Areas B and C and a limited number of white sucker tissue data (six samples from each area). To overcome some of the data limitations and to facilitate the risk assessment process, Areas A and B were combined into one exposure area (Area A/B). Nonetheless, 95% UCLs could not be calculated for some COPCs because there were too few samples (less than eight). In these cases, the mean concentration was used to estimate exposures, and this statistic underestimates risk as compared to the 95% UCL.

Likewise, even if there were enough samples to calculate a 95% UCL, the method used to treat the non-detects (either the use of one-half the MDL or an estimation of non-detects from ProUCL) has the potential to either over- or underestimate the EPC, depending on which method was used. Each dataset was scrutinized to determine the number of non-detects, the MDL, the total number of samples, and the total number of detects. Best professional judgment was used to determine the best overall approach for treatment of the non-detects (refer to Section 3.2); however, there remains inherent uncertainties with each method.

5.7.1.2 White Sucker and Redbreast Sunfish Data

White sucker tissue data were selected as the primary data set to evaluate ecological risks because the white sucker data are available in whole body form and are more closely associated with the benthos than redbreast sunfish, for which only fillet data are available. In addition, there are more recent data available for this species than for either yellow or brown bullhead and white sucker are frequently used as a monitoring species (Doherty et al., 2004). It is unlikely, however, that the diet of piscivorous ecological receptors at the Site consists entirely of white sucker, and it is more likely that piscivorous birds and

mammals will ingest other fish tissue and non-fish tissue items (e.g., benthic invertebrates), as well. Given that white sucker generally have higher lipid content than other fish species, tissue concentrations may have been overestimated. This in turn would overestimate ecological risks to the kingfisher and the mink where the dietary exposures were based on analytical data for this species.

As discussed in Section 5.6.3.2, the unique presence of two dioxin-like congeners in a single white sucker sample collected from background Area C resulted in an over-estimate of background exposures to piscivorous wildlife (but most impactful to the mink) associated with dioxin-like PCBs. Although the source of these compounds in background fish tissue is unknown, a review of the available information suggests that relative to background conditions in Area C, the site-related risks associated with dioxin-like compounds are consistent with the findings for the PCB Aroclors and PCB congener COPCs.

Another potential uncertainty pertaining to the white sucker data is related to the fact that some of the white sucker samples are composites of fish, while others are individual fish. More specifically, the PCB data were obtained from individual fish, whereas the pesticides and metals data were analyzed from composite fish tissue samples. As stated in USEPA (2000c):

> *Composite samples are homogeneous mixtures of samples from two or more individual organisms of the same species collected at a particular site and analyzed as a single sample. Because the costs of performing individual chemical analyses are usually higher than the costs of sample collection and preparation, composite samples are most cost-effective for estimating average tissue concentrations of target analytes in target species populations. Besides being cost-effective, composite samples also ensure adequate sample mass to allow analyses for all recommended target analytes. A disadvantage of using composite samples, however, is that extreme contaminant concentration values for individual organisms are lost.*

The fact that not all of the white sucker data are the same sample type (i.e., composite or individual) has the potential to affect the data. Individual samples are not a homogeneous representation of the Site and composite samples may mask the minimum and maximum values, becoming essentially an average. Either sample type may lead to an over- or under-estimation of risk based on tissue concentrations.

One source of uncertainty in the wildlife exposure modeling related to the use of available fish tissue data to estimate contaminant intake to the belted kingfisher. A review of literature suggests that kingfishers collect relatively small fish of less than 20 cms in size, for instance once study in a Michigan stream reported average fish prey size taken by adult kingfishers was <7.6 cms (Prose, 1985). The 2006 sampling program included collection of both individual and composite white sucker samples and both sample types were used to generate EPCs for the BERA. The lengths of individual fish that comprised the composite samples (ranging from between 11 to 18 centimeters) were substantially less than the individual samples (ranging from 26.0 – 48.6 cms) (Arcadis, 2007). It is likely that the incorporation of the individual samples into the white sucker EPC calculations led to risk to the belted kingfisher being over-estimated in the ecological risk assessment as these fish are too large to be captured by this piscivores species. Concentrations of PCBs (the primary risk driver for this species) were generally higher (in some cases by over an order of magnitude) in the individual fish compared to the composite samples (Arcardis, 2007). As a result, the conclusion that this particular species is at low risk from exposures to Total PCBs and low to moderate risks from exposure to dioxin-like congeners is considered questionable. This uncertainty does not apply to either of the other two piscivorous species modeled as both the mink and heron could consume the larger size classes of fish included in the EPC calculations.

Redbreast sunfish data were for muscle tissue only (fillet data), which is relevant for human exposures but not as relevant for ecological exposure because ecological receptors will typically consume the entire fish.

Bioaccumulative chemical like PCBs and pesticides tend to concentrate in tissue with higher fat content, and muscle tissue has lower fat content than other tissue. Therefore, using redbreast sunfish data for the risk estimates may underestimate risk to higher trophic level receptor. Furthermore, redbreast sunfish are in less contact with sediments than other fish species like the white sucker. Therefore, their exposure to COPCs in sediment is lower, and their body burdens may be less than fish species that are in more direct contact with the benthos. Again, this can lead to an underestimate of risk for wildlife receptors from exposure to COPCs in fish tissue.

5.7.2 Exposure Parameters

The relationship between receptor size and dietary intake is a critical factor in estimating exposure. In addition, dietary composition affects exposure because different food sources contain varying levels of COPCs. Although literature exists for dose calculation inputs such as body weight, ingestion rate, and dietary composition for each receptor evaluated, natural populations may exhibit considerable variability in these parameters. The wildlife exposure models were parameterized using available information for adult females for each selected receptor species, and average values were selected for the parameter values where a range of data was provided. The use of literature-derived exposure parameters increases uncertainty, which could result in an over- or under-estimation of the typical exposures.

5.7.3 Critical Body Residues and Toxicity Reference Values

In all risk assessments, uncertainty is associated with the extrapolation of literature-derived toxicity endpoints (especially laboratory-based studies) to equivalent endpoints for receptors at the Site because of differences in exposure conditions. The majority of the toxicity data were derived from laboratory studies. Laboratory conditions typically result in more homogeneous exposures than are experienced by receptors in the environment. Although controlled experiments result in a more valid interpretation of the isolated parameters, uncertainty is associated with the assumption that laboratory exposure conditions are relevant to establishing protective media concentrations under field exposures.

Furthermore, laboratory data are usually limited and there are often no more than a handful of appropriate studies from which to derive established toxicological reference doses (i.e., CBRs or TRVs). For both the white sucker and salmon fry there were a limited amount of data from which to establish CBRs and few studies had bounded pairs of NOAELs/LOAELs based on mortality, growth, or reproduction. In addition, some of the studies were at least 30 years old and laboratory toxicological methods and protocols have likely changed since then, potentially causing the older studies to be less reliable than more recent studies. In other cases, toxicity data for similar contaminants were used to estimate risks from exposure to contaminants with limited data. For example, PCB toxicity data were only available for Aroclor 1254 and the dioxin-like TEQs. Therefore, effects from all PCB parameters were assumed equivalent to these TRVs, which could over- or underestimate risk, depending on the PCB congeners present. There is also a degree of uncertainty regarding the toxicity of the dioxin-like congeners and which congeners have a mode of action similar to that of 2,3,7,8-TCDD (refer to Section 5.7.4 below).

CBRs (based on PCB mixtures) were compared to Total PCB estimates based both on congener and Aroclor data for calculation of HQs. Neither comparison is ideal because effect concentrations are typically based on toxicity studies of PCB mixtures represented by a single Aroclor. Because individual sites are characterized by different Aroclors, which are dependent upon historical operations, it is difficult to assess risks unless the Aroclors present are the same as those used in the representative toxicity studies. Furthermore, if additional PCB congeners that are not part of those Aroclor mixtures are also present, risks could be under-estimated. Although EPCs based on congener analysis are considered to be more precise and accurate, in general the risk estimates derived using the two approaches should be comparable. This was borne out by the results summarized in Section 5.6.2.

5.7.4 Dioxin-Like PCB Congeners

Wildlife exposures to dioxin-like PCB congeners were estimated using TRVs similar to those recommended by USEPA (1993c) and the consensus-based TEFs from Van den Berg et al. (1998; 2006). This approach represents the most recent risk assessment approach for evaluating dioxins, furans, and the non-*ortho*- and mono-*ortho*-substituted PCBs. This approach has been employed because there has been no adequate toxicity testing for each of the hundreds of dioxin-like congeners. Although the use of TEFs has a sound scientific basis, there is some uncertainty associated with their use in estimating the ecological effects from exposure to dioxin-like compounds, including assumption of additivity and methods used to determine relative potency. The TEQ approach also does not account for toxicity of dioxin/furan and PCB congeners that have a non-AhR-mediated toxicological mechanism[1]. However, risk associated with exposure to compounds that exhibit non-dioxin-like effects was evaluated separately using toxicological data for Aroclor 1254, which has the potential to overestimate risks due to the relatively toxic congeners comprising Aroclor 1254.

5.7.5 Calculation of BSAFs

Potential adverse ecological effects to salmon fry were estimated using BSAFs developed for white sucker. The BSAF was used, along with percent lipid for salmon fry, to back-calculate a potential fish tissue concentration of PCBs in salmon fry. This value was then compared to appropriate literature-based CBRs. There are various uncertainties with this approach including the fact that these are two different species of fish with different diet and behavioral characteristics. The white sucker is a resident adult fish with higher lipid content than juvenile salmon (fry) that only temporarily reside in the Souhegan River. Site-specific data are available for the white sucker; however, no site-specific data are available for salmon, so the BSAF for the salmon relied on a literature-based lipid fraction. This value can vary greatly among different fish species, ages, and sizes. In general, lipid content in salmon fry is lower than that in white sucker. Values presented in Milston et al. (2003) range from 2.4 to 5.1% lipid in whole body Chinook salmon fry. Gruger et al. (1975) showed a lipid content of 3.8% in juvenile Coho salmon. A value of 3.65 (the mean of Milston et al. [2003] data) was used in this supplemental BERA and, although it is from a different species (Chinook vs. Atlantic salmon), it is the most relevant data available to represent the lipid content of salmon fry potentially residing in the Souhegan River absent actual Site-specific data.

5.7.6 Measures of Effects

There is uncertainty regarding whether adverse effects will be observed, even when COPC concentrations is sediment and tissue exceed effects concentrations. Measures of effects are expressed as HQs. Although HQs measure the degree to which chemical concentrations in environmental media (in this case, sediment) and tissue (body burdens), they are not a measure of the level of effects that may be observed. Even when concentrations exceed NOAELs and LOAELs, there is no certainty that effects will be observed. There is also greater uncertainty that effects will be observed when COPC concentrations exceed NOAELs but do not exceed LOAELs. However, the likelihood of observing adverse effects increases when COPC concentrations exceed effects concentrations by a greater margin. The level of effects observed for a given HQ will vary across chemicals, receptors, and life history stage. Other factors such as the health of the receptor and how well the receptor has adapted to prolonged exposures can affect the level of effects observed for a given HQ, as well.

As previously discussed, the relative hazards from exposure to the different chemical groups or all chemicals, expressed as HIs, must be interpreted with caution. Although this is used as a tool for

[1] The aryl hydrocarbon receptor (AhR) is a protein found in the cytoplasm of somatic cell tissues. The binding of dioxin-like compounds to this receptor has been shown to be the first critical step in expression of toxicological responses in mammals, birds, and fish.

comparisons across areas, it cannot be used for comparing hazards across contaminant groups and/or receptors. As mentioned above, hazard quotients, which are summed to calculate an overall HI, can only be used to measure the degree to which chemical concentrations exceed effects concentrations. The relative degree to which a receptor is affected by a given exceedence level will vary across chemicals and chemical groups. Furthermore, interactions between chemicals, which may augment or decrease overall effects, are not captured by the HI calculation. Therefore, direct comparison across chemical groups and/or receptors cannot be made.

5.8 Ecological Risk Assessment Summary and Conclusions

Risks to ecological receptors including benthic invertebrates, fish, and upper-trophic level wildlife receptors were evaluated in this supplemental BERA. Fish were represented by white sucker, redbreast sunfish, and salmon fry; upper-trophic level wildlife receptors were represented by the belted kingfisher, mink, and green heron.

Despite the detection of a few pesticides with elevated concentrations in surface water during the 1990s, the surface water ingestion pathway does not likely represent a substantial exposure pathway to Site-related contaminants for any receptors evaluated. Rather, the major pathways for ecological receptors are direct exposure to sediment (benthic invertebrates) and the sediment and fish tissue ingestion pathways (fish and wildlife), with a significant portion of observed risk to wildlife receptors coming from the latter. In addition, there is a low risk from exposure to bank soils that may be inundated with flooded river water during high flow events. In the events of potential sediment scouring, subsurface sediments could pose the potential for significant ecological risk if receptors are exposed to these sediments.

Ecological risks were evaluated using Site-collected surface sediment and fish tissue data collected from two areas potentially affected by contamination (Areas A and B) and one background area (Area C). In addition, a hot spot was identified near the former source of PCBs to the Souhegan River, where PCB concentrations were statistically significantly elevated compared to nearby samples. Several data gaps were identified for this assessment, including limited available data for PCB congeners. Furthermore, exposure areas A and B were combined into one exposure area (Area A/B) for sample grouping and EPC calculations because these areas were not determined to be ecologically separated, and the high variability in the data prevented delineation of the boundary between the two areas based on sediment chemical and physical characteristics.

The primary contaminants at the site, PCBs, have the potential to bioaccumulate and get passed on to upper trophic level receptors through the food chain. Therefore, PCBs in sediment may present risk to wildlife, as well as fish and invertebrates, from multiple exposure routes. The potential for chemicals to bioaccumulate in fish tissue from sediment at the Site, measured as the normalized ratio of fish tissue concentrations to sediment concentrations and represented by a biota-sediment accumulation factor (BSAF), was determined to be lower than other sites with PCB contamination.

Overall, risks to benthic invertebrates are mainly attributed to PCBs in sediment, followed by pesticides (Figure 10). Based on HQs greater than 1.0, indicating a potential for adverse effects, there is risk to benthic invertebrates from exposure to mean and maximum concentrations of individual COPCs in sediment for the following chemicals:

COPC	HQ for maximum concentration	Maximum Concentration (mg/kg)			HQ for mean concentration
		Value	Location	Area	
Lead	2.3	81	T-2-8	A/B	0.24
Silver	1.7	1.7	DEP-4	A/B	1.2
Arsenic	1.4	13	DEP-4	A/B	0.49
Cadmium	9.6	9.5	DEP-4	A/B	0.39
Total PCB congeners	180	11	SED-02A	Hot Spot	19
Alpha-BHC	1.5	0.0091	T-15-6	Hot Spot	0.78
Beta-BHC	12	0.061	T-15-6	Hot Spot	1.2
Gamma-BHC	5.1	0.012	T-15-6	Hot Spot	0.88
Endrin	4.1	0.0091	SD-27	Hot Spot	4.0
4,4'-DDD	13	0.065	DEP-5	A/B	2.1
4,4'- DDE	6.3	0.020	T-15-6	Hot Spot	0.90
4,4'- DDT	16	0.066	DEP-5	A/B	2.6
Endosulfan I	2.7	0.0079	T-15-6	Hot Spot	0.48
Endosulfan II	1.9	0.026	T-15-6	Hot Spot	0.65
HPAH	6.8	11	DEP-5	A/B	0.74
LPAH	3.6	2.0	DEP-5	A/B	1.3

Risks to white sucker, based on CBRs, are attributed mainly to metals in sediment, followed by PCBs (Figure 11). Risks to redbreast sunfish are also attributed primarily to metals, with the greatest risk to sunfish being from mercury body burdens, again followed by PCBs. Risks to benthic invertebrates and white sucker associated with exposure to PCBs are relatively similar in both the Hot Spot Area and in Area A/B, most likely because of the mobility of these receptors.

Risks to the upper trophic-level wildlife receptors are attributed to PCBs, including both total PCBs and dioxin-like congeners (i.e., TEQs) mainly from exposure to these COPCs in fish tissue (Figures 12 through 14). The greatest risk was observed for piscivorous mammals, represented by the mink. The assessment of risks to wildlife from exposure to PCBs in the tissue of benthic-dwelling fish species, represented by white sucker, was considered most appropriate for this evaluation because whole body data were available for white sucker. Risks from exposure to white sucker in Area A/B, expressed as HQs, were identified for both NOAELs and LOAELs and showed low to moderate risks as follows:

Ecological Risks Related to Ingestion of White Sucker within Area A/B COPC	Belted Kingfisher		Green Heron		Mink	
	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ
Total PCB (Aroclor)	8.1E+00	1.0E+01	8.1E+00	1.0E+01	4.4E+01	5.3E+01
Total PCB (Congener)	7.0E+00	8.7E+00	6.8E+00	8.5E+00	3.8E+01	4.5E+01
PCB_TEQ_BIRD	6.6E+00	6.6E+01	7.5E+00	7.5E+01	NA	NA
PCB_TEQ_MAMMAL	NA	NA	NA	NA	5.9E+00	1.6E+02

This supplemental BERA found that exposure to PCBs in Area A/B for benthic invertebrates, fish, and wildlife resulted in substantially higher risks relative to those estimated for the background area (Area C). Although risk to mink from exposure to PCBs in white sucker in background Area C was found to be somewhat higher than Area A/B, this anomalous finding is due to the presence of two potent dioxin-like congeners that were uniquely detected in a single sample from background Area C. These compounds appear to be unrelated to the site as they were not detected in surface sediment samples during this same sampling event conducted in 2006. Assessment of exposures to COPCs in redbreast sunfish indicated that risk to mink from PCB exposures in Area A/B is greater than exposure risk for background Area C.

A qualitative evaluation of COPC concentrations in surface water, river bank soil, and sub-surface sediment indicated a low potential for adverse effects from exposure to metals in surface water, a low potential for adverse effects on benthic invertebrates from exposure to PCBs in river bank soil, and elevated concentrations of PCBs in sub-surface sediment in the Hot Spot Area. Because of the low HQs (< 10) and likelihood that COPCs in surface water and eroded river bank soil will be diluted within the river, risks from exposure to these media are considered to negligible. However, storm events and flooding could result in scouring of the river bed, exposing sediment with higher concentrations of PCBs than surface sediment and elevating risks to ecological receptors.

6.0 RISK ASSESSMENT CONCLUSIONS

There is elevated risk to human and ecological receptors from exposure to PCBs in Souhegan River sediments within Area A/B of the OU-2 Souhegan River study area. There is risk to human receptors from direct contact with sediments and fish ingestion, with fish ingestion risks being of particular concern. There is also some risk to benthic invertebrates from exposure to metals and pesticides in sediment. The observed Site-related risk is elevated compared with the background area (Area C) located upstream from the Site. A hot spot area within Area A/B of the OU-2 Souhegan River study area was identified where there are statistically significant elevated concentrations of PCBs in surface sediments. Within this area, there are also elevated concentrations of PCBs in sub-surface sediments that could pose greater risk to human and ecological receptors if storm and flood events expose these deeper sediment layers. Consequently, the Hot Spot Area could provide a continuing source of PCBs to the Souhegan River if not remediated.

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Table 3-1. Summary of PCB Data Collected from the Fletcher's Paint Superfund Site

Year	Analysis	Number of Samples
2004	Individual Aroclors	31
2006	Total PCBs (sum of 209 congeners)	6
	Total PCBs (sum of Aroclors)	43
	Individual Aroclors	43
	14 congeners (including the 12 dioxin-like congeners)	6
2007	Total PCBs (sum of 209 congeners)	9
	Individual Aroclors	9
	14 congeners (including the 12 dioxin-like congeners)	9

Table 3-2. Sample IDs for the Rope Swing/Hot Spot Area
Fletcher's Paint Superfund Site

Sample ID
SED-02A
SRSD13
SRSD8
SRSD15
SD-26
SRSD19
SD-27
SRSD27
SRSD25
T-15-7-A
SRSD17
SRSD22
SRSD28
T-15-6
SRSD20
SRSD18
SRSD23
SD-14
SRSD12
SRSD11
SED-11
SRSD14
SD-18
SRSD16
SRSD26
SRSD24

Notes:
The Hot Spot Area was defined spatially by the samples containing PCB concentrations that are statistically elevated above samples in the surrounding area.

Bolded sample IDs indicate samples that are spatially located within the defined hotspot area but with PCB concentrations that are not statistically elevated above the surrounding samples.

Table 4-1

RAGS PART D Table 1
Selection of Exposure Pathways
-

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Sediment	Surface Sediment (0-6 inches)	Areas A, B, and C (individually)	Recreational - Angler/Wader	Child/Adult	Ingestion	On-Site	Quantitative	Receptor incidentally ingests sediments while angling/wading in the Souhegan River.
						Dermal Contact	On-Site	Quantitative	Receptor contacts sediments while angling/wading in the Soughean
						Inhalation	On-Site	Qualitative	Sediment expected to be under water the majority of the time. Given the substrate, high winds would be necessary to entrain sediment and sediments with lower TOC would not be expected to contain high amounts of organic contaminants.
			Areas A, B, and C (individually)	Recreational - Swimmer	Child/Adult	Ingestion	On-Site	Quantitative	Receptor incidentally ingests sediments while swimming in the Souhegan River.
						Dermal Contact	On-Site	Quantitative	Receptor contacts sediments while swimming in the Soughean River.
						Inhalation	On-Site	Qualitative	Sediment expected to be under water the majority of the time. Given the substrate, high winds would be necessary to entrain sediment and sediments with lower TOC would not be expected to contain high amounts of organic contaminants.
			Deep Pool across from Elm Street	Recreational - Rope Swinger/Swimmer	Adolescent (age 10-18)	Ingestion	On-Site	Quantitative	Receptor incidentally ingests sediments while engaging in rope swing activities.
						Dermal Contact	On-Site	Quantitative	Receptor contacts sediments while engaging in rope swing activities.
						Inhalation	On-Site	Qualitative	Sediment expected to be under water the majority of the time. Given the substrate, high winds would be necessary to entrain sediment and sediments with lower TOC would not be expected to contain high amounts of organic contaminants.
		Surface Sediment (0-12 inches)	Sand Bar near recreational area	Recreational - Angler/Wader	Child/Adult	Ingestion	On-Site	Qualitative	Receptor incidentally ingests sandy surface soil while engaged in recreational activitites (e.g., picnicking, fishing) on the sandbar.
						Dermal Contact	On-Site	Qualitative	Receptor conatcts sandy surface soil while engaged in recreational activities (e.g., picnicking, fishing) on the sandbar.
						Inhalation	On-Site	Qualitative	Receptor inhales entrained sandy surface soil while engaged in recreational activities (e.g., picnicking, fishing) on the sandbar.
	Sediment	Subsurface Sediment (6 to 56 inches)	Areas A, B, and C (individually)	Recreational - Angler/Wader	Child/Adult	Ingestion	On-Site	Qualitative	Contamination appears to increase at depth. Currently not an exposure concern; however, scouring events could expose underlying layers of sediment.
						Dermal Contact	On-Site	Qualitative	
						Inhalation	On-Site	Qualitative	
			Areas A, B, and C (individually)	Recreational - Swimmer	Child/Adult	Ingestion	On-Site	Qualitative	Contamination appears to increase at depth. Currently not an exposure concern; however, scouring events could expose underlying layers of sediment.
						Dermal Contact	On-Site	Qualitative	
						Inhalation	On-Site	Qualitative	

Table 4-1

RAGS PART D Table 1
Selection of Exposure Pathways
-

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future, continued	Sediment, continued	Subsurface Sediment (6 to 56 inches), continued	Deep Pool across from Elm Street	Recreational - Rope Swinger/Swimmer	Adolescent (age 10-18)	Ingestion	On-Site	Qualitative	Contamination appears to increase at depth. Currently not an exposure concern; however, scouring events could expose underlying layers of sediment.
						Dermal Contact	On-Site	Qualitative	
						Inhalation	On-Site	Qualitative	
		Subsurface Sediment (12-24 inches)	Sand Bar near recreational area	Recreational - Angler/Wader	Child/Adult	Ingestion	On-Site	Qualitative	Contamination appears to increase at depth. Currently not an exposure concern; however, scouring events could expose underlying layers of sediment.
						Dermal Contact	On-Site	Qualitative	
						Inhalation	On-Site	Qualitative	
	Surface Water	Surface Water	Areas A, B, and C (individually)	Recreational - Angler/Wader	Child/Adult	Ingestion	On-Site	Qualitative	Receptor incidentally ingests surface water while wading/fishing in the Souhegan River.
						Dermal Contact	On-Site	Qualitative	Receptor contacts surface water while wading/fishing in the Soughean River.
			Areas A, B, and C (individually)	Recreational - Swimmer	Child/Adult	Ingestion	On-Site	Qualitative	Receptor incidentally ingests surface water while swimming in the Souhegan River.
						Dermal Contact	On-Site	Qualitative	Receptor contacts surface water while swimming in the Soughean River.
			Deep Pool across from Elm Street	Recreational - Rope Swinger	Adolescent (age 10-18)	Ingestion	On-Site	Qualitative	Receptor incidentally ingests surface water while engaging in rope swing activities.
						Dermal Contact	On-Site	Qualitative	Receptor contacts surface water while engaging in rope swing activities.
	Fish	Fish Tissue - Fillet Data	Areas A, B, and C (individually)	Recreational Anglers	Child/Adult	Ingestion	On-Site	Quantitative	Receptor ingests fish caught in the Souhegan River.

Table 4-2

RAGS Part D TABLE 3.1

EXPOSURE POINT CONCENTRATION SUMMARY

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediments (0-6")

Exposure Point	Contaminant of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (1) (Distribution)		Maximum Concentration	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Areas A and B	Benzo[a]pyrene	mg/kg	1.37E-01	1.60E-01	(L)	1.40E+00	1.60E-01	mg/kg	95% H-UCL	(2)
	Benzo[b]fluoranthene	mg/kg	1.75E-01	2.17E-01	(L)	1.90E+00	2.17E-01	mg/kg	95% H-UCL	(2)
	Dibenz[a,h]anthracene	mg/kg	3.19E-02	2.70E-02	(L)	1.90E-01	2.70E-02	mg/kg	95% H-UCL	(2)
	Total PCB Aroclors	mg/kg	6.98E-01	3.37E+00	(L)	1.49E+01	3.37E+00	mg/kg	99% Chebyshev (MVUE) UCL	(2)
	Total PCB Congeners (Measured)	mg/kg	1.16E+00	5.38E+00	(G)	1.10E+01	5.38E+00	mg/kg	95% Adjusted Gamma UCL	(3)
	Mammal TEQ (Measured)	mg/kg	9.48E-07	5.63E-06	(N)	4.91E-06	4.91E-06	mg/kg	99% Chebyshev (mean, sd) UCL	(4)
	Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	mg/kg	1.14E+00	4.78E+00	(ND)	1.09E+01	4.78E+00	mg/kg	95% Chebyshev (mean, sd) UCL	(5)
	Arsenic	mg/kg	4.77E+00	7.96E+00	(ND)	1.33E+01	7.96E+00	mg/kg	99% Chebyshev(Mean, SD) UCL	(5)
	Beryllium	mg/kg	4.88E-01	1.60E+00	(ND)	9.60E+00	1.60E+00	mg/kg	95% Chebyshev(Mean, SD) UCL	(5)
	Thallium	mg/kg	3.15E+00	3.51E+00	(ND)	9.70E+00	3.51E+00	mg/kg	95% Student's-t UCL	(5)

Note: The EPC is based on the 95% UCL or the maximum detected concentration, whichever value is lower.

(1) Nondetects were included at half the detection limit, except when substitution was made for PCBs.

(2) Based on ProUCL recommendation, data is lognormally distributed.

(3) Based on ProUCL recommendation, data has gamma distribution.

(4) Based on ProUCL recommendation, data is normally distributed.

(5) Data distribution is not discernable, UCL selection is based on ProUCL recommendation.

Definitions: L = Lognormal
G = Gamma
N = Normal
NC = not calculated; sample size less than five
ND = not discernable

Table 4-3

RAGS Part D TABLE 3.2

EXPOSURE POINT CONCENTRATION SUMMARY

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediments (0-6")

Exposure Point	Contaminant of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (1) (Distribution)	Maximum Concentration	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Rope Swing Area	Benzo[a]pyrene	mg/kg	1.09E-01	1.28E-01 (G)	2.80E-01	1.28E-01	mg/kg	95% KM (BCA) UCL	(2)
	Total PCB Aroclors	mg/kg	2.02E+00	3.82E+00 (G)	1.49E+01	3.82E+00	mg/kg	95% Adjusted Gamma UCL	(2)
	Total PCB Congeners (Measured)	mg/kg	3.56E+00	NC	1.10E+01	1.10E+01	mg/kg	UCL not calculated because only 4 observations	(3)
	Mammal TEQ (Measured)	mg/kg	2.61E-06	NC	4.91E-06	4.91E-06	mg/kg	UCL not calculated because only 4 observations	(3)
	Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	mg/kg	3.51E+00	NC	1.09E+01	1.09E+01	mg/kg	UCL not calculated because only 4 observations	(3)
	Arsenic	mg/kg	3.96E+00	4.78E+00 (G)	1.10E+01	4.78E+00	mg/kg	95% KM (BCA) UCL	(2)

Note: The EPC is based on the 95% UCL or the maximum detected concentration, whichever value is lower.

(1) Nondetects were included at half the detection limit, except when substitution was made for PCBs.

(2) Based on ProUCL recommendation, data has gamma distribution.

(3) 95% UCL was not calculated because of small sample size. Therefore, the maximum concentration was used for the EPC.

(4) Based on ProUCL recommendation, data is lognormally distributed.

Definitions: G = Gamma
L = Lognormal

Table 4-4

RAGS Part D TABLE 3.3

EXPOSURE POINT CONCENTRATION SUMMARY

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediments (0-6")

Exposure Point	Contaminant of Potential Concern	Units	Arithmetic Mean (1)	95% UCL	Maximum Concentration	Exposure Point Concentration						
						RME Value	Units	Statistic	CTE Value	Units	Statistic	Rationale
Area C	Benzo[a]pyrene	mg/kg	1.45E-01	NC	2.60E-01	2.60E-01	mg/kg	(2)	1.45E-01	mg/kg	(3)	See Text
	Total PCB Aroclors	mg/kg	1.73E-02	NC	3.01E-02	3.01E-02	mg/kg	(2)	1.73E-02	mg/kg	(3)	See Text
	Total PCB Congeners (Measured)	mg/kg	8.00E-03	NC	8.00E-03	8.00E-03	mg/kg	(2)	8.00E-03	mg/kg	(3)	See Text
	Mammal TEQ (Measured)	mg/kg	2.22E-08	NC	2.22E-08	2.22E-08	mg/kg	(2)	2.22E-08	mg/kg	(3)	See Text
	Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	mg/kg	7.26E-03	NC	7.26E-03	7.26E-03	mg/kg	(2)	7.26E-03	mg/kg	(3)	See Text
	Arsenic	mg/kg	6.30E+00	NC	9.20E+00	9.20E+00	mg/kg	(2)	6.30E+00	mg/kg	(3)	See Text
	Beryllium	mg/kg	4.02E-01	NC	6.70E-01	6.70E-01	mg/kg	(2)	4.02E-01	mg/kg	(3)	See Text

(1) Nondetects were included at half the detection limit, except when substitution was made for PCBs.

Definitions: NC = not calculated

(2) RME exposure point concentration represented by the maximum detected concentration.

(3) CTE exposure point concentration represented by the arithmetic mean concentration.

Table 4-5

RAGS Part D TABLE 3.4

EXPOSURE POINT CONCENTRATION SUMMARY

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Fish Tissue
Exposure Medium: Redbreast Sunfish Fillet

Exposure Point	Contaminant of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (1) (Distribution)		Maximum Concentration	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Areas A and B	4,4'-DDE	mg/kg	7.22E-03	8.35E-03	(N)	1.16E-02	8.35E-03	mg/kg	95% Student's-t UCL	(2)
	Total PCB Aroclors	mg/kg	8.50E-01	2.06E+00	(L)	5.43E+00	2.06E+00	mg/kg	95% Chebyshev (MVUE) UCL	(3)
	Total PCB Congeners (Measured)	mg/kg	5.82E-01	3.17E+00	(L)	4.00E+00	3.17E+00	mg/kg	99% Chebyshev (MVUE) UCL	(3)
	Mammal TEQ (Measured)	mg/kg	1.25E-06	2.54E-06	(L)	8.30E-06	2.54E-06	mg/kg	95% Chebyshev (MVUE) UCL	(3)
	Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	mg/kg	5.49E-01	3.48E+00	(ND)	3.79E+00	3.48E+00	mg/kg	99% Chebyshev (MVUE) UCL	(4)
	Mercury	mg/kg	1.23E-01	1.40E-01	(N)	1.75E-01	1.40E-01	mg/kg	95% Student's-t UCL	(2)

Note: The EPC is based on the 95% UCL or the maximum detected concentration, whichever value is lower.

(1) Nondetects were included at half the detection limit, except when substitution was made for PCBs.

(2) Based on ProUCL recommendation, data is normally distributed.

(3) Based on ProUCL recommendation, data is lognormally distributed.

(4) Data distribution is not discernable, UCL selection is based on ProUCL recommendation.

Definitions: L = Lognormal
N = Normal
ND = not discernable

Table 4-6

RAGS Part D TABLE 3.5

EXPOSURE POINT CONCENTRATION SUMMARY

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Fish Tissue
Exposure Medium: Redbreast Sunfish Fillet

Exposure Point	Contaminant of Potential Concern	Units	Arithmetic Mean (1)	95% UCL	Maximum Concentration	Exposure Point Concentration						
						RME Value	Units	Statistic	CTE Value	Units	Statistic	Rationale
Area C	Dieldrin	mg/kg	2.99E-03	NC	1.15E-02	1.15E-02	mg/kg	(2)	2.99E-03	mg/kg	(3)	See Text
	Total PCB Aroclors	mg/kg	2.66E-02	NC	6.36E-02	6.36E-02	mg/kg	(2)	2.66E-02	mg/kg	(3)	See Text
	Total PCB Congeners (Measured)	mg/kg	1.35E-02	NC	2.50E-02	2.50E-02	mg/kg	(2)	1.35E-02	mg/kg	(3)	See Text
	Mammal TEQ (Measured)	mg/kg	4.03E-08	NC	5.70E-08	5.70E-08	mg/kg	(2)	4.03E-08	mg/kg	(3)	See Text
	Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	mg/kg	1.22E-02	NC	2.31E-02	2.31E-02	mg/kg	(2)	1.22E-02	mg/kg	(3)	See Text
	Mercury	mg/kg	1.48E-01	NC	2.76E-01	2.76E-01	mg/kg	(2)	1.48E-01	mg/kg	(3)	See Text

(1) Nondetects were included at half the detection limit, except when substitution was made for PCBs.

(2) RME exposure point concentration represented by the maximum detected concentration.

(3) CTE exposure point concentration represented by the arithmetic mean concentration.

Definitions: NC = not calculated

TABLE 4-7

RAGS Part D TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal (1)		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (2) (MM/DD/YYYY)
Benzo[a]pyrene	7.30E+00	1/mg/kg/day	1.0E+00	7.30E+00	1/mg/kg/day	B2	IRIS	2/6/2008
Benzo[b]fluoranthene	7.30E-01	1/mg/kg/day	1.0E+00	7.30E-01	1/mg/kg/day	NA	NCEA	Region 6 MSL Table (2007)
Dibenz[a,h]anthracene	7.30E+00	1/mg/kg/day	1.0E+00	7.30E+00	1/mg/kg/day	NA	NCEA	Region 6 MSL Table (2007)
4,4'-DDE	3.40E-01	1/mg/kg/day	1.0E+00	3.40E-01	1/mg/kg/day	B2	IRIS	2/6/2008
delta-BHC	NA	---	---	NA	---	D	IRIS	2/6/2008
Total PCB Aroclors (3)	2.00E+00	1/mg/kg/day	1.0E+00	2.00E+00	1/mg/kg/day	B2	IRIS	2/6/2008
Total PCB Congeners (Measured) (3)	2.00E+00	1/mg/kg/day	1.0E+00	2.00E+00	1/mg/kg/day	B2	IRIS	2/6/2008
Mammal TEQ (Measured)	1.50E+05	1/mg/kg/day	1.0E+00	1.50E+05	1/mg/kg/day	B2	HEAST	1997
Total PCB Congeners (Measured) Minus TEQ Congeners (Measured) (3)	2.00E+00	1/mg/kg/day	1.0E+00	2.00E+00	1/mg/kg/day	B2	IRIS	2/6/2008
Arsenic	1.50E+00	1/mg/kg/day	1.0E+00	1.50E+00	1/mg/kg/day	A	IRIS	2/6/2008
Beryllium	NA	---	---	NA	---	B1	IRIS	2/6/2008
Mercury	NA	---	---	NA	---	C	IRIS	2/6/2008
Thallium	NA	---	---	NA	---	D	IRIS	2/6/2008

(1) EPA, 2004b.
(2) Represents date source was searched.
(3) Total PCBs value used.

Definitions: HEAST = Health Effects Assessment Summary Table.
IRIS = Integrated Risk Information System
NA = Not available
NCEA=National Center for Environmental Assessment
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.

TABLE 4-8

RAGS Part D TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal (1)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD: Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (2) (MM/DD/YYYY)
Benzo[a]pyrene	NA	NA	NA	---	NA	NA	---	---	---	---
Benzo[b]fluoranthene	NA	NA	NA	---	NA	NA	---	---	---	---
Dibenz[a,h]anthracene	NA	NA	NA	---	NA	NA	---	---	---	---
4,4'-DDE	NA	NA	NA	---	NA	NA	---	---	---	---
delta-BHC	NA	NA	NA	---	NA	NA	---	---	---	
Total PCB Aroclors (3)	Chronic	2.00E-05	mg/kg-day	1.0E+00	2.00E-05	(mg/kg-day)	Eyes, Immune system	300	IRIS	2/6/2008
Total PCB Congeners (Measured) (3)	Chronic	2.00E-05	mg/kg-day	1.0E+00	2.00E-05	(mg/kg-day)	Eyes, Immune system	300	IRIS	2/6/2008
Mammal TEQ (Measured)	NA	NA	NA	---	NA	NA	---	---	---	---
Arsenic	Chronic	3.00E-04	mg/kg-day	1.0E+00	3.00E-04	(mg/kg-day)	Skin	3	IRIS	2/6/2008
Beryllium	Chronic	2.00E-03	mg/kg-day	7.0E-03	1.40E-05	(mg/kg-day)	Small Intestine	300	IRIS	2/6/2008
Mercury	Chronic	3.00E-04	mg/kg-day	7.0E-02	2.10E-05	(mg/kg-day)	Immune System	1,000	IRIS	2/6/2008
Thallium	Chronic	6.50E-05	mg/kg/day	1.0E+00	6.50E-05	mg/kg/day	None observed	3,000	IRIS	2/6/2008

(1) EPA, 2004b.

(2) Represents date source was searched.

(3) Aroclor 1254 used as a surrogate.

Definitions: IRIS=Integrated Risk Information System

NA=Not available

ORNL=Oak Risk National Laboratory

RSL=Regional screening level

Table 4-9. Summary of Exposure Parameter Uncertainties For RME Scenarios

Fletcher's Paint Superfund Site

Exposure Parameter	Potential Direction of Uncertainty Per Receptor				
	Wader/Angler		Swimmer		Rope Swinger
	Child	Adult	Child	Adult	
Sediment Ingestion Rate	Likely overestimates	Likely overestimates	Likely overestimates	Likely overestimates	Likely overestimates
Fish Ingestion Rate	+ 2 – 3 times	Either	+ 2 – 3 times	Either	Either
Fraction Ingested – Sediment	Either	Either	Either	Either	Either
Fraction Ingested –Fish	± 100%	± 100%	± 100%	± 100%	± 100%
Exposed Skin Area	Neutral to overestimate	Neutral to overestimate	Overestimate	Overestimate	Overestimate
Sediment Adherence Factor	Neutral	Overestimate	Neutral	Overestimate	Overestimate
Exposure Frequency – Sediment	Either	Either	Either	Either	Either
Exposure Frequency – Fish	May underestimate	May underestimate	May underestimate	May underestimate	May underestimate
Body Weight	Either (quantifiable depending upon age)	Likely overestimates for males, may underestimate for females	Either (quantifiable depending upon age)	Likely overestimates for males, may underestimate for females	Either (quantifiable depending upon age)
Overall Direction of Uncertainty	***Likely Overestimate***	***Likely Overestimate***	***Likely Overestimate***	***Likely Overestimate***	***Likely Overestimate***

Notes:

Either = Value used in risk assessment may lead to an under- or an overestimate of exposure and, subsequently in the prediction of the potential for adverse health effects.

Likely overestimates = Value used in risk assessment is more likely to overestimate exposure and, subsequently the potential for adverse health effects.

May underestimate = Depending upon the individual, value used in risk assessment may underestimate exposure and, subsequently the potential for adverse health effects.

Table 5-1. Summary of Ecological Receptors and Exposure Pathways

Receptor	Exposure Pathways
Benthic invertebrate community	Direct contact with sediment Ingestion of sediment Ingestion of prey
Resident fish (white sucker)	Incidental ingestion of sediment Direct contact with sediment Ingestion of prey
Resident fish (redbreast sunfish)	Incidental ingestion of sediment Ingestion of prey
Anadromous fish (Atlantic salmon)	Incidental ingestion of sediment Direct contact with sediment Ingestion of prey
Piscivorous bird (belted kingfisher)	Ingestion of prey
Piscivorous mammal (mink)	Incidental sediment ingestion Ingestion of prey
Piscivorous bird (green heron)	Incidental sediment ingestion Ingestion of prey

Table 5-2. Exposure Point Concentrations for Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site

		White Sucker		Red-breasted Sunfish		Sediment		
COPEC	**Units**	**Area A/B[a]**	**Area C[b]**	**Area A/B[a]**	**Area C[b]**	**Area A/B[a]**	**Hotspot[a]**	**Area C[b]**
Measured Data								
Aluminum	mg/kg	46.98	22.45	7.234	4.540	3777	nc	4204
Barium	mg/kg	1.702	1.27	0	0.090	20.66	nc	21.94
Chromium	mg/kg	0.636	0.251	0	0.310	7.761	nc	10.38
Cobalt	mg/kg	0.121	0.086	0	0.090	3.777	nc	3.12
Copper	mg/kg	0.975	0.313	0.446	0.280	4.22	nc	5.18
Manganese	mg/kg	28.2	24.0	1.5	2.150	nc	nc	89.9
Mercury	mg/kg	0.0737	0.070	0.140	0.150	0.0117	nc	0.0454
Nickel	mg/kg	0.313	0.641	0	0.280	4.179	nc	4.56
Zinc	mg/kg	22.66	19.6	7.337	6.640	37.81	nc	38.28
DDx	µg/kg	22.78	20.8	10.24	7.400	44.24	nc	5.22
Total BHC	µg/kg	1.42	4.59	5.146	nd	12.56	nc	4.84
Total PCB Aroclors	µg/kg	25320	2427[c]	2061	26.62	3368	3820	17.3
Total PCB Congeners	µg/kg	21707	1107	3171	13.52	5382	3560[d]	8
Fish TEQ	µg/kg	0.0162	0.0072	3.550E-03	6.810E-05	0.00324[f]	0.00181[d]	0.0000037[e]
Bird TEQ	µg/kg	5.735	0.362	1.349	0.023	1.233[f]	0.672[d]	0.0000074[e]
Mammal TEQ	µg/kg	0.0788	0.165	2.540E-03	1.810E-04	0.00491[f]	0.00261[d]	0.0000222[e]

nc = not calculated nd = not detected

[a] Based on 95%UCL, unless noted

[b] Based on mean data, unless noted

[c] Value based on 95%UCL

[d] Based on mean value

[e] Based on 1 congener detected in 1 sample. To avoid overestimating the TEQ by using 1/2 MDL for congeners that were not detected, only the congener that was detected was used to calculate the TEQ. In Area A/B congeners that were below detection limits were included as 1/2 MDL to calculate TEQs because the proportion of non-detect data was generally lower than in Area C (i.e., PCB concentrations overall were higher).

[f] Based on maximum concentration because 95% UCL was higher.

Table 5-3. BSAF Calculation for White Sucker and Redbreast Sunfish
Fletcher's Paint Superfund Site

Exposure Area	Matrix	Parameter	Avg Concentration	Unit
Area A/B		TOC	0.53	%
	Sediment	Total PCB Aroclor	697.7	ug/kg
		Total PCB Congeners	651.3	ug/kg
Area A/B	White Sucker	Lipid	5.6	%
		Total PCB Aroclor	5809.725	ug/kg
		Total PCB Congeners	10470	ug/kg
Area A/B	Redbreast Sunfish	Lipid	0.9	%
		Total PCB Aroclor	850.38	ug/kg
		Total PCB Congeners	581.68	ug/kg
Area A/B - White Sucker			**$BSAF_{Aroclor}$**	**0.79**
			$BSAF_{congener}$	**0.86**
Area A/B - Redbreast Sunfish			**$BSAF_{Aroclor}$**	**0.72**
			$BSAF_{congener}$	**0.29**
Area C	Sediment	TOC	0.89	%
		Total PCB Aroclor	17.3	ug/kg
		Total PCB Congeners	8	ug/kg
Area C	White Sucker	Lipid	5.9	%
		Total PCB Aroclor	1115.2	ug/kg
		Total PCB Congeners	1106.7	ug/kg
Area C	Redbreast Sunfish	Lipid	0.92	%
		Total PCB Aroclor	27.94	ug/kg
		Total PCB Congeners	13.52	ug/kg
Area C - White Sucker			**$BSAF_{Aroclor}$**	**NA**
			$BSAF_{congener}$	**NA**
Area C - Redbreast sunfish			**$BSAF_{Aroclor}$**	**NA**
			$BSAF_{congener}$	**NA**

Notes:
BSAFs calculated using 1/2 the MDL for non-detects and measured and estimated data for PCB congeners in Area A/B
Average concentrations from data summary tables
BSAF = $(C_{fish}*\%TOC)/(C_{sed}*\%lipid)$

NA - BSAFs were calculated only if the means had less than 20% non-detects (Berthouex and Brown, 1994). More than 20% of the Aroclor samples in Area C were non-detects; therefore, a BSAF was not calculated. There was only one sediment sample in Area C with congener data; therefore a BSAF was not calculated.

Table 5-4. BSAFs for Total PCBs at other Superfund Sites

Superfund Site	Number of BSAF Values	Min BSAF	Max BSAF	Mean BSAF
White Sucker				
Housatonic River	11	0.34	17.53	3
Centredale Manor	3	1.4	1.8	1.6
Kalamazoo River	1			0.82
Sheboygan River	4	0.89	3.43	1.92
			Mean	**1.8**
Redbreast Sunfish				
Hudson River	3	0.19	3.32	2.11
			Mean	**2.1**
All Sunfish				
Housatonic River[1]	13	0.34	12.13	4.06
Hudson River[2]	12	0.19	10.62	3.31
Muddy Cove[3]	4	0.17	2.14	1.20
Muddy Cove (fillet)[3]	4	0.21	3.22	1.60
			Mean	**3.80**
			Mean Fillet	**1.68**

Notes:
BSAFs are for whole body tissue data unless otherwise noted.
[1]Sunfish collected from the Housatonic River included bluegills, pumpkinseed sunfish, and yellow perch.
[2]Sunfish collected from the Hudson River included pumpkinseed sunfish, redbreast sunfish, white perch, and yellow perch.
[3]Sunfish collected from Muddy Cove were white perch.

Table 5-5. Exposure Parameters for Belted Kingfisher
Fletcher's Paint Superfund Site

Common Name	**Belted Kingfisher**				
Scientific Name	***Ceryle alcyon***				
Exposure parameter	**Symbol**	**Units**	**Selected Value**	**Reported Values/Notes**	**Reference[a]**
Home Range	HR	ha	1.03	The value presented in USEPA (1993) is 1.03 kilometer of stream bank. Assumed a stream width of 10 meters (appropriate for the Souhegan) and came up with an area of 10,300 square meters which is equivalent to 1.03 hectares.	Brooks and Davis, 1987
Exposure Duration	ED	days/year	183	In Maine, fall depatures in mid October with returns in early April.	Bent, 1940
Dietary Composition				numbers of crayfish in diet as well as amphibians, mussels, insects, and even young birds and mice. Dietary composition based on analysis of fecal pellets from animals captured from ripari	USEPA, 1993; White, 1936
fish	P_{fish}	unitless	100%		assumption
insects	P_{insect}	unitless	0%		assumption
crustaceans	P_{crust}	unitless	0%		assumption
amphibians	P_{amphib}	unitless	0%		assumption
mammals	P_{mam}	unitless	0%		assumption
vegetation	P_{veg}	unitless	0%		assumption
Food Ingestion Rate	IR_{food}	kg/day	0.05	Calculated using regression equation for non-passerines: IR_{food} (g/day) = 0.301 * BW $^{0.751}$ (g)[b].	USEPA, 1993; Suter, 1993
Sediment Ingestion Rate	IR_{sed}	kg/day	0.0	Assume no contact with sediment.	assumption
Body Weight	BW	kg	0.15	Average body weight of kingfishers in Pennsylvania and Ohio.	Brooks and Davis, 1987

Footnotes:

a. Primary literature as cited in USEPA, 1993 unless otherwise noted.

b. Values derived from the regression equation expressed on a dry weight basis. Converted to a wet weight ingestion rate by calculating the estimated intake (kg/day) of each food item (i.e., multiply dry weight ingestion rate by percent composition), dividing by 1 minus the moisture content of that food item and summing across all food items. Assumed that fish, invertebrates, crustaceans, amphibians, mammals, seeds, and plants contain 73%, 80%, 80%, 73%, 63%, 11.5%, and 85% water content, respectively (Suter, 1993).

Table 5-5. Exposure Parameters for Belted Kingfisher
Fletcher's Paint Superfund Site

Common Name	**Belted Kingfisher**
Scientific Name	***Ceryle alcyon***

References:

Bent, A.C., 1940. Life histories of North American cuckoos, goat suckers, hummingbirds, and their allies; Washington, D.C.; U.S. Government Printing Office; Smithsonian Inst. U.S. Nat. Mus. Bull. 176.

Brooks, R.P., and W.J. Davis, 1987. Habitat selection by breeding belted kingfishers (*Ceryl alcyon*); Am. Midl. Nat. 117:63-70.

Calder, W.A., and E.J. Braun, 1983. Scaling of osmotic regulation in mammals and birds, Am. J. Physiol., 244: R601-R606.

Davis, W.J., 1980. The belted kingfisher, *Megaceryle alcyon*: its ecology and territorality (master's thesis); Cincinnati, OH: University of Cincinnati.

Lasiewski, R.C., and W.A.Calder, 1971. A preliminary allometric analysis of respiratory variables in resting birds; Resp. Phys. 11:152-166.

Nagy, K.A., 1987. Field metabolic rate and food requirement scaling in mammals and birds; Ecol. Monogr. 57:111-128.

Suter, G.W., 1993. Ecological Risk Assessment; Lewis Publishers, Boca Raton.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

Walsberg, G.E. and J.R.King, Jr., 1978. The relationship of the external surface area of birds to skin surface area and body mass; J. Exp. Biol. 76:185-189.

White, H.C., 1936. The food of kingfishers and mergansers on the Margaree River, Nova Scotia; J. Biol. Board Can. 2:299-309.

Table 5-6. Exposure Parameters for Mink
Fletcher's Paint Superfund Site

Common Name	**Mink**				
Scientific Name	***Mustela vison***				
Exposure parameter	**Symbol**	**Units**	**Selected Value**	**Reported Values/Notes**	**Reference[a]**
Home Range	HR	ha	7.8	Reported home range for adult females in Montana/riverine habitat containing heavy vegetation.	Mitchell, 1961
Exposure Duration	ED	days/year	365	Active year-round	USEPA, 1993
Dietary Composition[b]				Opportunistic nocturnal hunters along shorelines and emergent vegetation; prey consumption depends on availability. Mammals are an important component of the mink diet in portions of its range but depending on habitat, aquatic prey (including fish, amphibians, and crustaceans) and terrestrial prey (birds, reptiles, and insects) may predominate. Dietary composition assumptions derived as normalized percentages of aquatic prey in diet in Michigan river.	USEPA, 1993; Alexander, 1977
fish	P_{fish}	unitless	100%		assumption
insects	P_{insect}	unitless	0%		assumption
crustaceans	P_{crust}	unitless	0%		assumption
amphibians	P_{amphib}	unitless	0%		assumption
mammals[c]	P_{mam}	unitless	0%		assumption
vegetation	P_{veg}	unitless	0%		assumption
Food Ingestion Rate	IR_{food}	kg/day	0.16	Calculated using regression equation for mammals: IR_{food} (g/day) = 0.235 * BW $^{0.822}$ (g)[d]. Comparable to a value of 0.22 g/g-day (i.e., 0.125 kg/day for a 0.6 kg animal) as reported in the cited reference.	USEPA, 1993
Sediment Ingestion Rate	IR_{sed}	kg/day	0.003	Assume 2 percent of daily food ingestion rate	assumption
Body Weight	BW	kg	0.6	Average of female summer and fall weights in Montana.	Mitchell, 1961

Footnotes:

a. Primary literature as cited in USEPA, 1993 unless otherwise noted.

b. Assumed that animals will also forage in floodplains (increasing throughout the year); dietary composition applicable to spring/early summer.

c. Assumed that small mammals not included in diet, however, small birds/mammals (especially muskrat) may comprise 5 - 6 % of mink diet in similar habitats (Alexander, 1977).

d. Values derived from the regression equation expressed on a dry weight basis. Converted to a wet weight ingestion rate by calculating the estimated intake (kg/day) of each food item (i.e., multiply dry weight ingestion rate by percent composition), dividing by 1 minus the moisture content of that food item and summing across all food items. Assumed that fish, invertebrates, crustaceans, amphibians, mammals, seeds, and plants contain 73%, 80%, 80%, 73%, 63%, 11.5%, and 85% water content, respectively (Suter, 1993).

Table 5-6. Exposure Parameters for Mink
Fletcher's Paint Superfund Site

Common Name	**Mink**
Scientific Name	***Mustela vison***

References:

Alexander, G., 1977. food of vertebrate predators on trout waters in north central lower Michigan; Michigan Academician 10:181-195.

Arnold, T.W., and E.K. Fritzell, 1987. Food habits of prairie mink during the waterfowl breeding season; Can. J. Zool. 65:2322-2324.

Calder, W.A., and E.J. Braun, 1983. Scaling of osmotic regulation in mammals and birds, Am. J. Physiol., 244: R601-R606.

Gerell, R., 1970. Home ranges and movements of the mink *Mustela vison* Schreber in southern Sweden; Oikos 20:451-460.

Hornshaw, T.C, R.J. Aulerich, and H.E. Johnson, 1980. Feeding Great Lakes fisk to mink: effects on mink and accumulation and elimination of PCBs by mink; J. Toxicol. Environ. Health 11:933-946.

Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.

Llewellyn, L.M., and F.M. Uhler, 1952. The foods of fur animals of the Patuxent Research Refuge, Maryland; Am. Midl. Nat. 48:193-203.

Nagy, K.A., 1987. Field metabolic rate and food requirement scaling in mammals and birds; Ecol. Monogr. 57:111-128.

Stahl, W.R., 1967. Scaling of respiratory variables in mammals; J. Appl. Physiol. 22:453-460.

Suter, G.W., 1993. Ecological Risk Assessment; Lewis Publishers, Boca Raton.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

Table 5-7. Exposure Parameters for Green Heron
Fletcher's Paint Superfund Site

Common Name	**Green heron**				
Scientific Name	***Butorides virescens***				
Exposure parameter	**Symbol**	**Units**	**Selected Value**	**Reported Values/Notes**	**Reference[a]**
Home Range	HR	ha	4.5	Midpoint of values, based on great blue heron (45,000 sq meters)	USEPA, 2003
Exposure Duration	ED	days/year	183	Spring/summer breeding season based on great blue heron	USEPA, 1993
Dietary Composition				Mostly fish, some worms and other invertebrates, small mammals, aquatic plants, and small herpatofauna (USEPA, 2003). Dietary composition based on percent wet weight of aquatic prey in stomach contents, normalized to 100 percent.	USEPA, 2003
fish	P_{fish}	unitless	80%	Prey preferences range from 0.4 to 0.9 (percent of diet)	USEPA, 2003
invertebrates	$P_{inverts}$	unitless	20%	Including worms; prey preferences range from 0 to 0.24 (percent of diet)	USEPA, 2003
crustaceans	P_{crust}	unitless	0%		USEPA, 2003
amphibians	P_{amphib}	unitless	0%	Prey preferences range from 0.01 to 0.1 (percent of diet)	USEPA, 2003
mammals	P_{mam}	unitless	0%	Prey preferences range from 0 to 0.05 (percent of diet)	USEPA, 2003
seeds	P_{seed}	unitless	0%		USEPA, 2003
vegetation	P_{veg}	unitless	0%	Prey preferences range from 0 to 0.03 (percent of diet)	USEPA, 2003
Food Ingestion Rate	IR_{food}	kg/day	0.087	Calculated using regression equation: IR_{food} (g DW/day) = 0.64 * $(BW)^{0.651}$ (g); converted to fresh weight food.	Nagy, 1987; USEPA, 2003
Sediment Ingestion Rate	IR_{sed}	kg/day	0.0082	Assume 9.4 percent of daily food ingestion rate.	USEPA, 2003
Body Weight	BW	kg	0.23	Average body weight of female herons.	USEPA, 2003

Footnotes:

a. Primary literature as cited in USEPA, 2003 unless otherwise noted.

References:

Calder, W.A., and E.J. Braun, 1983. Scaling of osmotic regulation in mammals and birds, Am. J. Physiol., 244: R601-R606.

Lasiewski, R.C., and W.A.Calder, 1971. A preliminary allometric analysis of respiratory variables in resting birds; Resp. Phys. 11:152-166.

Nagy, K.A., 1987. Field metabolic rate and food requirement scaling in mammals and birds; Ecol. Monogr. 57:111-128.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

Table 5-7. Exposure Parameters for Green Heron
Fletcher's Paint Superfund Site

Common Name	**Green heron**
Scientific Name	***Butorides virescens***

USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

Walsberg, G.E. and J.R.King, Jr., 1978. The relationship of the external surface area of birds to skin surface area and body mass; J. Exp. Biol. 76:185-189.

Table 5-8. Summary of CBRs for Fish Tissue
Fletcher's Paint Superfund Site

COPC	# Samples	Species	Endpoint	CBR[a] NOAEL	CBR[a] LOAEL	Notes
Aluminum	18	Altantic salmon	Mortality (LD_{50})	0.78[b]	7.8	
Barium	7	Atlantic salmon	Growth (ED_{17})	0.015[b]	0.15	
Chromium	14	Chinook salmon	Mortality (LD_{13})	0.13[b]	1.3	
Cobalt	NA	NA	NA	NA	NA	
Copper	48	Rainbow trout	Mortality (LD_{11})	0.14[b]	1.4	
Manganese	4	Atlantic salmon	Growth (ED_{41})	0.22[b]	2.2	
Mercury	54	Channel catfish	Mortality (LD_{50})	0.006[b]	0.06	
Nickel	2	Common carp	Mortality (LD_{50})	12[b]	120	No whole body data, used white muscle tissue
Zinc	21	Brook trout	Mortality	3.9	4.5	Values are NOED and LOED from study
DDx[c]	16	Lake trout	Mortality (LOED)	0.029[b]	0.29	
BHC[d]	22	Atlantic salmon	Mortality (NOED)	2	20[b]	Includes muscle data to supplement limited whole body data
Total PCBs[e]	75	Zebra danio	Growth (LOED)	0.014[b]	0.14	
2,3,7,8-TCDD (TEQ)	115	Rainbow trout	Growth/Mortality	0.0016	1.4	Values are NOED and LOED from study

a. Units in mg/kg
b. Estimated using a 10-fold extrapolation factor
c. Based on 4,4'-DDE
d. Based on lindane (gamma BHC)
e. Based on PCB mixtures including Aroclor-1254

TABLE 5-9
Summary of Toxicity Reference Values for Birds (μg/g-d)

Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site

		Bird				
CAS #	**Chemical Name**	**NOAEL**	**LOAEL**	**Test Species**	**Toxic Endpoint**	**Reference**
7429-90-5	Aluminum[a]	NA	NA			
7440-39-3	Barium	NA	NA			
7440-48-4	Cobalt	7.61E+00	7.61E+01	NOAEL equivalent to geometric mean of NOAEL values for reproduction and growth; LOAEL set by applying a 10-fold extrapolation factor.		Eco SSL, March 2005
7440-47-3	Chromium	2.66E+00	2.66E+01	NOAEL equivalent to geometric mean of NOAEL values for reproduction and growth; LOAEL set by applying a 10-fold extrapolation factor.		Eco SSL, March 2005
7440-50-8	Copper	4.05E+00	1.21E+01	Chicken	Reproduction	Ankari et al, 1998[b]
7439-96-5	Manganese	1.79E+02	1.79E+03	NOAEL equivalent to geometric mean of NOAEL values for reproduction and growth; LOAEL set by applying a 10-fold extrapolation factor.		Eco SSL, April 2007
7439-97-6	Mercury	8.00E-02	8.00E-01	Mallard	Reproduction	Heinz, 1979[c]
7440-02-0	Nickel	6.71E+00	6.71E+01	NOAEL equivalent to geometric mean of NOAEL values for reproduction and growth; LOAEL set by applying a 10-fold extrapolation factor.		Eco SSL, March 2007
7440-66-6	Zinc	6.61E+01	6.61E+02	NOAEL equivalent to geometric mean of NOAEL values for reproduction and growth; LOAEL set by applying a 10-fold extrapolation factor.		Eco SSL, June 2007
Total Aroclor	Total PCB (Aroclor)[d]	4.00E-01	5.00E-01	Chicken	Reproduction	Chapman, 2003
Total Congener	Total PCB (Congener)[f]	4.00E-01	5.00E-01	Chicken	Reproduction	Platanow and Reinhart, 1973; Britton & Huston, 1973
319-85-7	Beta-BHC[e]	5.60E-01	2.30E+00	Japanese quil	Reproduction	Sample et al., 1996; Vos et al., 1971
Total DDx	Total DDx	2.27E-01	2.27E+00	Chicken	Growth	Cecil et al., 1978
TEQ Bird	PCB_TEQ_BIRD	1.40E-05	1.40E-04	Ring-necked pheasant	Reproduction	Nosek et al., 1992a,b[i]

Units in ug/g-d

a Aluminum is identified as a COPC only at sites where the soil pH is less than 5.5 (Eco SSL, November 2003).
b High TRVs are equivalent to the LOAEL from the study that the low TRV (NOAEL) was selected.
c The selected study did not identify a NOAEL; the value is based on applying a 10-fold LOAEL-to-NOAEL extrapolation factor.
d Aroclor 1248 used as a surrogate.
e Based on mixed BHC isomers.
f Reported doses were based on exposures via interperitoneal injection and converted to an ingestion dose (USEPA, 1993).
NA - not applicable/available

TABLE 5-10
Summary of Toxicity Reference Values for Mammals (μg/g-d)

Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site

CAS #	Chemical Name	Mammal NOAEL	Mammal LOAEL	Test Species	Toxic Endpoint	Reference
7429-90-5	Aluminum[a]	NA	NA			
7440-39-3	Barium	5.18E+01	5.18E+02	NOAEL equivalent to geometric mean of NOAEL values for reproduction and growth; LOAEL set by applying a 10-fold extrapolation factor.		Eco SSL, February 2005
7440-48-4	Cobalt	7.33E+00	7.33E+01	NOAEL equivalent to geometric mean of NOAEL values for reproduction and growth; LOAEL set by applying a 10-fold extrapolation factor.		Eco SSL, March 2005
7440-47-3	Chromium	2.40E+00	2.40E+01	NOAEL equivalent to geometric mean of NOAEL values for reproduction and growth; LOAEL set by applying a 10-fold extrapolation factor.		Eco SSL, March 2005
7440-50-8	Copper	5.60E+00	9.34E+00	Pig	Suvival, growth	Allcroft et al, 1961[b]
7439-96-5	Manganese	5.15E+01	5.15E+02	NOAEL equivalent to geometric mean of NOAEL values for reproduction and growth; LOAEL set by applying a 10-fold extrapolation factor.		Eco SSL, April 2007
7439-97-6	Mercury	5.50E-02	1.80E-01	Mink	Anorexia, ataxia, nerve lesions	Wobeser et al., 1976a,b
7440-02-0	Nickel	1.70E+00	3.40E+00	Mouse	Reproduction	Pandey and Srivastava, 2000[b]
7440-66-6	Zinc	7.54E+01	7.54E+02	NOAEL equivalent to geometric mean of NOAEL values for reproduction and growth; LOAEL set by applying a 10-fold extrapolation factor.		Eco SSL, June 2007
Total Aroclor	Total PCB (Aroclor)[c]	8.00E-02	9.60E-02	Mink	Reproduction	Chapman, 2003
Total Congener	Total PCB (Congener)[c]	8.00E-02	9.60E-02	Mouse	Reproduction	Simmons & McKee, 1992; Linzey, 1987
319-85-7	Beta-BHC[d]	1.40E-02	1.40E-01	Mink	Reproduction	Sample et al., 1996; Bleavins et al., 1984
Total DDx	Total DDx	1.47E-01	7.35E-01	Rat	Reproduction	Wrenn et al., 1970[b]
TEQ Mammal	PCB_TEQ_MAMMAL	8.00E-08	2.24E-06	Mink	Reproduction	Tillet et al., 1996

Units in ug/g-d

a Aluminum is identified as a COPC only at sites where the soil pH is less than 5.5 (Eco SSL, November 2003).

b High TRVs are equivalent to the LOAEL from the study that the low TRV (NOAEL) was selected.

c Aroclor 1254 used as a surrogate.

d Based on mixed BHC isomers.

NA - not applicable/available

Table 5-11. Summary of Hazard Quotients for Wildlife Dietary Exposures
Fletcher's Paint Superfund Site

HQ Summaries for Kingfisher

COPC	White Sucker Ingestion				Redbreast Sunfish Ingestion			
	Area A/B		Reference Area C		Area A/B		Reference Area C	
	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ
Total PCB (Aroclor)	8.1E+00	1.0E+01	7.8E-01	9.8E-01	6.6E-01	8.3E-01	8.6E-03	1.1E-02
Total PCB (Congener)	7.0E+00	8.7E+00	3.6E-01	4.4E-01	1.0E+00	1.3E+00	4.3E-03	5.4E-03
PCB_TEQ_BIRD	6.6E+00	6.6E+01	4.2E-01	4.2E+00	1.5E+00	1.5E+01	2.6E-02	2.6E-01
Total DDx	1.6E-03	1.6E-02	1.5E-03	1.5E-02	7.3E-04	7.3E-03	5.2E-04	5.2E-03
BHC	9.9E-05	4.1E-04	3.2E-04	1.3E-03	3.6E-04	1.5E-03	3.6E-04	1.5E-03
Chromium	3.8E-03	3.8E-02	1.5E-03	1.5E-02			1.9E-03	1.9E-02
Cobalt	2.6E-04	2.6E-03	1.8E-04	1.8E-03			1.9E-04	1.9E-03
Copper	1.3E-02	3.9E-02	4.2E-03	1.2E-02	5.9E-03	1.8E-02	3.7E-03	1.1E-02
Manganese	2.5E-03	2.5E-02	2.2E-03	2.2E-02	1.4E-04	1.4E-03	1.9E-04	1.9E-03
Mercury	1.5E-02	1.5E-01	1.4E-02	1.4E-01	2.8E-02	2.8E-01	3.0E-02	3.0E-01
Nickel	7.5E-04	7.5E-03	1.5E-03	1.5E-02			6.7E-04	6.7E-03
Zinc	5.5E-03	5.5E-02	4.8E-03	4.8E-02	1.8E-03	1.8E-02	1.6E-03	1.6E-02

HQ Summaries for Heron

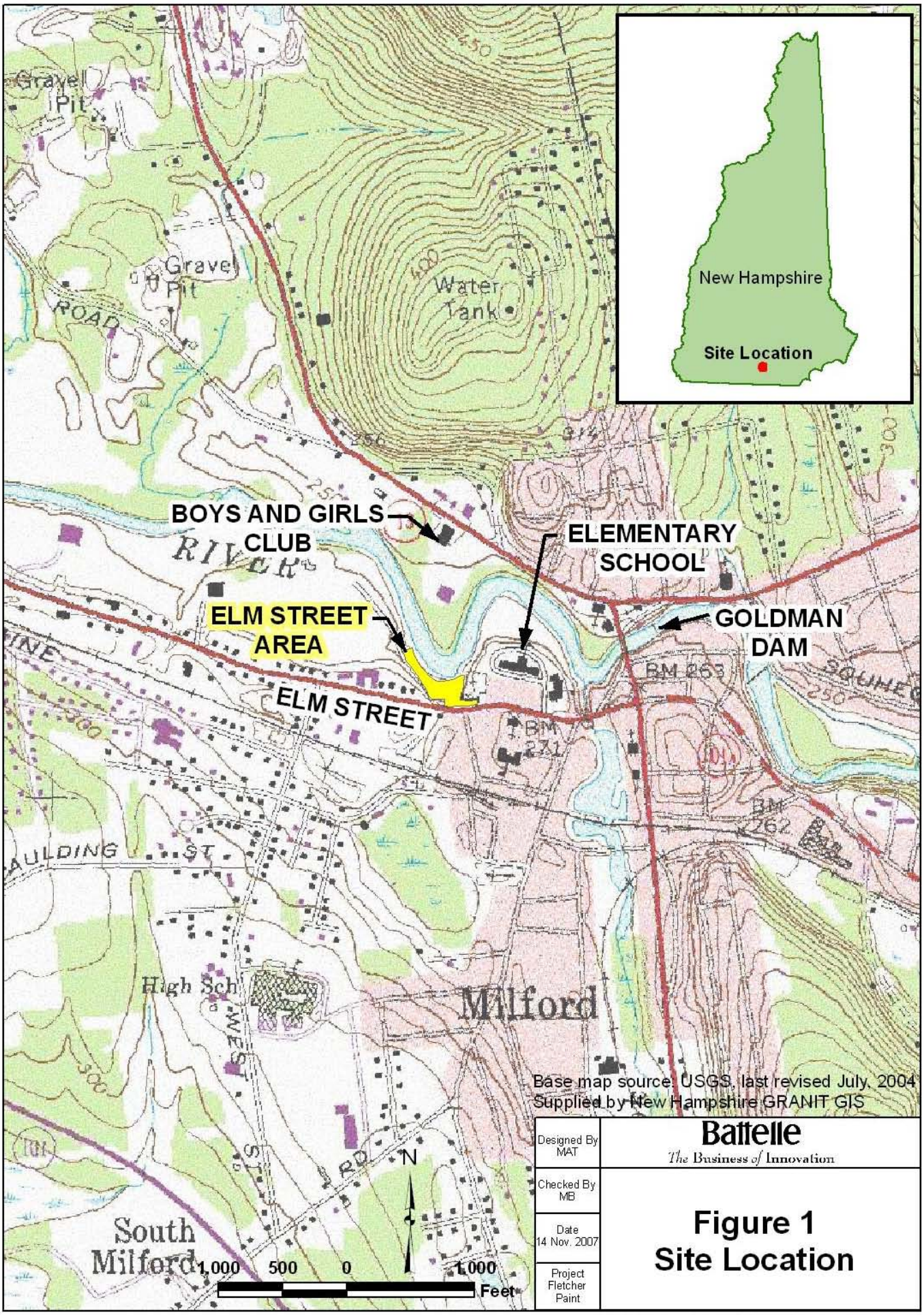
COPC	White Sucker Ingestion				Redbreast Sunfish Ingestion			
	Area A/B		Reference Area C		Area A/B		Reference Area C	
	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ
Total PCB (Aroclor)	8.1E+00	1.0E+01	7.4E-01	9.3E-01	6.3E-01	7.8E-01	1.0E-02	1.3E-02
Total PCB (Congener)	7.3E+00	9.1E+00	3.4E-01	4.2E-01	1.2E+00	1.5E+00	5.1E-03	6.3E-03
PCB_TEQ_Bird	6.8E+00	6.8E+01	3.9E-01	3.9E+00	2.8E+00	2.8E+01	2.5E-02	2.5E-01
Total DDx	2.7E-03	2.7E-02	1.5E-03	1.5E-02	1.8E-03	1.8E-02	6.3E-04	6.3E-03
BHC	4.0E-04	1.7E-03	3.0E-04	1.2E-03	6.5E-04	2.7E-03	3.4E-04	1.4E-03
Chromium	2.2E-02	2.2E-01	2.6E-02	2.6E-01	1.9E-02	1.9E-01	2.7E-02	2.7E-01
Cobalt	1.2E-03	1.2E-02	9.4E-04	9.4E-03	9.3E-04	9.3E-03	9.5E-04	9.5E-03
Copper	1.2E-01	3.5E-01	1.3E-01	3.9E-01	1.1E-01	3.3E-01	1.3E-01	3.9E-01
Manganese	2.4E-03	2.4E-02	2.0E-03	2.0E-02	1.3E-04	1.3E-03	1.8E-04	1.8E-03
Mercury	1.6E-02	1.6E-01	2.3E-02	2.3E-01	2.9E-02	2.9E-01	3.8E-02	3.8E-01
Nickel	2.9E-03	2.9E-02	3.9E-03	3.9E-02	2.2E-03	2.2E-02	3.0E-03	3.0E-02
Zinc	5.5E-02	5.5E-01	5.5E-02	5.5E-01	5.1E-02	5.1E-01	5.2E-02	5.2E-01

HQ Summaries for Mink

COPC	White Sucker Ingestion				Redbreast Sunfish Ingestion			
	Area A/B		Reference Area C		Area A/B		Reference Area C	
	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ	LOAEL-Based HQ	NOAEL-Based HQ
Total PCB (Aroclor)	4.4E+01	5.3E+01	4.2E+00	5.1E+00	3.7E+00	4.4E+00	4.7E-02	5.6E-02
Total PCB (Congener)	3.8E+01	4.5E+01	1.9E+00	2.3E+00	5.7E+00	6.8E+00	2.4E-02	2.9E-02
PCB_TEQ_MAMMAL	5.9E+00	1.6E+02	1.2E+01	3.4E+02	2.0E-01	5.5E+00	1.4E-02	3.8E-01
Total DDx	5.4E-03	2.7E-02	4.7E-03	2.4E-02	2.5E-03	1.3E-02	1.7E-03	8.5E-03
BHC	2.0E-03	2.0E-02	5.5E-03	5.5E-02	6.4E-03	6.4E-02	6.1E-03	6.1E-02
Chromium	5.5E-03	5.5E-02	3.2E-03	3.2E-02	1.1E-03	1.1E-02	3.6E-03	3.6E-02
Cobalt	4.5E-04	4.5E-03	3.4E-04	3.4E-03	1.7E-04	1.7E-03	3.5E-04	3.5E-03
Copper	1.9E-02	3.2E-02	7.4E-03	1.2E-02	9.5E-03	1.6E-02	6.9E-03	1.1E-02
Manganese	9.1E-03	9.1E-02	7.8E-03	7.8E-02	4.9E-04	4.9E-03	7.0E-04	7.0E-03
Mercury	6.9E-02	2.2E-01	6.6E-02	2.2E-01	1.3E-01	4.3E-01	1.4E-01	4.6E-01
Nickel	1.9E-02	3.9E-02	3.6E-02	7.2E-02	4.1E-03	8.2E-03	1.8E-02	3.6E-02
Zinc	5.2E-03	5.2E-02	4.5E-03	4.5E-02	1.8E-03	1.8E-02	1.6E-03	1.6E-02

Note: Shaded entries indicate a potential for adverse effects (HQs >1.0)

LIST OF FIGURES



Designed By MAT	Battelle *The Business of Innovation*
Checked By MB	**Figure 1 Site Location**
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Project Fletcher Paint	

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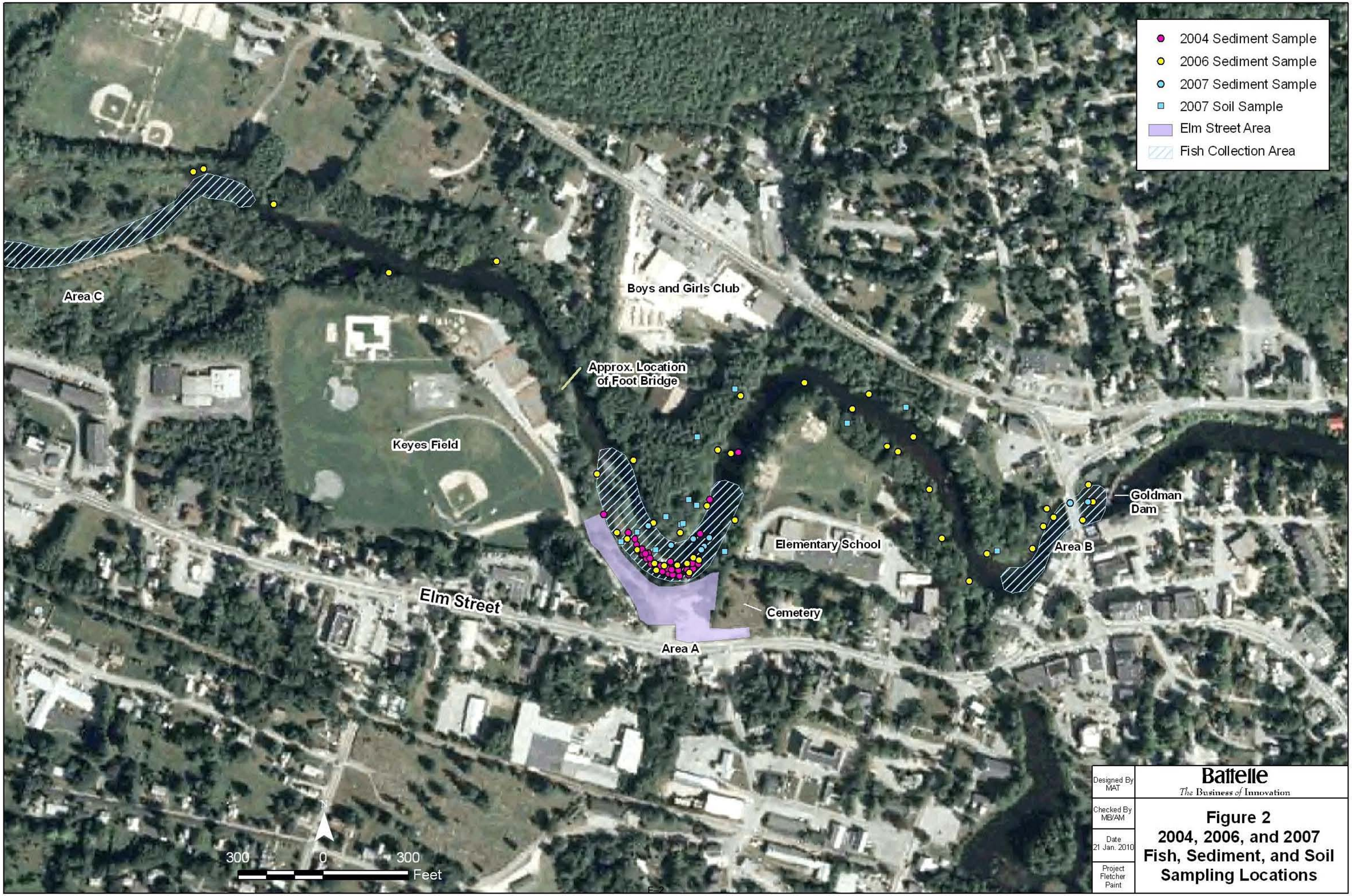

Designed By MAT	Battelle *The Business of Innovation*
Checked By MB/AM	**Figure 2**
Date 21 Jan. 2010	**2004, 2006, and 2007 Fish, Sediment, and Soil Sampling Locations**
Project Fletcher Paint	

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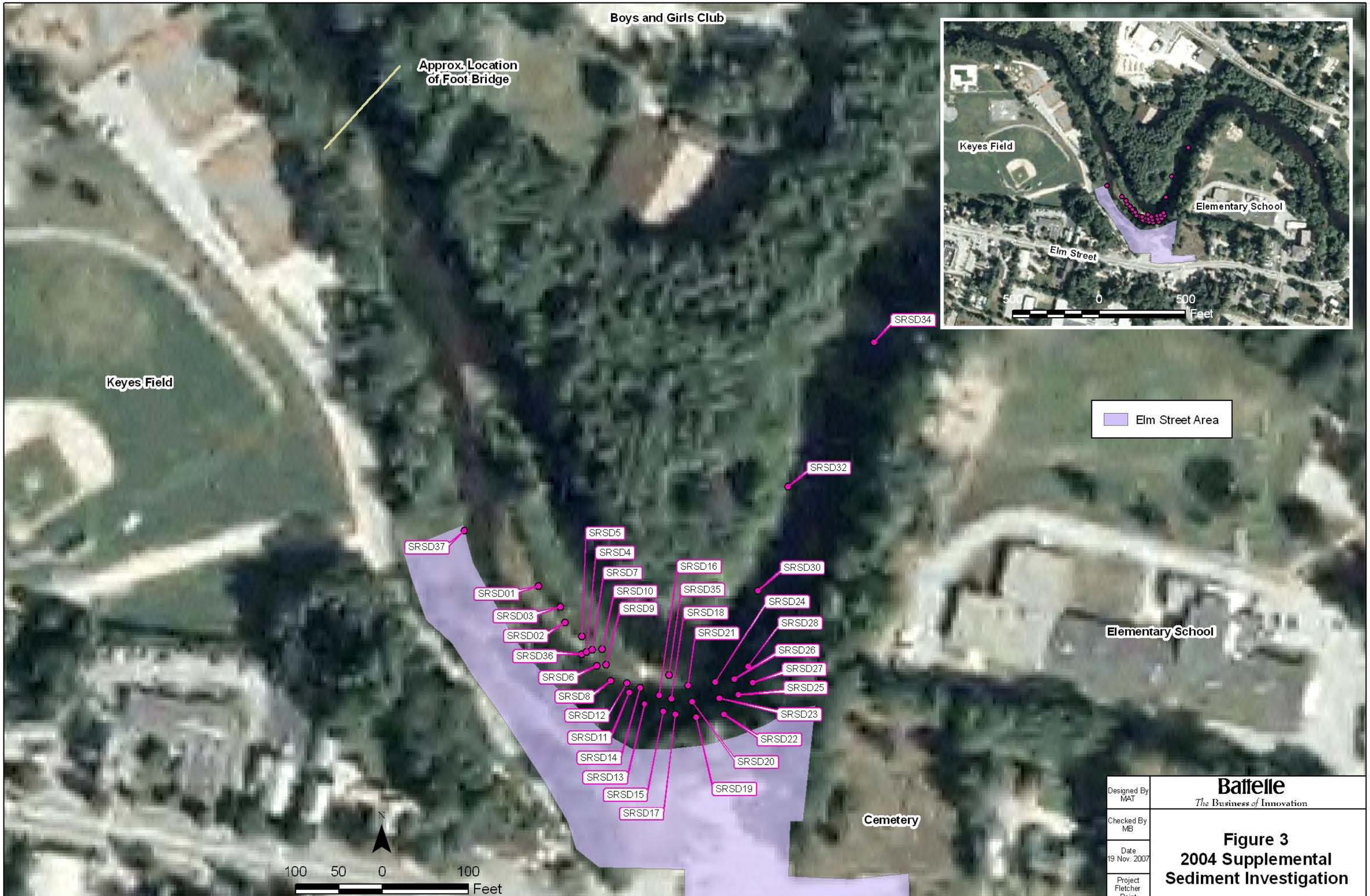

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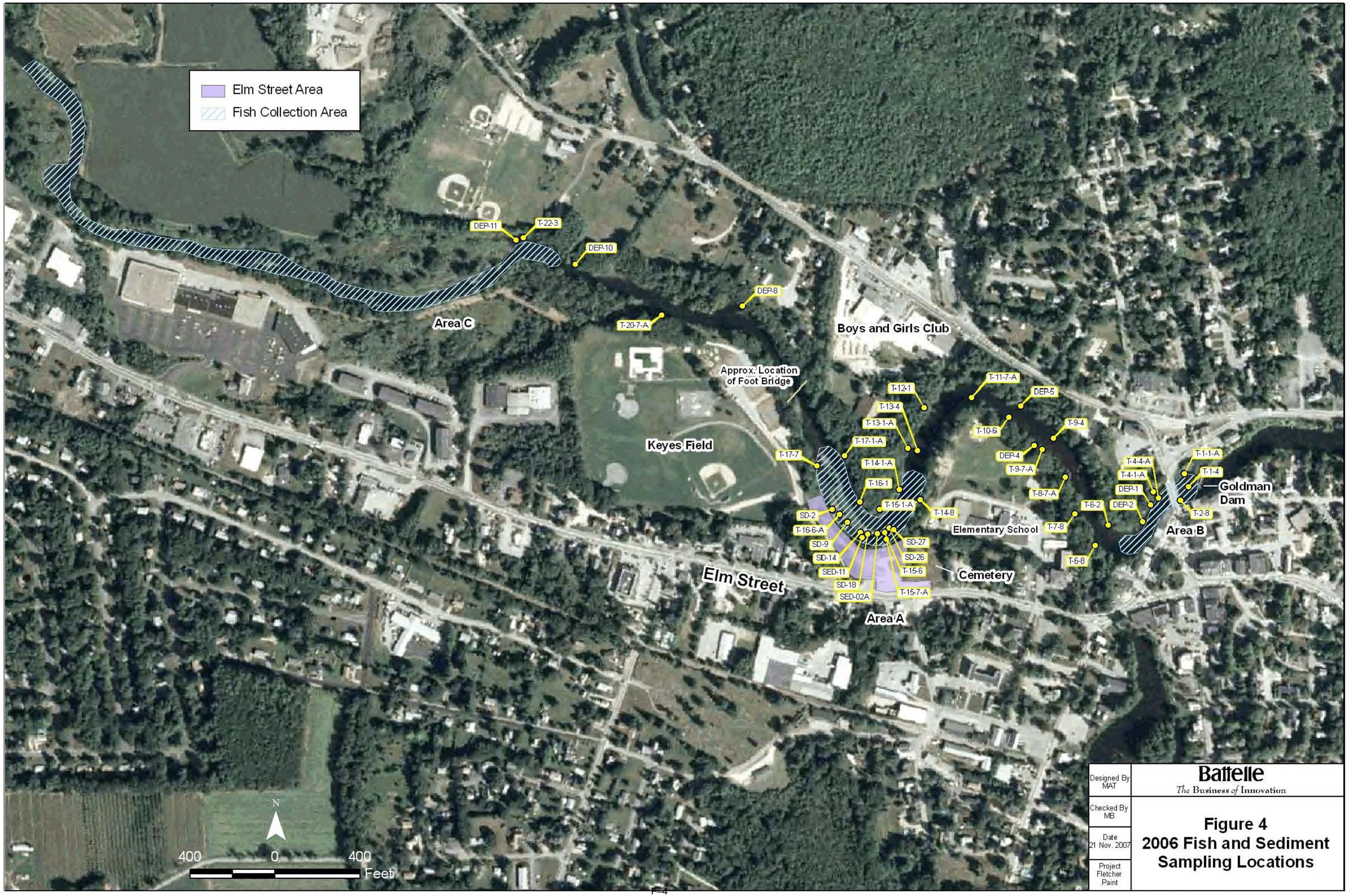

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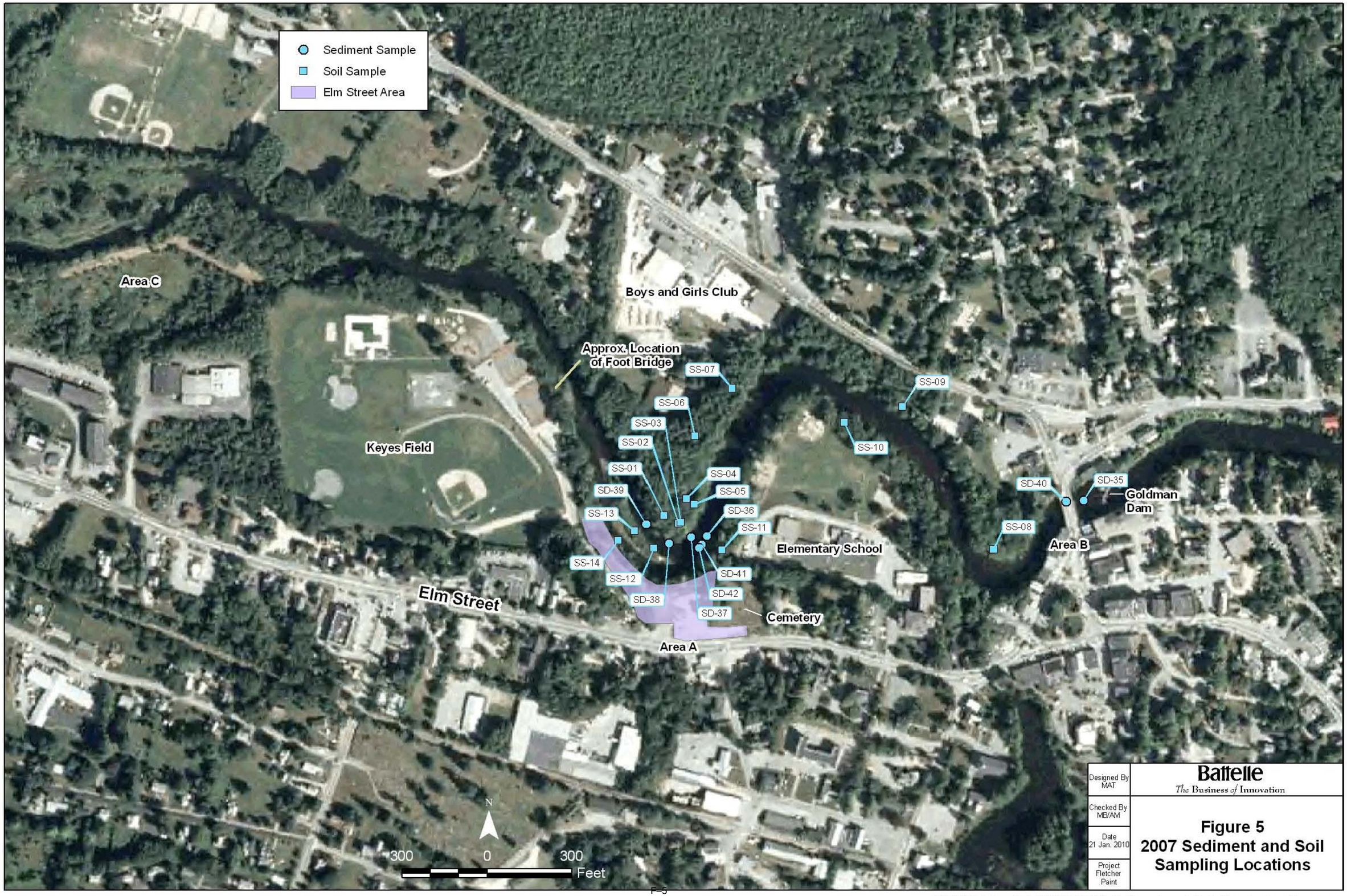

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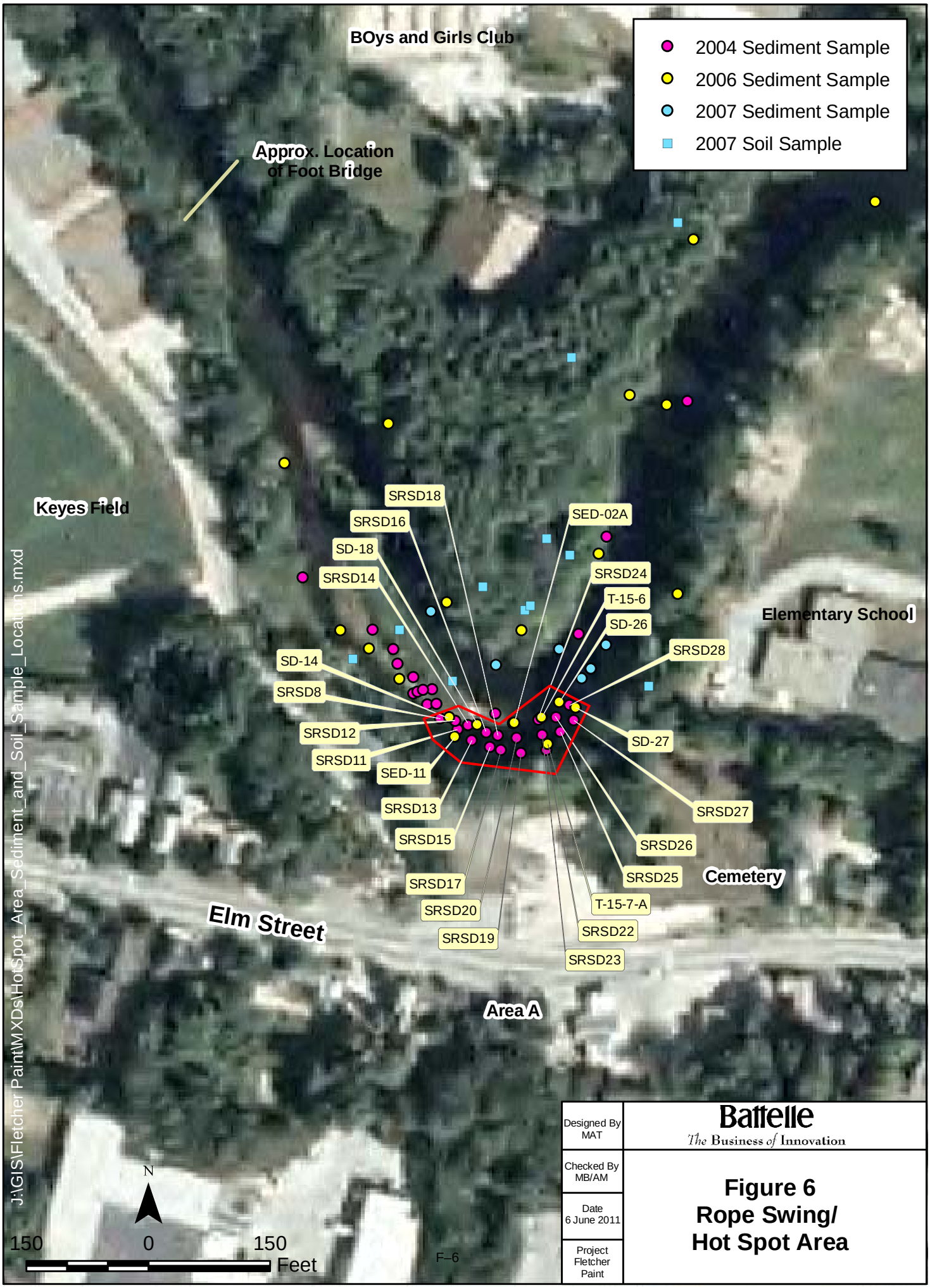
BOys and Girls Club
2004 Sediment Sample
2006 Sediment Sample
2007 Sediment Sample
2007 Soil Sample
Approx. Location of Foot Bridge
Keyes Field
Elementary School
Cemetery
Elm Street
Area A
SRSD18
SRSD16
SD-18
SRSD14
SED-02A
SRSD24
T-15-6
SD-26
SRSD28
SD-14
SRSD8
SRSD12
SRSD11
SED-11
SRSD13
SRSD15
SRSD17
SRSD20
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SD-27
SRSD27
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SRSD25
T-15-7-A
SRSD22
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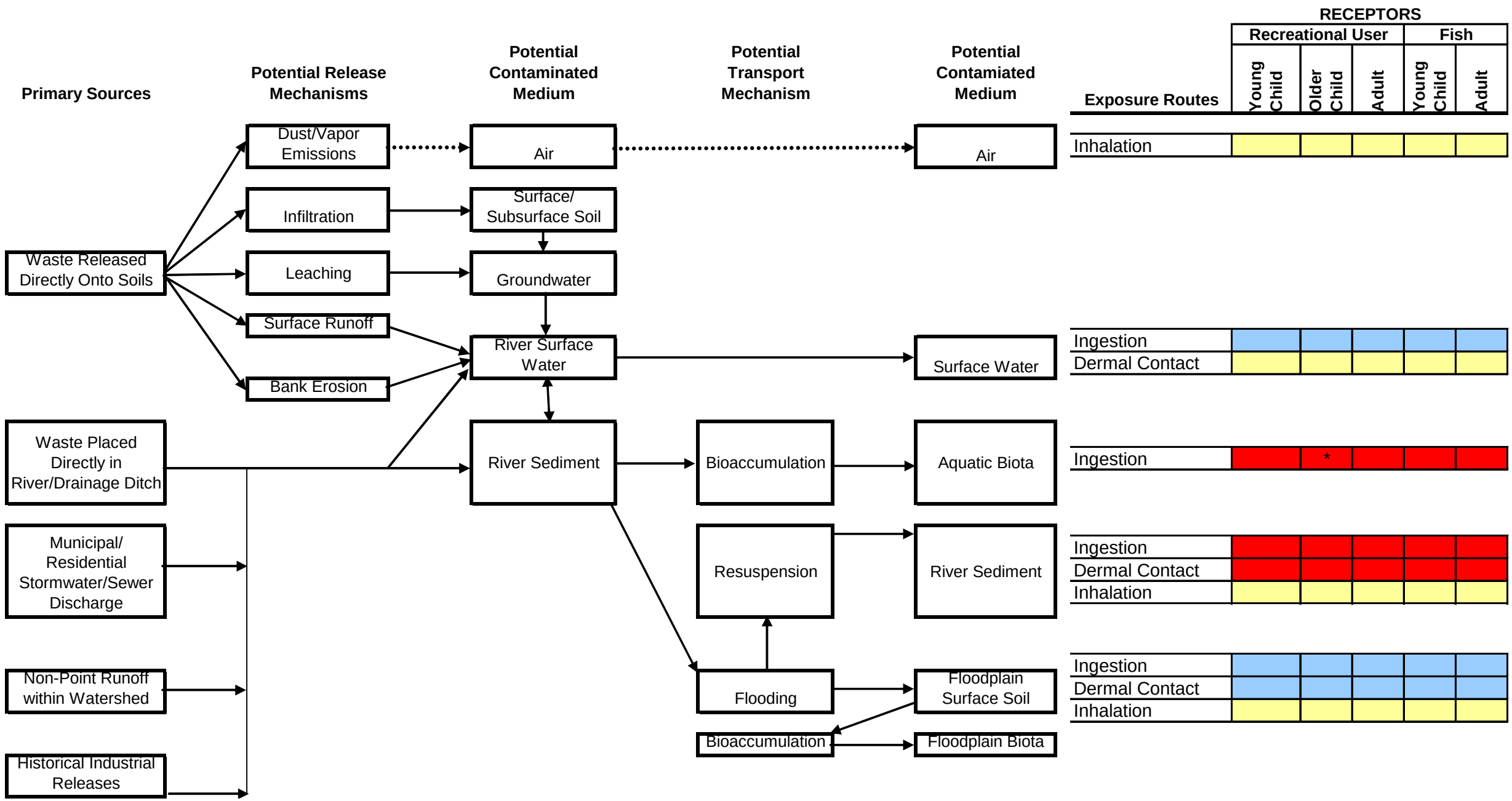
Designed By MAT
Battelle
The Business of Innovation
Checked By MB/AM
Date 6 June 2011
Project Fletcher Paint
Figure 6
Rope Swing/
Hot Spot Area
F–6



Unlikely to be a significant pathway, not evaluated.
Complete exposure pathway of secondary concern, not quantitatively evaluated.
Complete exposure pathway of primary concern, quantitatively evaluated.

*Ingestion by an older child is not specifically evaluated, but is covered by the exposure to a child and adult.

Figure 7. CSM for Human Health Risk Assessment

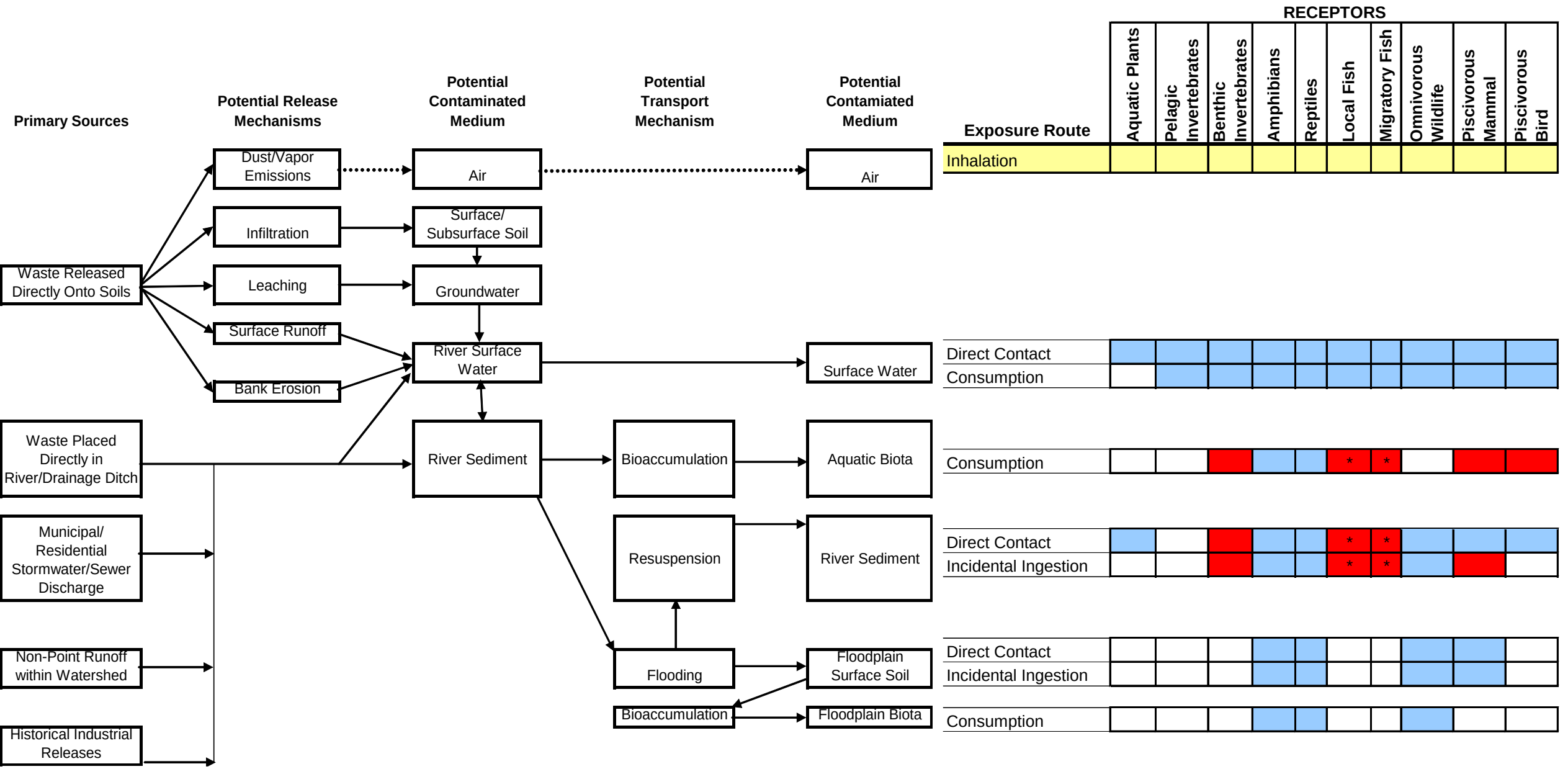


Figure 8. CSM for Ecological Risk Assessment

Figure 9. Total Hazards to Benthic Invertebrates - Area A/B

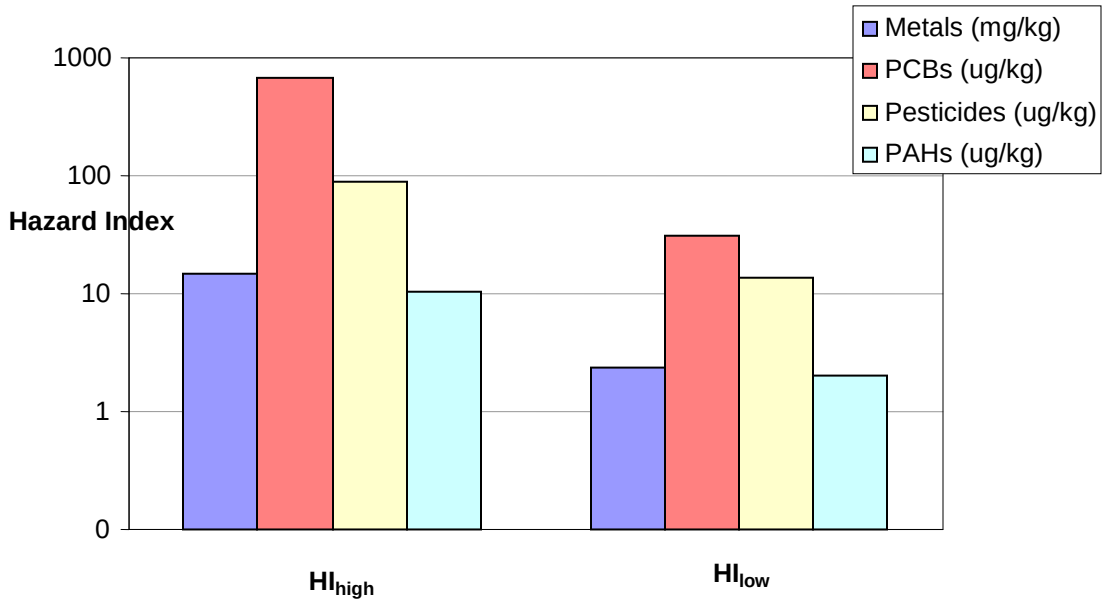


Figure 10. Percent Contribution of Overall Hazards to Benthic Invertebrates - Area A/B

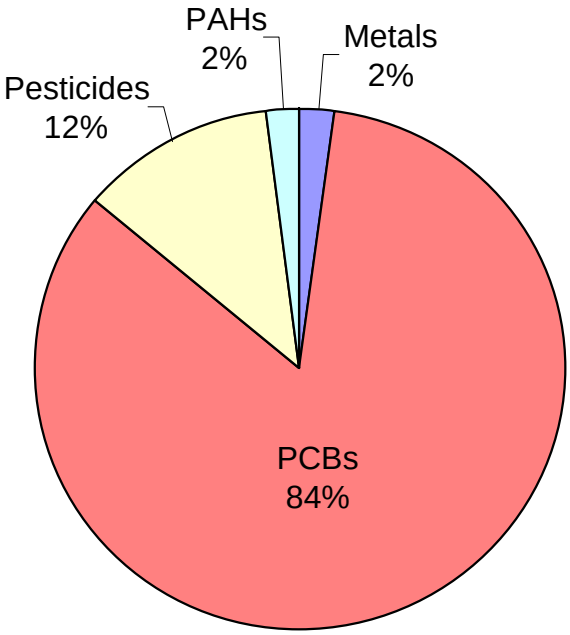


Figure 11. Overall Hazards to Fish

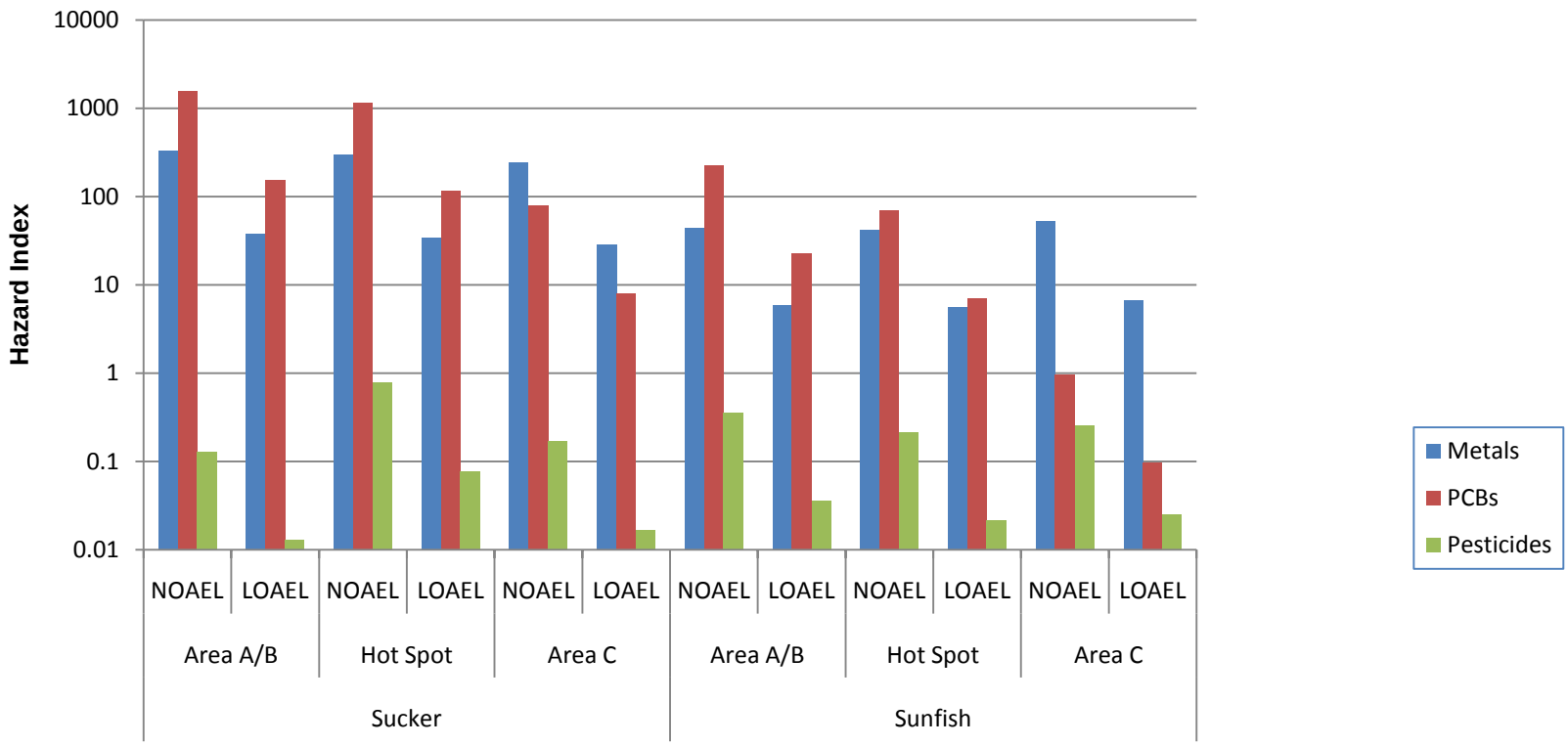
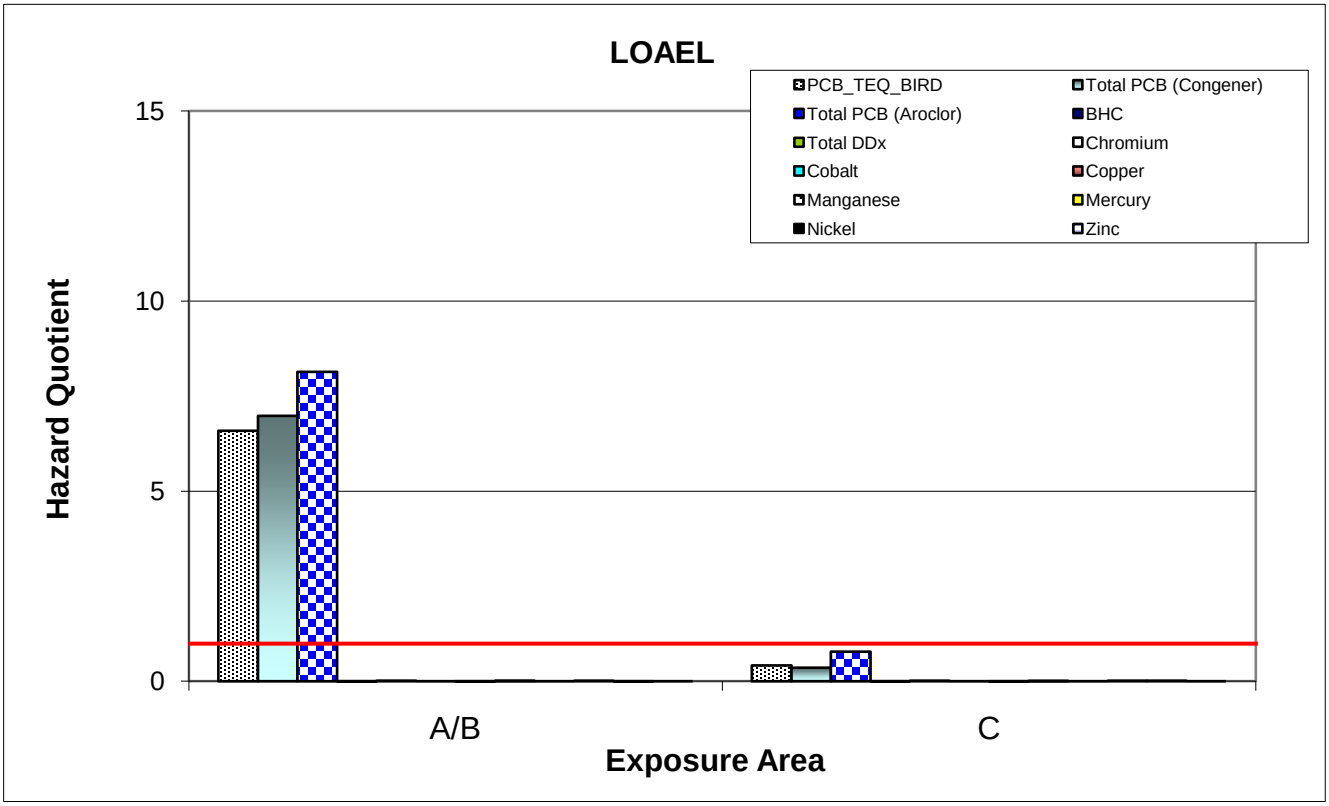


FIGURE 12A
Summary of Wildlife Exposure Modeling - Kingfisher (White Sucker Ingestion)

Ecological Risk Assessment
Fletcher's Paint Superfund Site



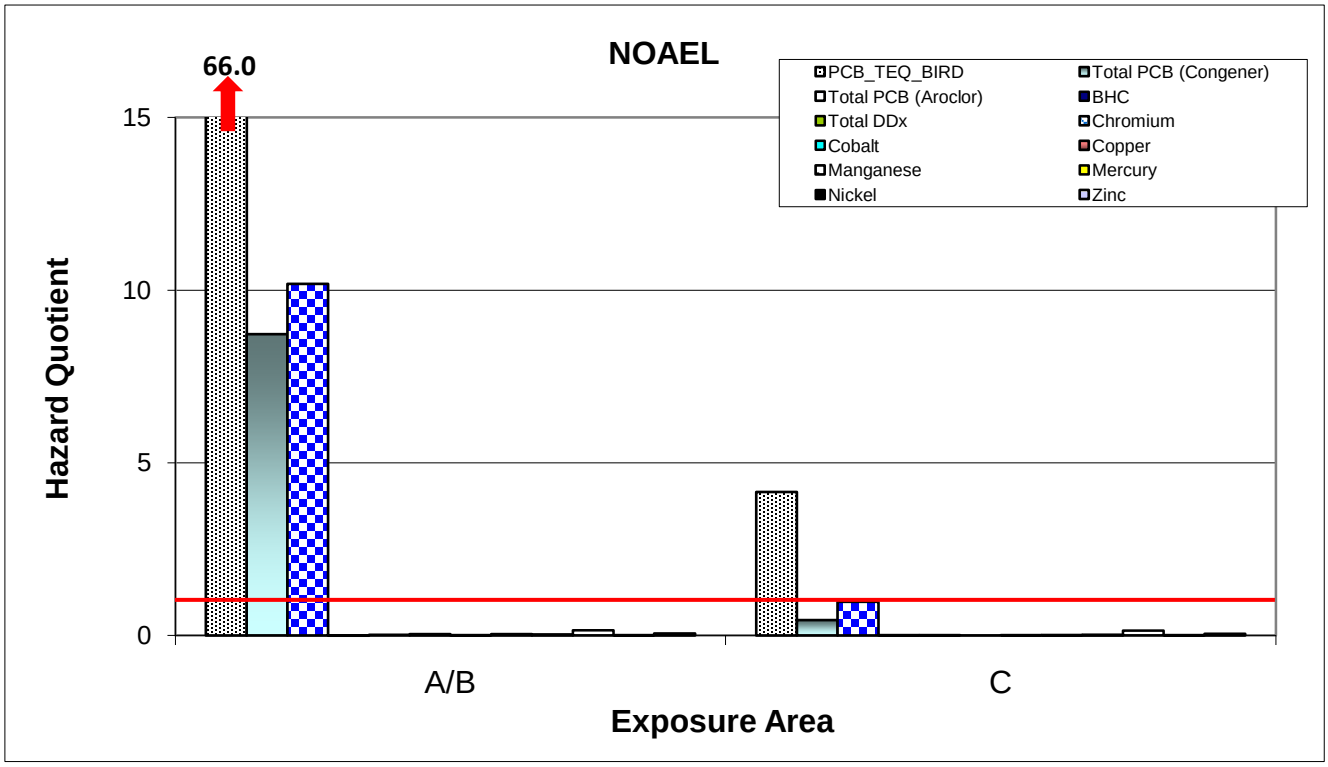
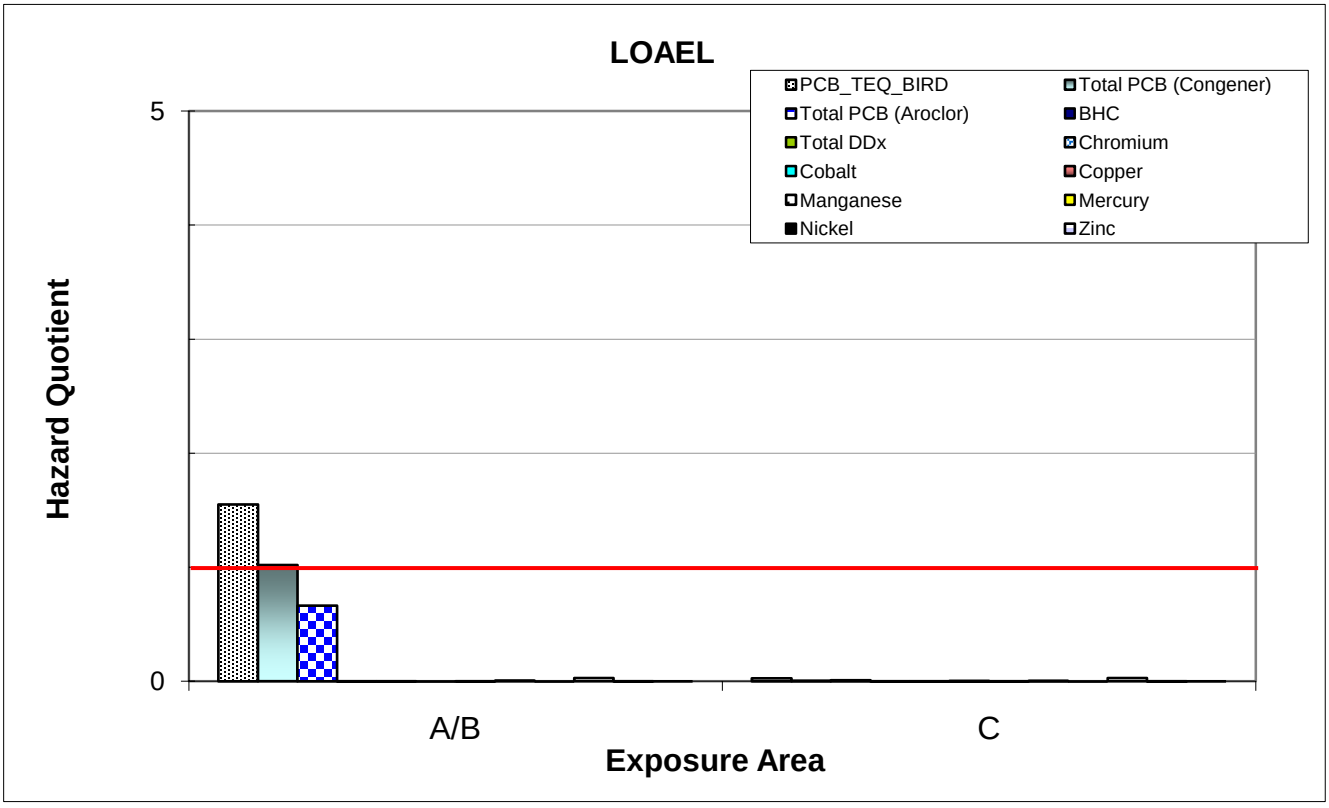


FIGURE 12B
Summary of Wildlife Exposure Modeling - Kingfisher (Redbreast Sunfish Ingestion)

Ecological Risk Assessment
Fletcher's Paint Superfund Site



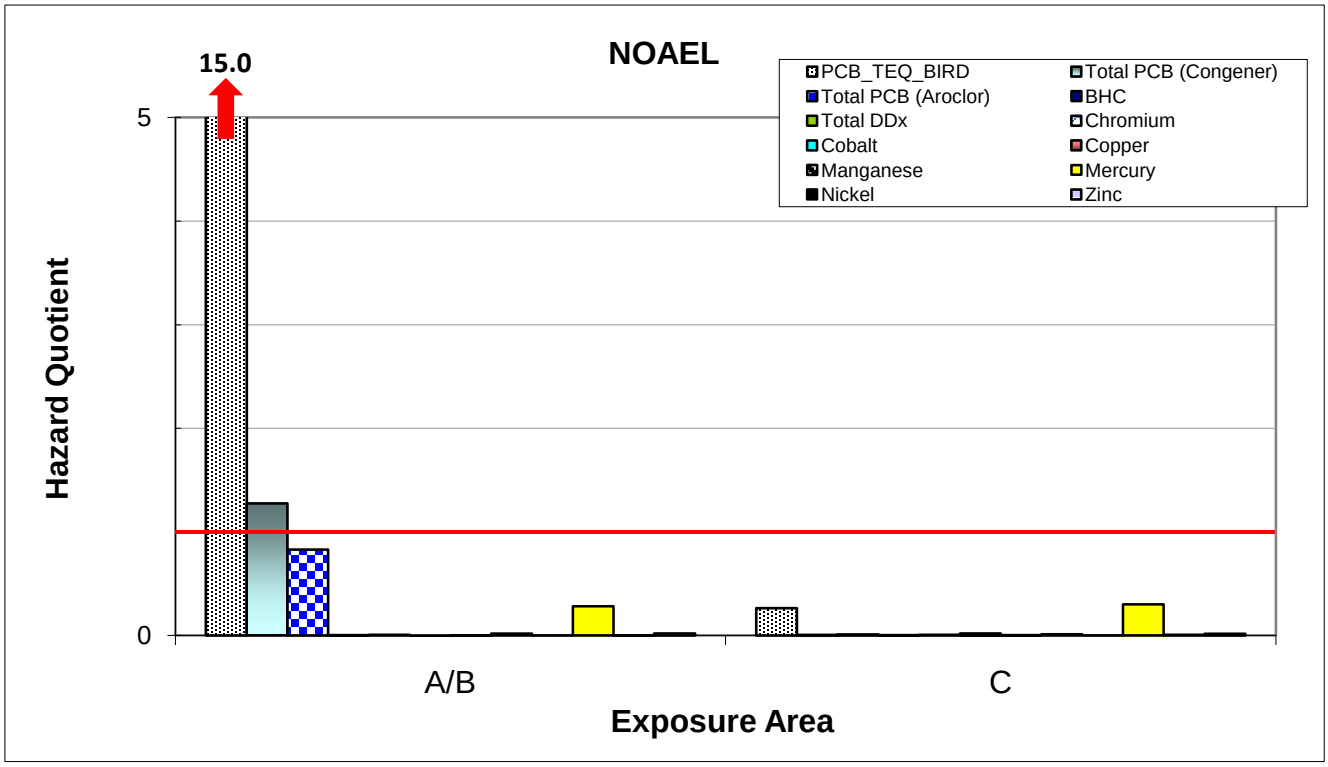
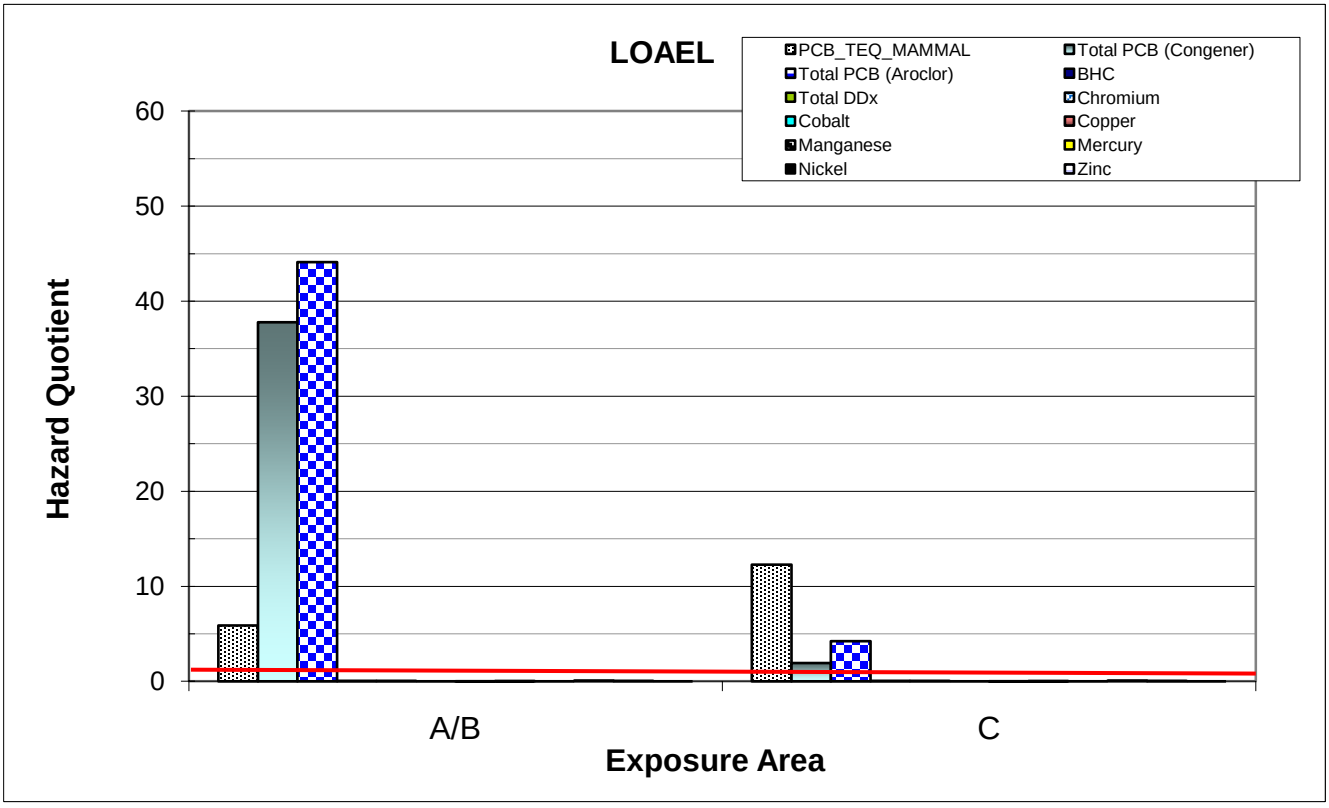


FIGURE 13A
Summary of Wildlife Exposure Modeling - Mink (White Sucker Ingestion)

Ecological Risk Assessment
Fletcher's Paint Superfund Site



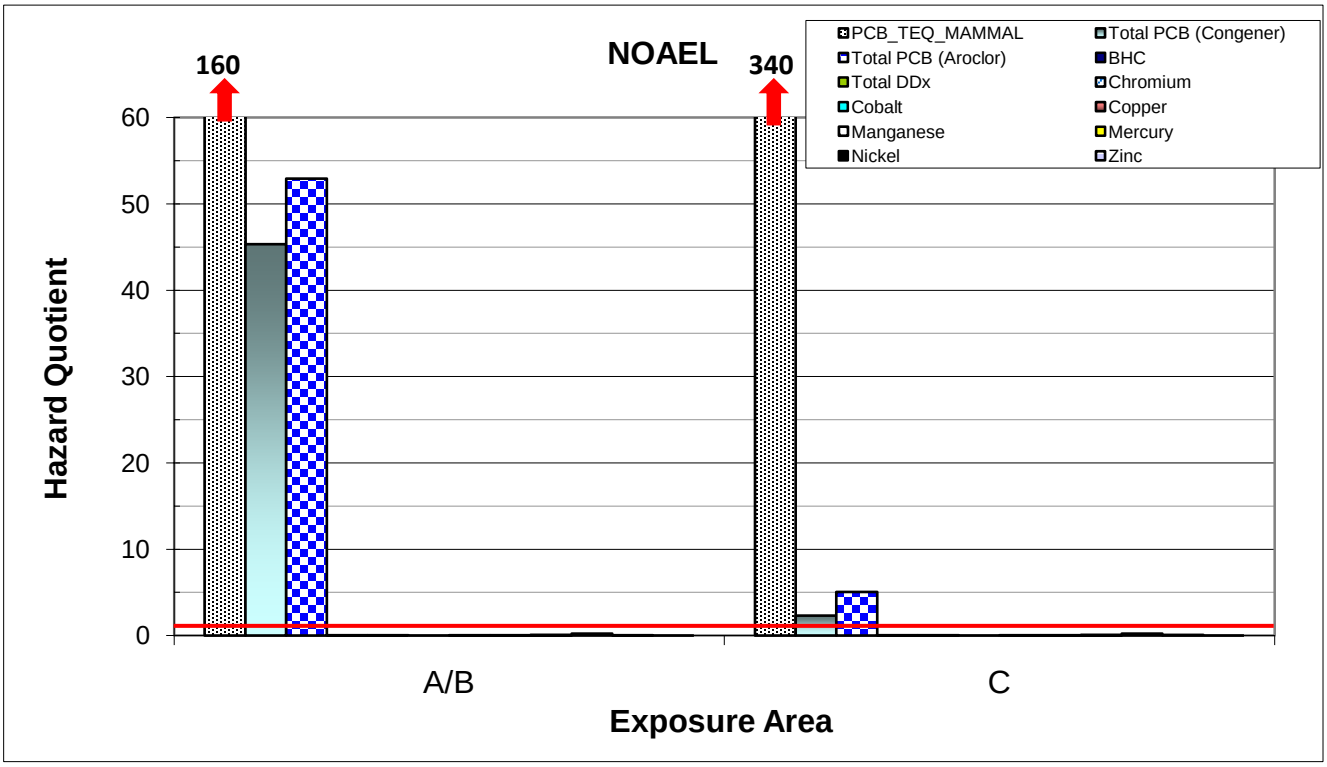
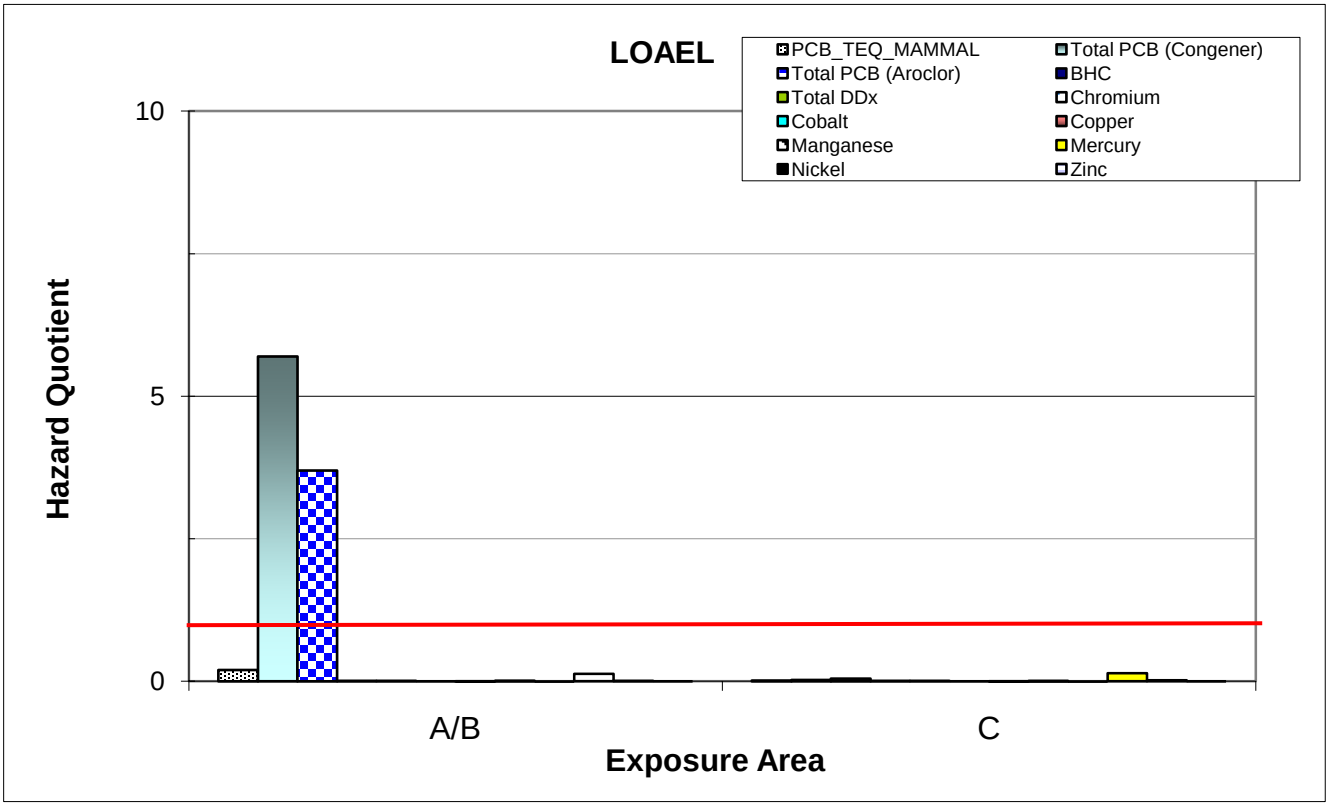


FIGURE 13B
Summary of Wildlife Exposure Modeling - Mink (Redbreast Sunfish Ingestion)

Ecological Risk Assessment
Fletcher's Paint Superfund Site



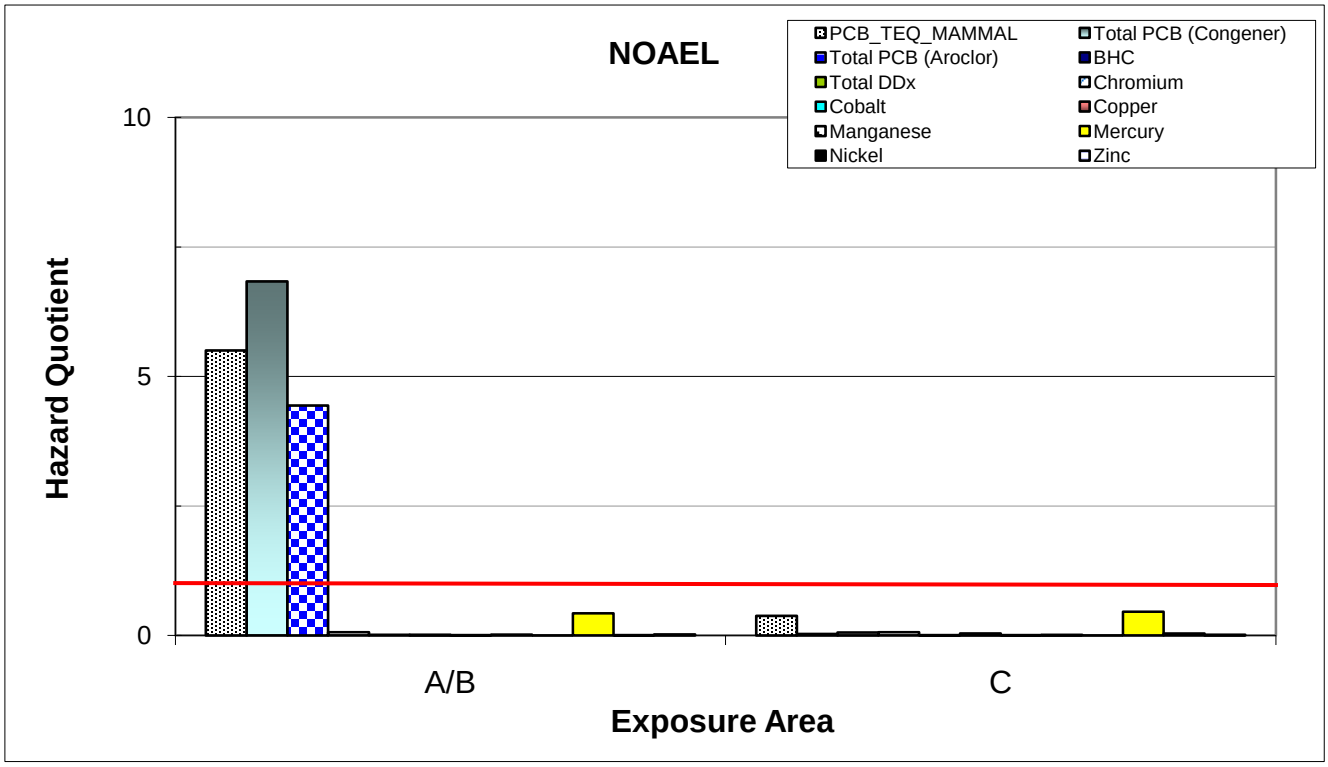
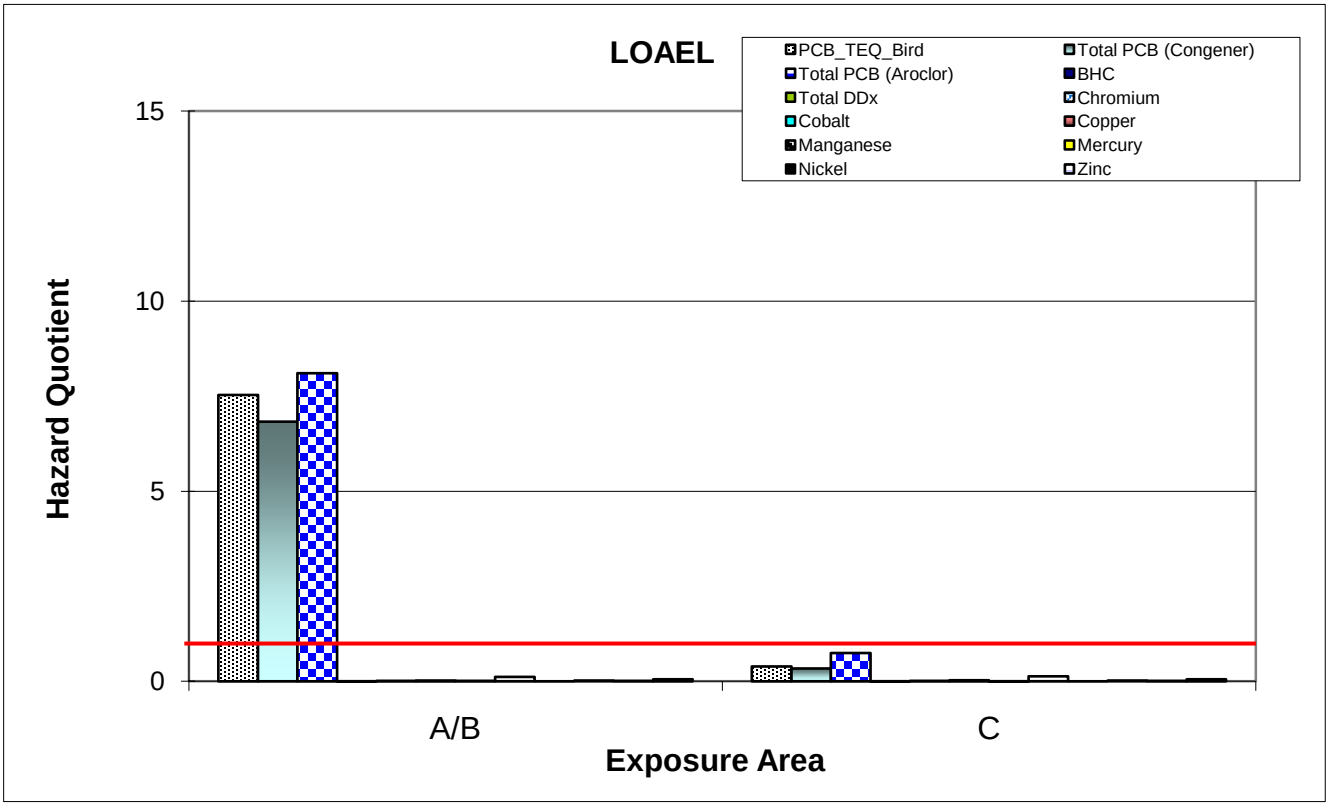


FIGURE 14A
Summary of Wildlife Exposure Modeling - Heron (White Sucker Ingestion)

Ecological Risk Assessment
Fletcher's Paint Superfund Site



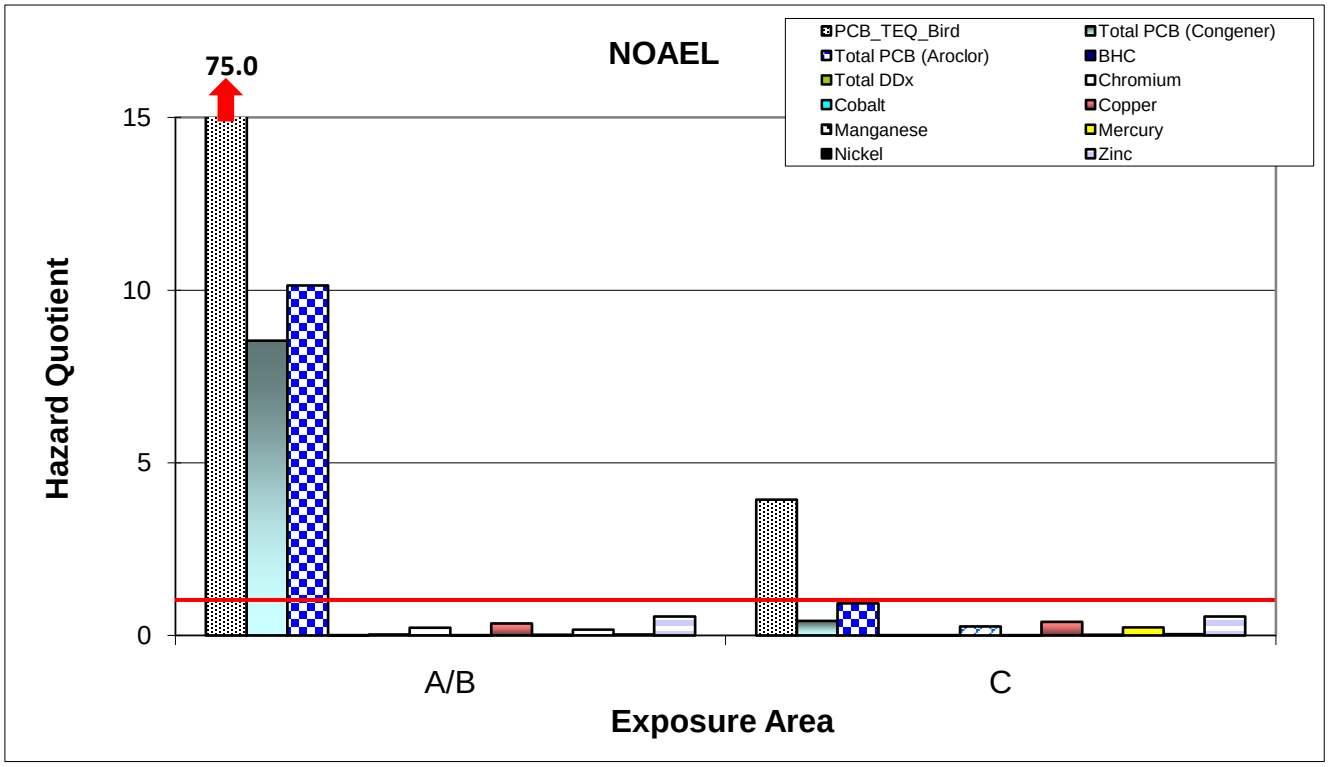
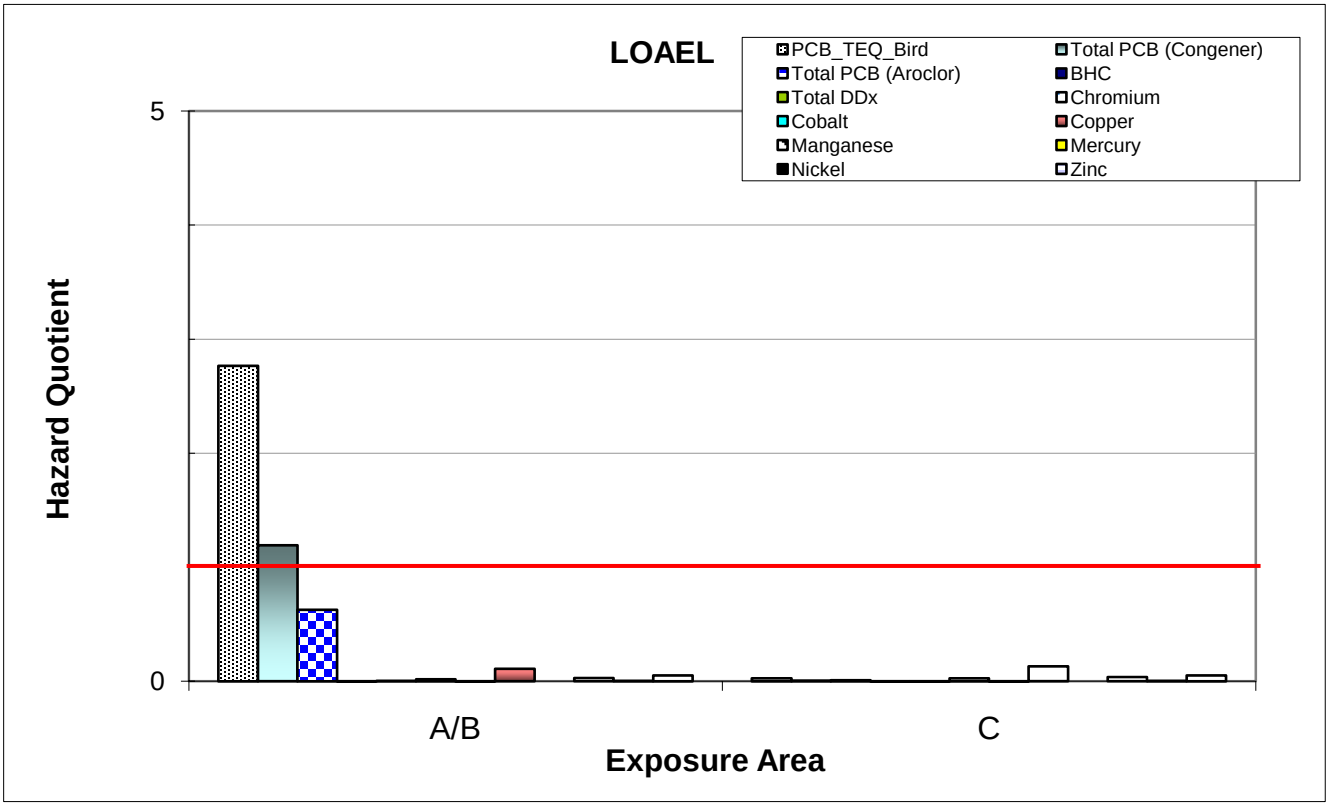
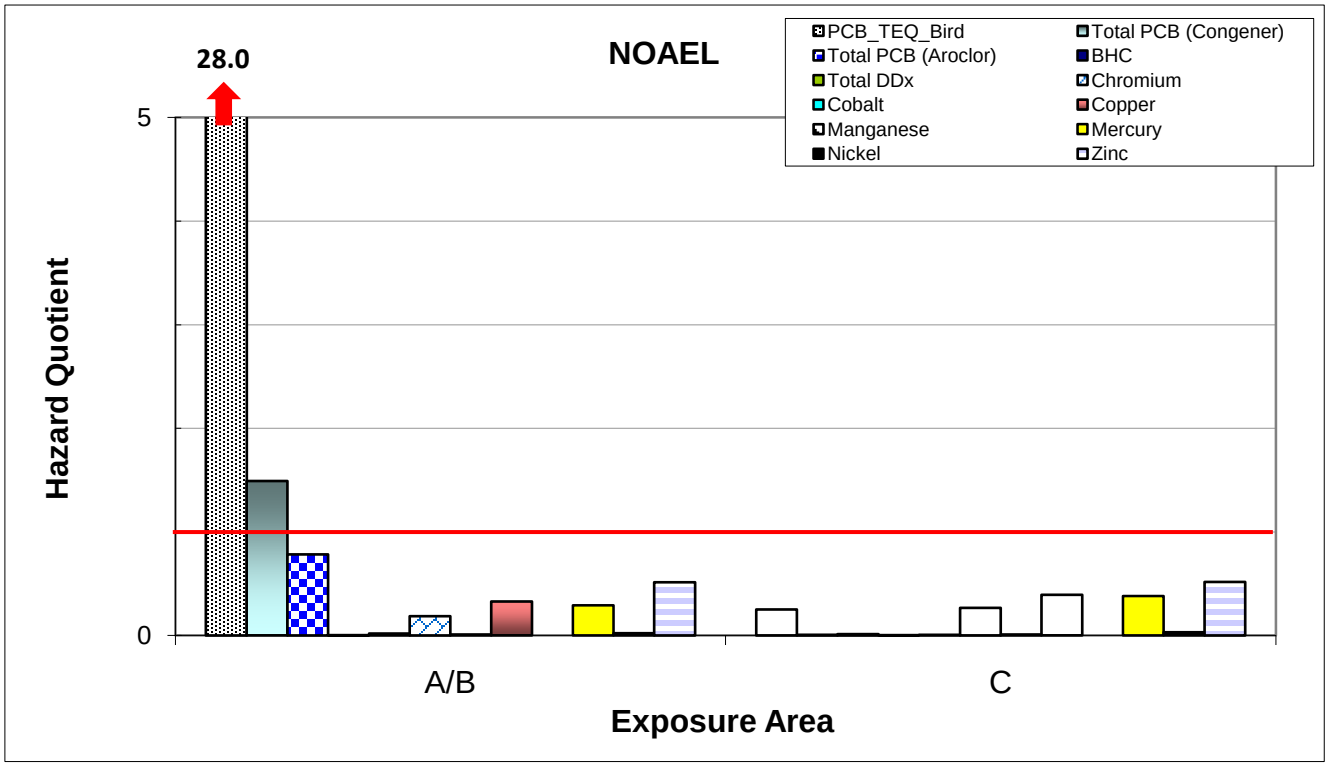


FIGURE 14B
Summary of Wildlife Exposure Modeling - Heron (Redbreast Sunfish Ingestion)

Ecological Risk Assessment
Fletcher's Paint Superfund Site





APPENDIX A

Data Summary Tables

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HEALTH CONSULTATION

EVALUATION OF CHEMICAL CONTAMINATION OF FISH FROM THE SOUHEGAN RIVER AREA OF

FLETCHER'S PAINT STORAGE FACILITY MILFORD, HILLSBOROUGH COUNTY, NEW HAMPSHIRE

CERCLIS NO. NHD981067614

December 10, 1997

Prepared by:

New Hampshire Office of Health Management
Bureau of Health Risk Assessment
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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HEALTH CONSULTATION

EVALUATION OF CHEMICAL CONTAMINATION OF FISH FROM THE SOUHEGAN RIVER AREA OF

FLETCHER'S PAINT STORAGE FACILITY MILFORD, HILLSBOROUGH COUNTY, NEW HAMPSHIRE

The Bottom Line

Fish from the Souhegan River near the Fletcher's Paint Works Superfund site were tested for contaminants. Contaminants were found in all fish. The amount of contaminants in the fish may pose a health risk over time to people who eat fish caught near the site. To reduce exposure to contaminants it is recommended that people limit eating fish from this area of the Souhegan River. Ingestion of contaminants found in the fish can be reduced by carefully trimming, skinning, and cooking the fish.

INTRODUCTION

Purpose

This Health Consultation discusses recent data describing chemical contamination of fish caught near the Fletcher's Paint Works and Storage Facility Superfund site and evaluates human health risk from eating contaminated fish from this area. The fish were tested because the presence of contaminants in the river and river sediments suggested that fish living in the area may also be contaminated. The risks posed by direct contact with the soils and river sediments near the site were evaluated in a previous health consultation prepared by the New Hampshire Office of Health Management-Bureau of Health Risk Assessment (BHRA) and were found to be a concern because of high contaminant levels[1]. These risks have been a concern of the community, the Environmental Protection Agency (EPA), BHRA and the Agency for Toxic Substances and Disease Registry (ATSDR).

Contaminants in fish

Fish are nutritious and good to eat, but some fish may take in contaminants from the water they live in and from the food they eat. Some of these contaminants build up in the fish over time. These contaminants could harm the people who eat them, so it is important to keep exposure to these contaminants as low as possible. Two contaminants of concern found at the site, PCBs (polychlorinated biphenyls) and pesticides are long-lasting contaminants and can build up in the fish and in the bodies of people who eat them over time. It takes months or years of regularly

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eating contaminated fish to build up amounts of contaminants in the body which are a health concern. Health problems that may result from the contaminants found in fish range from small changes in health to birth defects and cancer.

BACKGROUND AND STATEMENT OF ISSUES

Site Description

The Fletcher's Paint Works and Storage Facility site was listed on the National Priority List in March, 1989 and became inactive in 1991. The site consists of three areas; the Elm Street site, the Mill Street site and the drainage ditch/culvert system[1]. The Elm Street site contains the original Fletcher's Paint Works building which is bordered on the South by Elm Street, to the North by the Souhegan River, to the west by Keyes Park and to the East by a cemetery. The main part of this building is currently in use as a consignment store. The Mill Street site formerly contained a storage facility and is bordered to the North by a railroad track, to the South by Mill Street and residences, to the West by a coal yard and to the East by Cottage Street. A drainage ditch runs North from the Mill Street pond underneath Mill Street passing through the coal yard and between two vegetable gardens located behind Cottage Street. The ditch then runs underneath Elm Street and the paint works building before emptying into the Souhegan River directly behind the paint facility.

A Preliminary Health Assessment prepared by BHRA and issued in June of 1990 by ATSDR determined the site to be of potential public health concern because of risks associated with the potential exposure to volatile organic chemicals, PCBs (polychlorinated biphenyls), PAHs (polyaromatic hydrocarbons), and metals from soils, sediments and groundwater[2]. Since then, BHRA has prepared two health consultations regarding PCB contamination in the Mill Street area[3] and one health consultation regarding contamination of the Souhegan River, river sediments and river bank area[1].

A site visit was conducted on May 19, 1994 by Dennis Pinski and Robert Duff (BHRA) while accompanied by Greg Ulirsch (Technical Project Officer-ATSDR), Ted Bazenas (Regional Representative-ATSDR), EPA's remedial project manager, the site manager for the New Hampshire Department of Environmental Services and the Town Assessor[1]. During the visit it was noted that residents had been seen with children sun bathing on a sand bar in the Souhegan River approximately fifty yards upstream from the Elm Street facility. Easy access to this part of the river is available from Keyes Park which is West of the Elm Street facility and directly adjacent to it. Access via the cemetery on the opposite side of the paint facility was also noted. A path extends from the rear of the cemetery down to the river immediately adjacent to the paint

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facility. This area showed signs of recurrent use and provides access to the river. In 1997 a rope swing was installed across the river from the site. There is a visible path in the riverbed where sediments have been disturbed from Keyes Field to the sand bar, showing the route taken to access the swing.

Reason for Fish Testing

A Health Consultation prepared by BHRA in September, 1994 concluded that a public health hazard exists from long-term exposure to levels of PCBs and PAHs in the Souhegan River, river sediments, and river bank soil[1]. It is well established that certain chemicals such as PCBs can accumulate in fish from river contaminants[4]. Therefore, it is likely that fish in the Souhegan River near the Fletcher's Paint Works site are contaminated. The health risks posed by eating fish from the Souhegan River in the area of the site was a community health concern noted after a Public Availability session on May 19, 1994.

The river is accessible for fishing[1], except for a chain link fence that surrounds the Elm Street property. The fence does not prevent access from other properties to the riverbank adjacent to the site[5]. However, signs are posted at the fence near the riverbank at the upstream and downstream property boundaries of the Elm Street site and at the culvert outfall that warn that hazardous materials are present[5]. These signs do not warn against fishing or swimming. No other signs are posted near the river in this area. The accessibility of the river suggests that it is possible for the public to fish and swim there.

Fish Sampling

On October 25 and 26, 1994 personnel from an EPA contractor and the U.S. Fish and Wildlife Service collected samples of fish and freshwater mussels from the Souhegan River[6]. Samples were collected from both upstream and downstream of the Fletcher's Paint Works site. A total of 50 fish were taken from the river and 40 fish were analyzed. Twenty freshwater mussels were also collected. After collection the fish tissues were frozen. Table 1 summarizes the fish that were collected and analyzed.

Fish Test Results

In June 1995, fish were tested for PCBs and 21 pesticides. Some fish and mussels were collected to determine risk to the environment. This evaluation focuses on potential risks to human health only. Therefore the results shown are only for fish filets that are commonly eaten, that is, yellow bullhead and brown bullhead catfish (hornpouts). To simplify analysis of the results, the yellow and brown bullheads are grouped together. Upstream and downstream fish were also grouped

together. With regards to PCB contamination, downstream fish were about three times as contaminated on average as upstream fish. For pesticides upstream fish were contaminated just as much as downstream fish. The results are summarized in Table 2.

Table 1. Summary of Fish Collected and Analyzed from the Souhegan River

Number of Samples	Species	Collection Location	Tissue Analyzed
6	Brown Bullhead	Downstream	Fillet
6	Brown Bullhead	Downstream	Offal*
6	Brown Bullhead	Upstream	Fillet
6	Brown Bullhead	Upstream	Offal
4	Yellow Bullhead	Downstream	Fillet
4	Yellow Bullhead	Downstream	Offal
4	Yellow Bullhead	Upstream	Fillet
4	Yellow Bullhead	Upstream	Offal
10	Yellow Perch	Downstream	Whole Fish
10	Yellow Perch	Upstream	Whole Fish

*Offal is the parts of the fish that are not normally eaten. (October 1994)

Table 2. Results of Analysis of Fish from the Souhegan River

Chemical	Average Concentration* (ppb)	Maximum Concentration Detected (ppb)	Minimum Concentration Detected (ppb)	Number of Fish Testing Positive	Number of Fish Tested
Total PCBs**	232	660	30	20	20

DDD	5.1	15.8	4.78	8	20
DDE	32	131	8.84	20	20
DDT	3.1	14.2	0.8	14	20
Aldrin	5.3	17.5	3.68	10	20
Methoxychlor	3.5	3.09	3.09	1	20
Endosulfan sulfate	0.8	1.5	1.04	2	20
Heptachlor epoxide	0.5	0.57	0.192	4	20
Dieldrin	1.6	8.1	8.1	1	20
Endosulfan II	0.8	3.96	3.96	1	20
Endrin	1.0	4.1	4.1	1	20

*To calculate the average, one-half of the detection limit was used instead of zero when a chemical was not detected in a sample.
**Sum of detected PCBs. Tests measured individual Arochlor mixtures. Only 1248 and 1260 were detected. (June 1995)

PCBs and DDE were detected in every fish filet tested. In addition, DDT, DDD, aldrin, and heptachlor epoxide were each detected in more than two fish. Several other pesticides were detected in only one or two fish.

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DISCUSSION

What do the results mean?

Health risk depends on many things, including how much fish is eaten, the amount of contamination in the fish, how long someone has been eating contaminated fish and whether there is exposure to contaminants from other sources.

The results show that all of the tested bullhead catfish were contaminated with PCBs and DDE. Most of the fish were also contaminated with DDT. A few fish were also contaminated with other pesticides. The level of PCBs measured in the fish from the Souhegan River may pose a health risk to the people who eat them.

The risks of cancer from eating contaminated fish can not be predicted with certainty; but based on the fish sampling results and the potential for these health effects the public should be advised to limit consumption of fish caught from this area of the Souhegan river.

What are PCBs?

PCBs are a mixture of very similar chemicals[4]. They were used in electrical equipment such as transformers and capacitors. Manufacture of PCBs stopped in the U.S. in 1977 because of environmental and health concerns. PCBs were used commercially, not as individual chemicals, but as mixtures of several PCBs

Health Effects of PCBs

The widespread occurrence and environmental persistence of PCBs have caused concern over their possible health effects[4]. Animal studies in which PCBs were fed to animals throughout their lifetime have found that these animals develop liver cancer. Based on these results the EPA has classified PCBs as chemicals that probably can cause cancer in humans.

Other animal studies have found that feeding small amounts of PCBs to animals for several weeks or months caused injuries to the skin and nails, liver, stomach, thyroid, and immune system[4]. Animals also had anemia, acne, and damaged ability to reproduce. Some of the same effects were also found in the offspring of animals that were fed PCBs. The immune system and skin and nails appear to be the most sensitive to PCBs. It is not known if PCBs can harm the immune system in humans, however, these effects are seen in several different animal species.

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Recent studies of children whose mothers ate PCB-contaminated fish suggest that PCBs may have neurobehavioral effects in children[4]. These findings are not certain because other chemicals in the fish may have caused the effects that were observed.

What are the other chemicals that were found in the fish?

The other chemicals found in the fish are pesticides or their breakdown products. For example, 4,4'-DDD and 4,4'-DDE are breakdown products of the pesticide 4,4'-DDT[7]. Many of these chemicals are no longer used or have been banned in the U.S.

Even though these pesticides are no longer used, they are still present throughout the environment. They break down slowly and are found in many rivers and lakes. These chemicals can build up over time in the bodies of fish and other animals, and if the levels get high enough, can affect their health. People who eat contaminated fish over months or years can build up amounts of these long-lasting chemicals in their bodies, which can affect their health or if pregnant, the health of their fetuses. The levels of these chemicals measured in the fish are too low to directly cause health problems.

HEALTH CONSULTATION

EVALUATION OF CHEMICAL CONTAMINATION OF FISH FROM THE SOUHEGAN RIVER AREA OF

FLETCHER'S PAINT STORAGE FACILITY MILFORD, HILLSBOROUGH COUNTY, NEW HAMPSHIRE

CONCLUSIONS

1. Measurable amounts of PCBs were found in all of the bullhead catfish caught and tested from the Souhegan River near the Fletcher's Paint Works site. Levels of PCBs in fish may pose a long-term health risk to people who eat contaminated fish caught near the site. No health risks are anticipated from other chemicals found in the fish.
2. There is still a public health hazard for recreators associated with long-term exposure to PCBs and PAHs in riverbank surface soils, sediments and surface water in the river area immediately adjacent to the Elm Street Site.
3. BHRA will continue to evaluate contamination levels in the Souhegan River and site activity to determine if further action is necessary to protect public health.

RECOMMENDATIONS

1. Reduce exposure to contaminants in the Souhegan River near the site. This can be accomplished by:

   Limiting consumption of fish caught in the site vicinity, especially larger, older fish.

   Avoiding contact with the soils and river sediments in the area immediately behind the paint facility and adjacent to the Souhegan River.

2. Conduct a community health education effort to inform residents of contaminants in the fish, riverbank soils and river sediments near the site.
3. Trim, skin and cook any fish caught from the Souhegan River near the Fletcher's Paint Works site. The amount of contaminants in the fish can be reduced by properly preparing the fish before eating. See the diagram in Appendix A for more information on proper preparation techniques.

PREPARERS OF REPORT

Todd A. Kennedy
Scott Sudweeks
Dennis Pinski
New Hampshire Department of Health and Human Services
Bureau of Health Risk Assessment
(603) 271-4664

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HEALTH CONSULTATION

EVALUATION OF CHEMICAL CONTAMINATION OF FISH FROM THE SOUHEGAN RIVER AREA OF

FLETCHER'S PAINT STORAGE FACILITY MILFORD, HILLSBOROUGH COUNTY, NEW HAMPSHIRE

ATSDR Regional Representative

Louise House
EPA Region I

ATSDR Technical Project Officer

Tina Forrester
Superfund Site Assessment Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

REFERENCES

1) Agency for Toxic Substances and Disease Registry. Health Consultation for The Souhegan River Area of the Fletcher's Paint Works and Storage Facility Superfund Site, Hillsborough County, Milford, New Hampshire. Prepared by the New Hampshire Division of Public Health Services. September 9, 1994.

2) Agency for Toxic Substances and Disease Registry. Preliminary Health Assessment for Fletcher's Paint Works and Storage Facility Hazardous Waste Site. Prepared by the New Hampshire Division of Public Health Services. June 11, 1990.

3) Agency for Toxic Substances and Disease Registry. Health Consultation Evaluating PCBs in Soil and Indoor Dust in the Mill Street Area of the Fletcher's Paint Works and Storage Facility NPL Site, Hillsborough County, Milford, New Hampshire. Prepared by the New Hampshire Division of Public Health Services. August 1, 1995.

4) Agency for Toxic Substances and Disease Registry. Toxicological profile for polychlorinated biphenyls. Atlanta: ATSDR, August, 1995.

5) New Hampshire Department of Health and Human Services. Personal communication to Todd Kennedy from New Hampshire Department of Environmental Services, Site Manager. December 10, 1996.

6) New Hampshire Department of Health and Human Services. Memorandum to New Hampshire Bureau of Health Risk Assessment from EPA Remedial Project Manager regarding Fletcher's Paint

Site Biota, Surface water and Sediment Data. May 7, 1996.

7) Agency for Toxic Substances and Disease Registry. Toxicological profile for 4,4'-DDT, 4,4'-DDE, 4,4'-DDD. Atlanta: ATSDR, May, 1994.

HEALTH CONSULTATION

EVALUATION OF CHEMICAL CONTAMINATION OF FISH FROM THE SOUHEGAN RIVER AREA OF

FLETCHER'S PAINT STORAGE FACILITY MILFORD, HILLSBOROUGH COUNTY, NEW HAMPSHIRE

CERTIFICATION

The Evaluation of Chemical Contamination of Fish From the Souhegan River Area of Fletcher's Paint Works and Storage Facility Superfund Site Health Consultation was prepared by the New Hampshire Office of Health Management, Bureau of Health Risk Assessment under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the Health Consultation was initiated.

Tina Forrester
Technical Project Officer, SPS, SSAB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this Health Consultation and concurs with its findings.

Richard Gillig
Chief, SPS, SSAB, DHAC, ATSDR

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HEALTH CONSULTATION

EVALUATION OF CHEMICAL CONTAMINATION OF FISH FROM THE SOUHEGAN RIVER AREA OF

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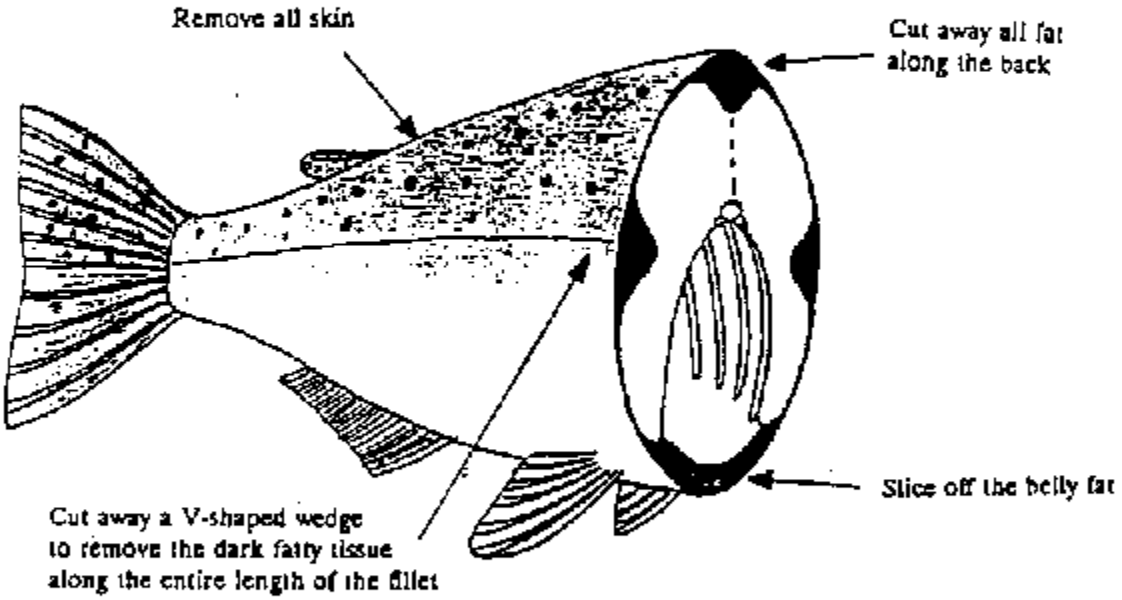
APPENDIX A

APPENDIX A

Cleaning and Cooking Your Fish

Many contaminants are found at higher levels in the fat of fish. You can reduce the amount of these contaminants in a fish meal by properly trimming, skinning, and cooking your catch. Remove the skin and trim all the fat from the areas shown on the diagram below: the belly flap, the line along the sides of the fish, fat along the back, and under the skin.



Cooking does not destroy contaminants in fish, but heat from cooking melts some of the fat in fish and allows some of the contaminated fat to drip away. Broil, grill, or bake the trimmed, skinned fish on a rack so the fat drips away. Do not use the drippings to prepare sauces or gravies.

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Table A-1. Surface Sediment Data - Area A/B
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value[a]	Min Detected Value[b]	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Metals (mg/kg)												
7429-90-5	Aluminum	37.	37.	100	3,447.97	2,260.	J	6,770.	J	T-9-4	0.	0.
7439-89-6	Iron	37.	37.	100	5,487.57	3,370.	J	12,700.	J	T-9-4	0.	0.
7439-92-1	Lead	71.	71.	100	8.45	2.7		80.9		T-2-8	0.016	0.029
7439-95-4	Magnesium	37.	37.	100	1,085.93	625.		3,230.	J	T-9-4	0.	0.
7439-96-5	Manganese	71.	71.	100	81.28	41.		230.		SRSD37	0.31	5.4
7439-97-6	Mercury	71.	44.	62	0.03	0.0013	J	0.049	J	T-14-8	0.0063	0.15
7440-02-0	Nickel	71.	71.	100	3.82	2.		12.4		DEP-4	0.078	0.14
7440-09-7	Potassium	37.	37.	100	674.73	350.		2,620.	J	DEP-2	0.	0.
7440-22-4	Silver	37.	2.	5	1.2	0.41		1.7		DEP-4	2.	3.2
7440-23-5	Sodium	37.	20.	54	300.43	31.5		462.		DEP-4	132.	1,620.
7440-28-0	Thallium	37.	3.	8	3.15	0.76		9.7		DEP-4	5.	9.2
7440-36-0	Antimony	71.	4.	6	3.9	0.084	JN	9.1		DEP-4	0.077	22.1
7440-38-2	Arsenic	71.	68.	96	4.81	2.4		13.3		DEP-4	0.033	2.5
7440-39-3	Barium	37.	37.	100	18.07	8.5		40.2		T-11-7-A	0.	0.
7440-41-7	Beryllium	37.	29.	78	0.48	0.1		9.6		DEP-4	0.14	0.4
7440-43-9	Cadmium	71.	55.	77	0.39	0.018		9.5		DEP-4	0.016	1.4
7440-47-3	Chromium	71.	71.	100	7.05	3.4		18.2		T-6-8	0.078	0.14
7440-48-4	Cobalt	37.	37.	100	2.4	0.99		11.4		DEP-4	0.	0.
7440-50-8	Copper	37.	37.	100	3.59	1.5		12.2		DEP-4	0.	0.
7440-62-2	Vanadium	71.	71.	100	7.25	4.3		15.9		DEP-4	0.078	0.14
7440-66-6	Zinc	37.	37.	100	26.08	10.9		93.3	J	T-11-7-A	0.	0.
7440-70-2	Calcium	37.	37.	100	501.32	163.		1,100.	J	T-4-4-A	0.	0.
7782-49-2	Selenium	37.	1.	3	4.46	9.5		9.5		DEP-4	7.	12.9
PCBs (ug/kg)												
11096-82-5	Aroclor 1260	79.	0.	0	11.27	0.		0.			6.2	465.
11097-69-1	Aroclor 1254	79.	16.	20	47.11	30.		1,400.	E	SRSD13	6.2	465.
11104-28-2	Aroclor 1221	79.	7.	9	135.63	6.14	J	8,690.		SED-02A	6.2	91.8
11141-16-5	Aroclor 1232	79.	3.	4	190.25	610.		13,000.		SED-02A	6.2	66.4
12672-29-6	Aroclor 1248	79.	26.	33	153.22	13.8	J	6,800.	E	SRSD8	6.2	465.
12674-11-2	Aroclor 1016	79.	0.	0	11.27	0.		0.			6.2	465.
53469-21-9	Aroclor 1242	79.	30.	38	650.34	12.8	J	26,000.		SED-02A	6.2	91.8
31508-00-6	Cl5-BZ#118	13.	8.	62	7.55	0.61		45.		SED-02A	0.22	0.5
32598-13-3	Cl4-BZ#77	13.	8.	62	3.76	0.24		22.	J	SED-02A	0.22	0.5
32598-14-4	Cl5-BZ#105	13.	8.	62	3.56	0.26		22.		SED-02A	0.22	0.5
32774-16-6	Cl6-BZ#169	13.	0.	0	0.18	0.		0.			0.22	0.67
35065-29-3	Cl7-BZ#180	13.	6.	46	0.9	0.41		5.		SED-02A	0.22	0.5
35065-30-6	Cl7-BZ#170	13.	5.	38	0.55	0.28		2.2		SD-27, SED-02A	0.22	0.54
38380-08-4	Cl6-BZ#156	13.	4.	31	0.41	0.26		1.7		SD-27	0.22	0.54
39635-31-9	Cl7-BZ#189	13.	0.	0	0.18	0.		0.			0.22	0.67
52663-72-6	Cl6-BZ#167	13.	2.	15	0.23	0.64		0.68		SD-27	0.22	0.67
57465-28-8	Cl5-BZ#126	13.	0.	0	0.18	0.		0.			0.22	0.67
69782-90-7	Cl6-BZ#157	13.	1.	8	0.21	0.72		0.72		SD-27	0.22	0.67
70362-50-4	Cl4-BZ#81	13.	2.	15	0.36	1.3	J	1.8	J	SD-27	0.22	0.67
70424-68-9/65510-44-3	Cl5-BZ#107/#123	13.	2.	15	1.01	4.8		5.6		SED-02A	0.43	1.3
74472-37-0	Cl5-BZ#114	13.	2.	15	0.45	2.		2.4		SED-02A	0.22	0.67
TOTAL_PCB congener	Total PCB congener	13.	13.	100	1,162.	0.795		11,000.	J	SED-02A	0.22	0.25
TOTAL_PCB_AROCLOR	Total PCB Aroclor	37.	30.	81	697.7	0.922	J	14,860.		SED-02A	20.	25.4
	PCB_TEQ_BIRD	13.	8.	62	0.24	0.0165		1.233		SED-02A		
	PCB_TEQ_FISH	13.	8.	62	0.000663	0.00007		0.0032		SED-02A		
	PCB_TEQ_MAMMAL	13.	8.	62	0.000948	0.00007		0.00491		T-2-8		
Pesticides (ug/kg)												
309-00-2	Aldrin	37.	0.	0	4.53	0.		0.			1.7	220.
319-84-6	Alpha-BHC	37.	1.	3	4.65	9.1		9.1		T-15-6	1.7	220.
319-85-7	Beta-BHC	37.	5.	14	6.19	0.9	JN	61.		T-15-6	1.7	220.
319-86-8	delta-BHC	37.	2.	5	4.53	0.73	J	1.3	JN	SD-9	1.7	220.
58-89-9	Gamma-BHC	30.	2.	7	2.09	9.4	J	12.		T-15-6	1.7	20.
	Total BHC	37.			17.07	3.13		330.		SED-02A		
5103-71-9	alpha-Chlordane	34.	0.	0	0.18	0.		0.		SRSD02	0.31	0.48
5103-74-2	gamma-Chlordane	34.	0.	0	0.18	0.		0.		SRSD02	0.31	0.48
57-74-9	Chlordane	37.	0.	0	45.28	0.		0.		SED-02A	17.	2,200.
12789-03-6	Technical Chlordane	34.	0.	0	1.84	0.		0.		SRSD02	3.1	4.8
60-57-1	Dieldrin	65.	1.	2	4.48	1.2	J	1.2	J	T-17-7	0.31	420.
72-20-8	Endrin	34.	6.	18	8.93	1.	J, JN	9.1	JN	SD-27	3.4	420.
53494-70-5	Endrin Ketone	37.	2.	5	9.39	2.2	JN	34.		T-15-6	3.4	420.
7421-93-4	Endrin Aldehyde	37.	1.	3	8.67	0.86	JN	0.86	JN	SD-9	3.4	420.
	Total Endrin	37.			26.258	3.06		630.		SED-02A		
72-43-5	Methoxychlor	37.	8.	22	41.39	1.	JN	5.8	JN	T-12-1	17.	2,200.
72-54-8	4,4'-DDD	37.	9.	24	10.1	1.2	JN	65.	J	DEP-5	3.4	420.
72-55-9	4,4'- DDE	19.	3.	16	2.84	0.8	J	20.		T-15-6	3.4	5.8
50-29-3	4,4'- DDT	37.	15.	41	10.68	0.94	J	66.	JN	DEP-5	3.4	420.

Table A-1. Surface Sediment Data - Area A/B
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value[a]	Min Detected Value[b]	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
	TOTAL_DDX	37.	37.	100.	16.09	3.		212.7		SED-02A		
76-44-8	Heptachlor	37.	2.	5	4.56	0.75	J	2.7	JN	T-12-1	1.8	220.
1024-57-3	Heptachlor epoxide (B)	69.	2.	3	2.44	0.64	J	1.3	JN	T-12-1	0.31	220.
8001-35-2	Toxaphene	37.	0.	0	452.77	0.		0.		SED-02A	170.	22,000.
959-98-8	Endosulfan I	34.	4.	12	1.4	0.59	JN	7.9	J	T-15-6	1.7	6.3
33213-65-9	Endosulfan II	36.	6.	17	9.16	1.	J	26.		T-15-6	3.4	420.
1031-07-8	Endosulfan Sulfate	37.	3.	8	8.55	1.2	JN	3.8	JN	DEP-5	3.4	420.
	Total Endosulfan	37.			18.752	3.85		420.		SED-02A		
SVOCs (ug/kg)												
120-12-7	Anthracene	37.	17.	46	133.34	22.	J	240.	J	DEP-5	330.	610.
129-00-0	Pyrene	37.	37.	100	260.16	19.	J	1,700.		DEP-5	0.	0.
191-24-2	Benzo[g,h,i]perylene	71.	65.	92	89.64	14.		620.		DEP-5	7.8	380.
193-39-5	Indeno[1,2,3-cd]pyrene	71.	64.	90	87.78	13.		620.		DEP-5	7.8	380.
205-99-2	Benzo[b]fluoranthene	71.	69.	97	172.83	17.		1,900.		DEP-5	7.8	380.
206-44-0	Fluoranthene	37.	37.	100	317.89	24.	J	2,000.		DEP-5	0.	0.
207-08-9	Benzo[k]fluoranthene	71.	62.	87	112.4	18.		820.		T-2-8	7.8	390.
208-96-8	Acenaphthylene	71.	41.	58	86.14	9.2		380.	J	DEP-5	7.8	610.
218-01-9	Chrysene	71.	67.	94	147.83	27.		1,200.		DEP-5	7.8	380.
50-32-8	Benzo[a]pyrene	71.	67.	94	137.15	21.		1,400.		DEP-5	7.8	380.
53-70-3	Dibenz[a,h]anthracene	71.	43.	61	74.79	9.4		190.	J	DEP-5	7.8	610.
56-55-3	Benz[a]anthracene	71.	67.	94	133.19	19.		1,200.		DEP-5	7.8	380.
83-32-9	Acenaphthene	37.	5.	14	181.09	20.	J	43.	J	T-17-7	330.	610.
85-01-8	Phenanthrene	71.	68.	96	153.18	20.	J	730.		DEP-5	7.8	380.
86-73-7	Fluorene	37.	6.	16	178.74	27.	J	77.	J	DEP-5	330.	610.
91-20-3	Naphthalene	71.	3.	4	106.15	20.		59.	J	T-2-8	7.8	610.
91-57-6	2-Methylnaphthalene	37.	1.	3	202.82	37.	J	37.	J	T-2-8	330.	610.
	HPAH	71.			1,256.839	33.2		11,470.		DEP-5		
	LPAH	71.			708.175	12.45		2,000.		DEP-5		
Total Organic Carbon	TOC (mg/kg)	37.	36.	97	5,288.11	780.		52,000.		T-14-1-A	690.	690.

[a] Average values based on original data and includes both detected and non-detected data.

[b] Minimum detected value based on original data (i.e., prior to estimating non-detects in ProUCL)

Table A-2. Surface Sediment Data - Area C
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value[a]	Min Detected Value[b]	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Metals (mg/kg)												
7429-90-5	Aluminum	5.	5.	100.	4,204.	2,820.		6,350.	J	T-20-7-A	0.	0.
7439-89-6	Iron	5.	5.	100.	6,606.	5,090.	J	8,870.	J	T-20-7-A	0.	0.
7439-92-1	Lead	5.	5.	100.	10.26	3.6		20.5		DEP-8	0.	0.
7439-95-4	Magnesium	5.	5.	100.	1,229.6	895.		1,680.		T-20-7-A	0.	0.
7439-96-5	Manganese	5.	5.	100.	89.9	73.8		108.	J	T-20-7-A	0.	0.
7439-97-6	Mercury	5.	2.	40.	0.0454	0.013	J	0.024	J	DEP-8	0.12	0.13
7440-02-0	Nickel	5.	5.	100.	4.56	3.		6.4		DEP-8, T-20-7-	0.	0.
7440-09-7	Potassium	5.	5.	100.	611.	410.		851.		T-20-7-A	0.	0.
7440-22-4	Silver	5.	0.	0.	1.36	0.		0.			2.4	3.1
7440-23-5	Sodium	5.	4.	80.	172.2	38.3		71.7		T-20-7-A	1,310.	1,310.
7440-28-0	Thallium	5.	0.	0.	3.42	0.		0.			6.1	7.8
7440-36-0	Antimony	5.	0.	0.	8.2	0.		0.			14.7	18.7
7440-38-2	Arsenic	5.	5.	100.	6.36	4.1		9.2		T-20-7-A	0.	0.
7440-39-3	Barium	5.	5.	100.	21.94	12.4		36.6		T-20-7-A	0.	0.
7440-41-7	Beryllium	5.	5.	100.	0.402	0.2		0.67		T-20-7-A	0.	0.
7440-43-9	Cadmium	5.	5.	100.	0.312	0.12		0.63		DEP-8	0.	0.
7440-47-3	Chromium	5.	5.	100.	10.38	6.		15.2		T-20-7-A	0.	0.
7440-48-4	Cobalt	5.	5.	100.	3.12	1.7		5.4		DEP-8	0.	0.
7440-50-8	Copper	5.	5.	100.	5.18	2.3		9.2		DEP-8	0.	0.
7440-62-2	Vanadium	5.	5.	100.	9.04	6.2		13.		T-20-7-A	0.	0.
7440-66-6	Zinc	5.	5.	100.	38.28	17.3		67.7		DEP-8	0.	0.
7440-70-2	Calcium	5.	5.	100.	683.4	263.		1,250.		DEP-8	0.	0.
7782-49-2	Selenium	5.	0.	0.	4.79	0.		0.			8.6	10.9
PCBs (ug/kg)												
11096-82-5	Aroclor 1260	5.	0.	0.	13.33	0.		0.			23.7	33.7
11097-69-1	Aroclor 1254	5.	0.	0.	13.33	0.		0.			23.7	33.7
11104-28-2	Aroclor 1221	5.	3.	60.	14.35	11.	J	19.3	J	T-20-7-A	24.	33.7
11141-16-5	Aroclor 1232	5.	0.	0.	13.33	0.		0.			23.7	33.7
12672-29-6	Aroclor 1248	5.	1.	20.	14.12	20.8	J	20.8	J	DEP-8	23.7	27.2
12674-11-2	Aroclor 1016	5.	0.	0.	13.33	0.		0.			23.7	33.7
53469-21-9	Aroclor 1242	5.	1.	20.	12.78	10.8	J	10.8	J	T-20-7-A	23.7	33.7
31508-00-6	Cl5-BZ#118	1.	1.	100.	0.74	0.74		0.74		T-20-7-A	0.	0.
32598-13-3	Cl4-BZ#77	1.	0.	0.	0.34	0.		0.			0.68	0.68
32598-14-4	Cl5-BZ#105	1.	0.	0.	0.34	0.		0.			0.68	0.68
32774-16-6	Cl6-BZ#169	1.	0.	0.	0.34	0.		0.			0.68	0.68
35065-29-3	Cl7-BZ#180	1.	0.	0.	0.34	0.		0.			0.68	0.68
35065-30-6	Cl7-BZ#170	1.	0.	0.	0.34	0.		0.			0.68	0.68
38380-08-4	Cl6-BZ#156	1.	0.	0.	0.34	0.		0.			0.68	0.68
39635-31-9	Cl7-BZ#189	1.	0.	0.	0.34	0.		0.			0.68	0.68
52663-72-6	Cl6-BZ#167	1.	0.	0.	0.34	0.		0.			0.68	0.68
57465-28-8	Cl5-BZ#126	1.	0.	0.	0.34	0.		0.			0.68	0.68
69782-90-7	Cl6-BZ#157	1.	0.	0.	0.34	0.		0.			0.68	0.68
70362-50-4	Cl4-BZ#81	1.	0.	0.	0.34	0.		0.			0.68	0.68
70424-68-9/65510-44-3	Cl5-BZ#107/#123	1.	0.	0.	0.7	0.		0.			1.4	1.4
74472-37-0	Cl5-BZ#114	1.	0.	0.	0.34	0.		0.			0.68	0.68
TOTAL_PCB congener	Total PCB congener	1.	1.	100.	8.	8.		8.		T-20-7-A	0.	0.
TOTAL_PCB_AROCLOR	Total PCB Aroclor	5.	4.	80.	17.3	11.	J	30.1	J	T-20-7-A	24.	24.
	PCB_TEQ_BIRD	1.			########	########		0.0000074		T-20-7-A		
	PCB_TEQ_FISH	1.			########	########		3.7E-06		T-20-7-A		
	PCB_TEQ_MAMMAL	1.			########	########		2.22E-05		T-20-7-A		
Pesticides (ug/kg)												
1024-57-3	Heptachlor epoxide (B)	5.	0.	0.	1.21	0.		0.			2.1	2.9
1031-07-8	Endosulfan Sulfate	5.	1.	20.	2.106	0.78	JN	0.78	JN	DEP-10	4.2	5.6
309-00-2	Aldrin	5.	0.	0.	1.21	0.		0.			2.1	2.9
319-84-6	Alpha-BHC	5.	0.	0.	1.21	0.		0.			2.1	2.9
319-85-7	Beta-BHC	5.	0.	0.	1.21	0.		0.			2.1	2.9
319-86-8	delta-BHC	5.	0.	0.	1.21	0.		0.			2.1	2.9
	TOTAL_BHC	5.			4.84	0.		0.				
	TOTAL_DDX	5.			5.22	4.2		6.3		DEP-11		
	Total Endosulfan	5.			5.696	4.03		7.05		T-20-7-A		
	Total Endrin	5.			7.14	0.		0.				
33213-65-9	Endosulfan II	5.	0.	0.	2.38	0.		0.			4.2	5.6
50-29-3	4,4'- DDT	5.	3.	60.	1.98	1.4	J	2.7	JN	DEP-10	4.2	4.2
53494-70-5	Endrin Ketone	5.	0.	0.	2.38	0.		0.			4.2	5.6
57-74-9	Chlordane	5.	0.	0.	12.1	0.		0.			21.	29.
58-89-9	Gamma-BHC	5.	0.	0.	1.21	0.		0.			2.1	2.9
60-57-1	Dieldrin	5.	0.	0.	2.38	0.		0.			4.2	5.6
72-20-8	Endrin	5.	0.	0.	2.38	0.		0.			4.2	5.6

Table A-2. Surface Sediment Data - Area C
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value[a]	Min Detected Value[b]	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
72-43-5	Methoxychlor	5.	0.	0.	12.1	0.		0.			21.	29.
72-54-8	4,4'-DDD	5.	0.	0.	2.38	0.		0.			4.2	5.6
72-55-9	4,4'- DDE	3.	2.	67	1.43333	1.	J	1.2	J	T-20-7-A	4.2	4.2
7421-93-4	Endrin Aldehyde	5.	0.	0.	2.38	0.		0.			4.2	5.6
76-44-8	Heptachlor	5.	0.	0.	1.21	0.		0.			2.1	2.9
8001-35-2	Toxaphene	5.	0.	0.	121.	0.		0.			210.	290.
959-98-8	Endosulfan I	5.	0.	0.	1.21	0.		0.			2.1	2.9
SVOCs (ug/kg)												
120-12-7	Anthracene	5.	2.	40.	147.2	47.	J	54.	J	T-20-7-A	420.	430.
129-00-0	Pyrene	5.	5.	100.	266.	110.	J	500.	J	T-20-7-A	0.	0.
191-24-2	Benzo[g,h,i]perylene	5.	5.	100.	94.6	48.	J	180.	J	T-20-7-A	0.	0.
193-39-5	Indeno[1,2,3-cd]pyrene	5.	5.	100.	87.	45.	J	160.	J	T-20-7-A	0.	0.
205-99-2	Benzo[b]fluoranthene	5.	5.	100.	236.	73.	J	440.	J	T-20-7-A	0.	0.
206-44-0	Fluoranthene	5.	5.	100.	320.	130.	J	650.		T-20-7-A	0.	0.
207-08-9	Benzo[k]fluoranthene	5.	5.	100.	227.6	30.	J	460.	J	T-20-7-A	0.	0.
208-96-8	Acenaphthylene	5.	0.	0.	240.	0.		0.			420.	570.
218-01-9	Chrysene	5.	5.	100.	165.6	71.	J	300.	J	T-20-7-A	0.	0.
50-32-8	Benzo[a]pyrene	5.	5.	100.	144.6	65.	J	260.	J	T-20-7-A	0.	0.
53-70-3	Dibenz[a,h]anthracene	5.	2.	40.	143.2	36.	J	45.	J	T-20-7-A	420.	430.
56-55-3	Benz[a]anthracene	5.	5.	100.	139.8	62.	J	270.	J	T-20-7-A	0.	0.
83-32-9	Acenaphthene	5.	0.	0.	240.	0.		0.			420.	570.
85-01-8	Phenanthrene	5.	5.	100.	167.	78.	J	320.	J	T-20-7-A	0.	0.
86-73-7	Fluorene	5.	0.	0.	240.	0.		0.			420.	570.
91-20-3	Naphthalene	5.	0.	0.	240.	0.		0.			420.	570.
91-57-6	2-Methylnaphthalene	5.	0.	0.	240.	0.		0.			420.	570.
	HPAH	5.			1,824.4	864.		3,265.		T-20-7-A		
	LPAH	5.			1,514.2	1,338.		1,799.		T-20-7-A		
Total Organic Carbon	TOC (mg/kg)	5.	5.	100.	8,910.	950.	J	20,000.	J	DEP-8	0.	0.

[a] Average values based on original data and includes both detected and non-detected data.

[b] Minimum detected value based on original data (i.e., prior to estimating non-detects in ProUCL)

Table A-3. Surface Sediment Data - Rope Swing/Hot Spot Area
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detection (%)	Avg Value[a]	Min Detected Value[b]	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Metals (mg/kg)												
7429-90-5	Aluminum	8.	8.	100.	2588.13	2,260.	J	3,340.		SED-02A	0.	0.
7439-89-6	Iron	8.	8.	100.	4843.75	4,270.	J	5,590.	J	SED-02A	0.	0.
7439-92-1	Lead	26.	26.	100.	5.85	3.		22.		SRSD22	0.016	0.027
7439-95-4	Magnesium	8.	8.	100.	915.31	741.5		1,220.		SED-02A	0.	0.
7439-96-5	Manganese	26.	26.	100.	68.19	41.8		150.		SRSD13	0.33	5.4
7439-97-6	Mercury	26.	18.	69	0.02	0.0016	J	0.034		SRSD22	0.0065	0.14
7440-02-0	Nickel	26.	26.	100.	3.33	2.6		6.9		SRSD22	0.081	0.14
7440-09-7	Potassium	8.	8.	100.	489.00	350.		648.		SD-18	0.	0.
7440-22-4	Silver	8.	0.	0.	1.10	0.		0.			2.1	2.35
7440-23-5	Sodium	8.	2.	25.	417.54	43.6		46.7		SED-02A	1,050.	1,140.
7440-28-0	Thallium	8.	1.	12.5	2.50	0.89		0.89		T-15-7-A	5.2	5.7
7440-36-0	Antimony	26.	1.	4	2.07	0.12		0.12		SRSD27	0.083	14.2
7440-38-2	Arsenic	26.	24.	92	3.96	2.4		11.		SRSD22	0.033	2.2
7440-39-3	Barium	8.	8.	100	12.08	8.5		19.9		SED-02A	0.	0.
7440-41-7	Beryllium	8.	8.	100	0.18	0.16		0.22		SED-02A	0.	0.
7440-43-9	Cadmium	26.	22.	85	0.18	0.018		0.61		SRSD22	0.016	1.15
7440-47-3	Chromium	26.	26.	100	6.37	3.4		16.		SRSD22	0.081	0.14
7440-48-4	Cobalt	8.	8.	100	1.49	1.2		2.2		SED-02A	0.	0.
7440-50-8	Copper	8.	8.	100	2.48	2.		4.		SED-02A	0.	0.
7440-62-2	Vanadium	26.	26.	100	6.61	4.7		14.		SRSD22	0.081	0.14
7440-66-6	Zinc	8.	8.	100	15.71	11.7		19.9		SED-02A	0.	0.
7440-70-2	Calcium	8.	8.	100	285.00	241.		329.		SED-11	0.	0.
7782-49-2	Selenium	8.	0.	0	3.87	0.		0.			7.3	8.25
PCBs (ug/kg)												
11096-82-5	Aroclor 1260	26.	0.	0	16.94	0.		0.			6.2	465.
11097-69-1	Aroclor 1254	26.	14.	54	120.77	30.		1,400.	E	SRSD13	6.2	465.
11104-28-2	Aroclor 1221	26.	4.	15	399.76	178.		8,690.		SED-02A	6.2	91.8
11141-16-5	Aroclor 1232	26.	3.	12	567.63	610.		13,000.		SED-02A	6.2	66.4
12672-29-6	Aroclor 1248	26.	5.	19	395.29	86.		6,800.	E	SRSD8	6.2	465.
12674-11-2	Aroclor 1016	26.	0.	0	16.94	0.		0.			6.2	465.
53469-21-9	Aroclor 1242	26.	20.	77	1951.14	13.6	J	26,000.		SED-02A	6.2	91.8
31508-00-6	Cl5-BZ#118	4.	3.	75	22.60	7.15		45.		SED-02A	0.5	0.5
32598-13-3	Cl4-BZ#77	4.	3.	75	11.60	4.15	J	22.	J	SED-02A	0.5	0.5
32598-14-4	Cl5-BZ#105	4.	3.	75	10.88	3.25	J	22.		SED-02A	0.5	0.5
32774-16-6	Cl6-BZ#169	4.	0.	0	0.27	0.		0.			0.5	0.58
35065-29-3	Cl7-BZ#180	4.	3.	75	2.24	0.59		5.		SED-02A	0.5	0.5
35065-30-6	Cl7-BZ#170	4.	2.	50	1.23	2.2		2.2		SD-27, SI	0.5	0.54
38380-08-4	Cl6-BZ#156	4.	2.	50	0.93	1.5		1.7		SD-27	0.5	0.54
39635-31-9	Cl7-BZ#189	4.	0.	0	0.27	0.		0.			0.5	0.58
52663-72-6	Cl6-BZ#167	4.	2.	50	0.46	0.64		0.68		SD-27	0.5	0.54
57465-28-8	Cl5-BZ#126	4.	0.	0	0.27	0.		0.			0.5	0.58
69782-90-7	Cl6-BZ#157	4.	1.	25	0.38	0.72		0.72		SD-27	0.5	0.58
70362-50-4	Cl4-BZ#81	4.	2.	50	0.91	1.3	J	1.8	J	SD-27	0.5	0.54
70424-68-9/65510-44-3	Cl5-BZ#107/#123	4.	2.	50	2.88	4.8		5.6		SED-02A	1.	1.
74472-37-0	Cl5-BZ#114	4.	2.	50	1.23	2.		2.4		SED-02A	0.5	0.54
TOTAL_PCB congener	Total PCB congener	4.	4.	100	3560.03	5.1	J	11,000.	J	SED-02A	0.	0.
TOTAL_PCB_AROCLOR	Total PCB Aroclor	26.	26.	100	2022	2.6	J	14,860.		SED-02A	20.4	20.4
	PCB_TEQ_BIRD	4		0	0.67	0.03761		1.23313		SED-02A		
	PCB_TEQ_FISH	4		0	0.0018	0.00016		0.00324		SED-02A		
	PCB_TEQ_MAMMAL	4		0	0.0026	0.00016		0.00491		SED-02A		
Pesticides (ug/kg)												
1024-57-3	Heptachlor epoxide (B)	25.	0.	0	5.15	0.		0.			0.31	220.
1031-07-8	Endosulfan Sulfate	8.	1.	13	30.83	1.6	JN	1.6	JN	SD-26	3.4	420.
12789-03-6	Technical Chlordane	18.	0.	0	1.80	0.		0.			3.1	4.1
309-00-2	Aldrin	8.	0.	0	16.26	0.		0.			1.8	220.
319-84-6	Alpha-BHC	8.	1.	13	16.84	9.1		9.1		T-15-6	1.8	220.
319-85-7	Beta-BHC	8.	1.	13	23.33	61.		61.		T-15-6	1.8	220.
319-86-8	delta-BHC	8.	1.	13	16.24	0.73	J	0.73	J	SD-14	1.8	220.
33213-65-9	Endosulfan II	8.	2.	25	33.23	3.3	JN	26.		T-15-6	3.4	420.
50-29-3	4,4'- DDT	8.	2.	25	31.05	0.94	J	2.	JN	SD-18	3.5	420.
5103-71-9	alpha-Chlordane	18.	0.	0	0.18	0.		0.			0.31	0.41
5103-74-2	gamma-Chlordane	18.	0.	0	0.18	0.		0.			0.31	0.41
53494-70-5	Endrin Ketone	8.	1.	13	34.30	34.		34.		T-15-6	3.4	420.
57-74-9	Chlordane	8.	0.	0	162.59	0.		0.			18.	2,200.
58-89-9	Gamma-BHC	6.	2.	33	5.68	9.4	J	12.		T-15-6	1.8	20.
60-57-1	Dieldrin	24.	0.	0	9.53	0.		0.			0.31	420.
72-20-8	Endrin	8.	3.	38	30.29	2.7	JN	9.1	JN	SD-27	3.4	420.
72-43-5	Methoxychlor	8.	1.	13	157.44	3.3	J	3.3	J	T-15-6	18.	2,200.
72-54-8	4,4'-DDD	8.	0.	0	31.11	0.		0.			3.4	420.

Table A-3. Surface Sediment Data - Rope Swing/Hot Spot Area
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detection (%)	Avg Value[a]	Min Detected Value[b]	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
72-55-9	4,4'- DDE	4.	1.	25	6.33	20.		20.		T-15-6	3.4	3.75
7421-93-4	Endrin Aldehyde	8.	0.	0	31.11	0.		0.			3.4	420.
76-44-8	Heptachlor	8.	0.	0	16.26	0.		0.			1.8	220.
8001-35-2	Toxaphene	8.	0.	0	1625.94	0.		0.			180.	22,000.
959-98-8	Endosulfan I	5.	1.	20	2.32	7.9	J	7.9	J	T-15-6	1.8	1.95
	TOTAL_BHC	8		0	60.67	3.43		330		SED-02A		
	TOTAL_DDX	8		0	65.32	3.75		420		SED-02A		
	Total Endosulfan	8		0	65.52	4.3		420		SED-02A		
	Total Endrin	8		0	95.70	5.1		630		SED-02A		
SVOCs (ug/kg)												
120-12-7	Anthracene	8.	3.	38	127.19	22.	J	58.	J	SD-27	340.	380.
129-00-0	Pyrene	8.	8.	100	152.38	22.	J	310.	J	SD-14	0.	0.
191-24-2	Benzo[g,h,i]perylene	26.	25.	96	73.83	18.	J	190.		SRSD13	7.8	380.
193-39-5	Indeno[1,2,3-cd]pyrene	26.	24.	92	74.88	17.		180.		SRSD13	7.8	380.
205-99-2	Benzo[b]fluoranthene	26.	26.	100	126.92	20.	J	360.	J	SD-27	7.8	10.
206-44-0	Fluoranthene	8.	8.	100	186.38	24.	J	420.		SD-27	0.	0.
207-08-9	Benzo[k]fluoranthene	26.	24.	92	92.35	19.	J	330.	J	SD-27	7.8	380.
208-96-8	Acenaphthylene	26.	19.	73	48.95	9.3		36.		SRSD13	7.8	380.
218-01-9	Chrysene	26.	25.	96	128.52	34.		330.		SRSD13	7.8	380.
50-32-8	Benzo[a]pyrene	26.	25.	96	108.94	22.	J	280.		SRSD13	7.8	380.
53-70-3	Dibenz[a,h]anthracene	26.	19.	73	51.50	9.4		45.		SRSD13	7.8	420.
56-55-3	Benz[a]anthracene	26.	25.	96	108.19	25.		260.		SRSD13	7.8	380.
83-32-9	Acenaphthene	8.	0.	0	184.69	0.		0.			340.	420.
85-01-8	Phenanthrene	26.	25.	96	132.63	26.		290.		SRSD13	7.8	380.
86-73-7	Fluorene	8.	0.	0	184.69	0.		0.			340.	420.
91-20-3	Naphthalene	26.	0.	0	59.93	0.		0.			7.8	420.
91-57-6	2-Methylnaphthalene	8.	0.	0	184.69	0.		0.			340.	420.
	HPAH	26		0	869.36	178.35		2,209		SD-27		
	LPAH	26		0	451.13	34.7		1,330		SD-26		
Total Organic Carbon	TOC (mg/kg)	8.	8.	100	1534.38	950.	J	3,000.	J	SED-02A	0.	0.

[a] Average values based on original data and includes both detected and non-detected data.

[b] Minimum detected value based on original data (i.e., prior to estimating non-detects in ProUCL)

Table A-4. Summary Statistics for Estimated and Measured PCB Data - Surface Sediment
Fletcher's Paint Superfund Site

Summary Statistics for Raw Full Data Sets - SEDIMENT										
Variable	Num Obs	Min	Max	Mean	Median	Variance	SD	Skewness	Kurtosis	CV
ROPE SWING/HOT SPOT AREA										
HS_LnROS_Total_Congeners	4	5.1	11000	3560	1618	25698380	5069	1.756	3.099	1.424
HS_Bird_TEQ	4	0.0376	1.233	0.672	0.709	0.39	0.624	-0.0802	-5.475	0.929
HS_Fish_TEQ	4	0.00016	0.00324	0.00181	0.00192	2.738E-06	0.00165	-0.0638	-5.633	0.915
HS_Mammal_TEQ	4	0.00016	0.00491	0.00261	0.00269	6.004E-06	0.00245	-0.0473	-5.472	0.938
HS_Sed_TotCong-TEQ_for_EPC	4	2.6	10899	3508	1565	25300190	5030	1.769	3.15	1.434
HS_LnROS_Total_Aroclors	26	2.596	14860	2022	640.5	15017029	3875	2.698	6.675	1.917
HS_Meas&Estim_TotCong	26	5.1	11000	1668	609.1	8158715	2856	2.619	6.324	1.713
HS_BirdTEQMean	26	0.00722	37.28	3.886	1.12	64.28	8.017	3.421	12.64	2.063
HS_FishTEQMean	26	2.987E-05	0.154	0.0159	0.00352	0.0011	0.0332	3.416	12.6	2.086
HS_MamTEQMean	26	3.07E-05	0.158	0.0165	0.00451	0.00116	0.0341	3.42	12.63	2.069
AREA A/B										
Meas&Estim_TotCong	79	0.0795	11000	651.3	161.4	3132476	1770	4.865	24.74	2.717
BirdTEQMean	79	0.00256	37.28	1.345	0.0771	23.82	4.881	6.024	40.29	3.629
FishTEQMean	79	1.061E-05	0.154	0.00551	0.0003187	0.0004078	0.0202	6.027	40.31	3.666
MamTEQMean	79	1.09E-05	0.158	0.00571	0.0003276	0.0004306	0.0207	6.025	40.3	3.637
Total_TEQ_Conc	13	1.1	100.7	18.8	2.5	1159	34.05	2.087	3.081	1.811
Bird_TEQ	13	0.0165	1.233	0.24	0.0376	0.19	0.436	2.058	2.873	1.815
Fish_TEQ	13	0.0000704	0.00324	0.0006634	0.0001455	1.336E-06	0.00116	2.064	2.883	1.742
Mammal_TEQ	13	0.0000704	0.00491	0.000948	0.00016	2.879E-06	0.0017	2.071	2.951	1.79
LnROS_Total_Congeners	13	0.0795	11000	1162	40	9212397	3035	3.316	11.32	2.612
LnROS_Total_Aroclors	79	0.922	14860	697.7	37.5	5688874	2385	5.002	25.92	3.419
AREA C										
Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	Skewness	Kurtosis	CV
Sed_Total_Congeners	1	8	8	8	8	N/A	N/A	N/A	N/A	N/A
Sed_Total_TEQ_Conc	1	0.74	0.74	0.74	0.74	N/A	N/A	N/A	N/A	N/A
Sed_TotCong-TEQ	1	7.26	7.26	7.26	7.26	N/A	N/A	N/A	N/A	N/A
Total_Congeners	1	8	8	8	8	N/A	N/A	N/A	N/A	N/A
Total_TEQ_Conc	1	3.82	3.82	3.82	3.82	N/A	N/A	N/A	N/A	N/A
Variable	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median	SD	Skewness	CV
Total_Aroclors	4	1	20.00%	11	30.1	18.63	16.7	8.772	0.849	0.471

Table A-5. Redbreast Sunfish Tissue Data - Area A/B
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Metals (mg/kg)												
7429-90-5	Aluminum	12.	9.	75.	4.265	2.18	J	7.01	J	SR-RB-89	1.71	1.76
7440-36-0	Antimony	12.	0.	0.	0.89	0.		0.			1.54	2.11
7440-38-2	Arsenic	12.	0.	0.	0.89	0.		0.			1.54	2.11
7440-39-3	Barium	12.	0.	0.	0.09	0.		0.			0.154	0.211
7440-41-7	Beryllium	12.	0.	0.	0.09	0.		0.			0.154	0.211
7440-43-9	Cadmium	12.	0.	0.	0.09	0.		0.			0.154	0.211
7440-70-2	Calcium	12.	12.	100.	1,069.92	249.	J	2,970.	J	SR-RB-87	0.	0.
7440-47-3	Chromium	12.	0.	0.	0.22	0.		0.			0.385	0.527
7440-48-4	Cobalt	12.	0.	0.	0.09	0.		0.			0.154	0.211
7440-50-8	Copper	12.	5.	41.66667	0.35	0.388		0.727		SR-RB-89	0.397	0.527
7439-89-6	Iron	12.	11.	91.66667	2.99	2.06	J	4.89	J	SR-RB-85	2.11	2.11
7439-92-1	Lead	12.	0.	0.	0.44	0.		0.			0.769	1.05
7439-95-4	Magnesium	12.	12.	100.	287.25	265.	J	322.		SR-RB-87	0.	0.
7439-96-5	Manganese	12.	12.	100.	1.02	0.362	J	3.31		SR-RB-87	0.	0.
7439-97-6	Mercury	12.	12.	100.	0.123	0.0845	J	0.175		SR-RB-86	0.	0.
7440-02-0	Nickel	12.	0.	0.	0.22	0.		0.			0.385	0.527
7440-09-7	Potassium	12.	12.	100.	3,321.67	3,130.	J	3,650.	J	SR-RB-93	0.	0.
7440-22-4	Silver	12.	0.	0.	0.22	0.		0.			0.385	0.527
7440-23-5	Sodium	12.	12.	100.	691.33	568.	J	796.	J	SR-RB-92	0.	0.
7440-28-0	Thallium	12.	0.	0.	0.89	0.		0.			1.54	2.11
7440-62-2	Vanadium	12.	0.	0.	0.22	0.		0.			0.385	0.527
7440-66-6	Zinc	12.	12.	100.	6.93	5.35		8.14		SR-RB-87	0.	0.
PCBs (ug/kg)												
12674-11-2	Aroclor 1016	12.	0.	0.	31.02	0.		0.			40.	240.
11104-28-2	Aroclor 1221	12.	0.	0.	31.02	0.		0.			40.	240.
11141-16-5	Aroclor 1232	12.	0.	0.	31.02	0.		0.			40.	240.
53469-21-9	Aroclor 1242	12.	0.	0.	31.15	0.		0.			40.	240.
12672-29-6	Aroclor 1248	12.	12.	100.	615.93	38.3	J	3,965.		SR-RB-37	0.	0.
11097-69-1	Aroclor 1254	12.	5.	41.66667	61.45	33.4	J	209.		SR-RB-43	40.	240.
11096-82-5	Aroclor 1260	12.	0.	0.	31.02	0.		0.			40.	240.
32598-13-3	Cl4-BZ#77	12.	5.	41.66667	3.97	0.98	J	28.	J	SR-RB-37	0.89	0.96
70362-50-4	Cl4-BZ#81	12.	0.	0.	0.46	0.		0.			0.89	0.96
32598-14-4	Cl5-BZ#105	12.	10.	83.33333	7.26	1.2		50.		SR-RB-37	0.89	0.89
70424-68-9/65510-44-3	Cl5-BZ#107/#123	12.	3.	25.	2.25	2.		13.		SR-RB-37	1.8	1.9
74472-37-0	Cl5-BZ#114	12.	2.	16.66667	0.9	1.2		5.		SR-RB-37	0.89	0.96
31508-00-6	Cl5-BZ#118	12.	11.	91.66667	16.38	2.1	J	110.	J	SR-RB-37	0.89	0.89
57465-28-8	Cl5-BZ#126	12.	0.	0.	0.46	0.		0.			0.89	0.96
38380-08-4	Cl6-BZ#156	12.	1.	8.33333	0.69	3.2		3.2		SR-RB-37	0.89	0.96
69782-90-7	Cl6-BZ#157	12.	1.	8.33333	0.51	1.		1.		SR-RB-37	0.89	0.96
52663-72-6	Cl6-BZ#167	12.	1.	8.33333	0.52	1.2		1.2		SR-RB-37	0.89	0.96
32774-16-6	Cl6-BZ#169	12.	0.	0.	0.46	0.		0.			0.89	0.96
35065-30-6	Cl7-BZ#170	12.	1.	8.33333	0.61	2.2		2.2		SR-RB-37	0.89	0.96
35065-29-3	Cl7-BZ#180	12.	3.	25.	0.97	1.4	J	4.3	J	SR-RB-37	0.89	0.96
39635-31-9	Cl7-BZ#189	12.	0.	0.	0.46	0.		0.			0.89	0.96
TOTAL_PCB congener	Total PCB congener	12.	12.	100.	581.68	8.1	J	4,000.	J	SR-RB-37	0.	0.
TOTAL_PCB_AROCLOR	Total PCB Aroclor	12.	12.	100.	850.38	38.3	J	5,430.		SR-RB-37	0.	0.
AREA A/B	TOT PCB-PCB_DIOX	12			549.197	4.085		3788.6		SR-RB-37		
	PCB_TEQ_MAMMAL	12			0.00125	0.00015		0.0083		SR-RB-37		
Pesticides (ug/kg)												
72-55-9	4,4'- DDE	10.	10.	100.	7.215	5.23	N	11.6	N	SR-RB-92	0.	0.
50-29-3	4,4'- DDT	12.	0.	0.	1.28	0.		0.			2.53	2.61
72-54-8	4,4'-DDD	12.	1.	8.33333	1.249	0.9	NJ	0.9	NJ	SR-RB-92	2.53	2.61
309-00-2	Aldrin	12.	0.	0.	1.28	0.		0.			2.53	2.61
319-84-6	Alpha-BHC	12.	0.	0.	1.28	0.		0.			2.53	2.61
5103-71-9	alpha-Chlordane	12.	0.	0.	1.28	0.		0.			2.53	2.61
319-85-7	Beta-BHC	12.	0.	0.	1.28	0.		0.			2.53	2.61
57-74-9	Chlordane	12.	0.	0.	64.	0.		0.			126.	130.
319-86-8	delta-BHC	12.	0.	0.	1.28	0.		0.			2.53	2.61
60-57-1	Dieldrin	12.	0.	0.	1.28	0.		0.			2.53	2.61
959-98-8	Endosulfan I	12.	0.	0.	1.28	0.		0.			2.53	2.61
33213-65-9	Endosulfan II	10.	0.	0.	1.281	0.		0.			2.53	2.61
1031-07-8	Endosulfan Sulfate	12.	0.	0.	1.28	0.		0.			2.53	2.61
72-20-8	Endrin	12.	0.	0.	1.28	0.		0.			2.53	2.61
7421-93-4	Endrin Aldehyde	12.	0.	0.	1.28	0.		0.			2.53	2.61
53494-70-5	Endrin Ketone	12.	0.	0.	1.28	0.		0.			2.53	2.61
58-89-9	Gamma-BHC	12.	0.	0.	1.28	0.		0.			2.53	2.61
76-44-8	Heptachlor	12.	0.	0.	1.28	0.		0.			2.53	2.61
72-43-5	Methoxychlor	12.	0.	0.	1.28	0.		0.			2.53	2.61
8001-35-2	Toxaphene	12.	0.	0.	127.958	0.		0.			253.	261.
	TOTAL_BHC	12.			5.118	5.06		5.22		SR-RB-96		
	Total_Chlordane	12.			1.28	1.265		1.305		SR-RB-96		
	TOTAL_DDX	12.			8.541	2.53		13.77		SR-RB-92		
	Total Endrin	12.			3.839	3.795		3.915		SR-RB-96		
	Total Endosulfan	12.			3.627	2.53		3.915		SR-RB-96		

Table A-5. Redbreast Sunfish Tissue Data - Area A/B
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
SVOCs (ug/kg)												
91-58-7	2-Chloronaphthalene	12.	0.	0.	213.83	0.		0.			383.	611.
91-57-6	2-Methylnaphthalene	12.	0.	0.	213.83	0.		0.			383.	611.
83-32-9	Acenaphthene	12.	0.	0.	213.83	0.		0.			383.	611.
208-96-8	Acenaphthylene	12.	0.	0.	213.83	0.		0.			383.	611.
120-12-7	Anthracene	12.	0.	0.	213.83	0.		0.			383.	611.
56-55-3	Benz[a]anthracene	12.	0.	0.	213.83	0.		0.			383.	611.
50-32-8	Benzo[a]pyrene	12.	0.	0.	213.83	0.		0.			383.	611.
205-99-2	Benzo[b]fluoranthene	12.	0.	0.	213.83	0.		0.			383.	611.
191-24-2	Benzo[g,h,i]perylene	12.	0.	0.	213.83	0.		0.			383.	611.
207-08-9	Benzo[k]fluoranthene	12.	0.	0.	213.83	0.		0.			383.	611.
86-74-8	Carbazole	12.	0.	0.	213.83	0.		0.			383.	611.
218-01-9	Chrysene	12.	0.	0.	213.83	0.		0.			383.	611.
53-70-3	Dibenz[a,h]anthracene	12.	0.	0.	213.83	0.		0.			383.	611.
132-64-9	Dibenzofuran	12.	0.	0.	213.83	0.		0.			383.	611.
206-44-0	Fluoranthene	12.	0.	0.	213.83	0.		0.			383.	611.
86-73-7	Fluorene	12.	0.	0.	213.83	0.		0.			383.	611.
193-39-5	Indeno[1,2,3-cd]pyrene	12.	0.	0.	213.83	0.		0.			383.	611.
91-20-3	Naphthalene	12.	0.	0.	213.83	0.		0.			383.	611.
85-01-8	Phenanthrene	12.	0.	0.	213.83	0.		0.			383.	611.
129-00-0	Pyrene	12.	0.	0.	213.83	0.		0.			383.	611.
	HPAH	12.		0.	2,138.33	1,915.		3,055.		SR-RB-89		
	LPAH	12.		0.	1,496.83	1,340.5		2,138.5		SR-RB-89		
Percent Lipid	PCT Lipid Analysis	24.	24.	100.	0.89867	0.52		1.4		SR-RB-85	0.	0.

Table A-6. Redbreast Sunfish Tissue Data - Area C
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequcnc y of Detection (%)	Avg Value	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Metals (mg/kg)												
7429-90-5	Aluminum	6.	6.	100.	4.54	3.19	J	8.05	J	SR-RB-84	0.	0.
7440-36-0	Antimony	6.	0.	0.	0.93	0.		0.			1.72	1.98
7440-38-2	Arsenic	6.	0.	0.	0.93	0.		0.			1.72	1.98
7440-39-3	Barium	6.	0.	0.	0.09	0.		0.			0.172	0.198
7440-41-7	Beryllium	6.	0.	0.	0.09	0.		0.			0.172	0.198
7440-43-9	Cadmium	6.	0.	0.	0.09	0.		0.			0.172	0.198
7440-70-2	Calcium	6.	6.	100.	1,651.83	251.	J	2,440.	J	SR-RB-80	0.	0.
7440-47-3	Chromium	6.	1.	17	0.31	0.683		0.683		SR-RB-80	0.429	0.494
7440-48-4	Cobalt	6.	0.	0.	0.09	0.		0.			0.172	0.198
7440-50-8	Copper	6.	1.	17	0.28	0.533		0.533		SR-RB-82	0.429	0.494
7439-89-6	Iron	6.	6.	100.	4.23	2.69	J	5.61	J	SR-RB-80	0.	0.
7439-92-1	Lead	6.	0.	0.	0.47	0.		0.			0.858	0.988
7439-95-4	Magnesium	6.	6.	100.	294.67	282.		316.		SR-RB-83	0.	0.
7439-96-5	Manganese	6.	6.	100.	2.15	0.7	J	3.48		SR-RB-81	0.	0.
7439-97-6	Mercury	6.	6.	100.	0.148	0.0918		0.276		SR-RB-79	0.	0.
7440-02-0	Nickel	6.	1.	17	0.28	0.519		0.519		SR-RB-80	0.429	0.494
7440-09-7	Potassium	6.	6.	100.	3,156.67	3,090.	J	3,240.	J	SR-RB-79	0.	0.
7440-22-4	Silver	6.	0.	0.	0.23	0.		0.			0.429	0.494
7440-23-5	Sodium	6.	6.	100.	663.5	582.	J	723.	J	SR-RB-84	0.	0.
7440-28-0	Thallium	6.	0.	0.	0.93	0.		0.			1.72	1.98
7440-62-2	Vanadium	6.	0.	0.	0.23	0.		0.			0.429	0.494
7440-66-6	Zinc	6.	6.	100.	6.64	5.52		8.13		SR-RB-80	0.	0.
PCBs (ug/kg)												
12674-11-2	Aroclor 1016	6.	0.	0.	19.08	0.		0.			40.	40.
11104-28-2	Aroclor 1221	6.	0.	0.	19.08	0.		0.			40.	40.
11141-16-5	Aroclor 1232	6.	0.	0.	19.08	0.		0.			40.	40.
53469-21-9	Aroclor 1242	6.	0.	0.	19.08	0.		0.			40.	40.
12672-29-6	Aroclor 1248	6.	3.	50.	22.97	20.5	J	32.4	J	SR-RB-63	40.	40.
11097-69-1	Aroclor 1254	6.	3.	50.	19.36	11.6	J	31.2	J	SR-RB-63	40.	40.
11096-82-5	Aroclor 1260	6.	0.	0.	19.08	0.		0.			40.	40.
32598-13-3	Cl4-BZ#77	6.	0.	0.	0.46	0.		0.			0.87	0.95
70362-50-4	Cl4-BZ#81	6.	0.	0.	0.46	0.		0.			0.87	0.95
32598-14-4	Cl5-BZ#105	6.	0.	0.	0.46	0.		0.			0.87	0.95
70424-68-9/65510-44-3	Cl5-BZ#107/#123	6.	0.	0.	0.91	0.		0.			1.7	1.9
74472-37-0	Cl5-BZ#114	6.	0.	0.	0.46	0.		0.			0.87	0.95
31508-00-6	Cl5-BZ#118	6.	6.	100.	1.34	0.96		1.9		SR-RB-63	0.	0.
57465-28-8	Cl5-BZ#126	6.	0.	0.	0.46	0.		0.			0.87	0.95
38380-08-4	Cl6-BZ#156	6.	0.	0.	0.46	0.		0.			0.87	0.95
69782-90-7	Cl6-BZ#157	6.	0.	0.	0.46	0.		0.			0.87	0.95
52663-72-6	Cl6-BZ#167	6.	0.	0.	0.46	0.		0.			0.87	0.95
32774-16-6	Cl6-BZ#169	6.	0.	0.	0.46	0.		0.			0.87	0.95
35065-30-6	Cl7-BZ#170	6.	0.	0.	0.46	0.		0.			0.87	0.95
35065-29-3	Cl7-BZ#180	6.	0.	0.	0.46	0.		0.			0.87	0.95
39635-31-9	Cl7-BZ#189	6.	0.	0.	0.46	0.		0.			0.87	0.95
TOTAL_PCB congener	Total PCB congener	6.	6.	100.	13.52	3.2		25.		SR-RB-63	0.	0.
TOTAL_PCB_AROCLOR	Total PCB Aroclor	6.	5.	83	27.94	11.6	J	63.6	J	SR-RB-63	40.	40.
	TOT PCB-PCB_DIOX	6			12.7	0.		23.1		SR-RB-63		
	PCB_TEQ_MAMMAL	6			0.00018	0.00017		0.0002		SR-RB-63		
Pesticides (ug/kg)												
72-55-9	4,4'- DDE	6.	6.	100.	4.86	2.8	N	7.2	N	SR-RB-82	0.	0.
50-29-3	4,4'- DDT	6.	0.	0.	1.28	0.		0.			2.53	2.6
72-54-8	4,4'-DDD	6.	1.	17	1.26	1.15	NJ	1.15	NJ	SR-RB-82	2.53	2.6
309-00-2	Aldrin	6.	0.	0.	1.28	0.		0.			2.53	2.6
319-84-6	Alpha-BHC	6.	0.	0.	1.28	0.		0.			2.53	2.6
5103-71-9	alpha-Chlordane	6.	0.	0.	1.28	0.		0.			2.53	2.6
319-85-7	Beta-BHC	6.	0.	0.	1.28	0.		0.			2.53	2.6
57-74-9	Chlordane	6.	0.	0.	63.92	0.		0.			126.	130.
319-86-8	delta-BHC	6.	0.	0.	1.28	0.		0.			2.53	2.6
60-57-1	Dieldrin	6.	1.	17	2.985	11.5	N	11.5	N	SR-RB-80	2.53	2.6
959-98-8	Endosulfan I	6.	0.	0.	1.28	0.		0.			2.53	2.6
33213-65-9	Endosulfan II	6.	0.	0.	1.28	0.		0.			2.53	2.6
1031-07-8	Endosulfan Sulfate	6.	0.	0.	1.28	0.		0.			2.53	2.6
72-20-8	Endrin	6.	0.	0.	1.28	0.		0.			2.53	2.6
7421-93-4	Endrin Aldehyde	6.	0.	0.	1.28	0.		0.			2.53	2.6
53494-70-5	Endrin Ketone	6.	0.	0.	1.28	0.		0.			2.53	2.6
58-89-9	Gamma-BHC	6.	0.	0.	1.28	0.		0.			2.53	2.6
5103-74-2	gamma-Chlordane	6.	0.	0.	1.28	0.		0.			2.53	2.6
76-44-8	Heptachlor	6.	0.	0.	1.28	0.		0.			2.53	2.6
1024-57-3	Heptachlor epoxide (B)	6.	0.	0.	1.28	0.		0.			2.53	2.6

Table A-6. Redbreast Sunfish Tissue Data - Area C
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequcnc y of Detection (%)	Avg Value	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
72-43-5	Methoxychlor	6.	0.	0.	1.28	0.		0.			2.53	2.6
8001-35-2	Toxaphene	6.	0.	0.	128.	0.		0.			253.	260.
	Total Endrin	6.		0.	3.84	3.795		3.9		SR-RB-79, SR-RB-84		
	TOTAL_BHC	6.		0.	5.12	5.06		5.2		SR-RB-79, SR-RB-84		
	Total_Chlordane	6.		0.	2.56	2.53		2.6		SR-RB-79, SR-RB-84		
	TOTAL_DDX	6.		0.	7.4	5.4		9.625		SR-RB-82		
	Total Endosulfan	6.		0.	3.84	3.795		3.9		SR-RB-79, SR-RB-84		
SVOCs (ug/kg)												
91-58-7	2-Chloronaphthalene	6.	0.	0.	206.42	0.		0.			386.	518.
91-57-6	2-Methylnaphthalene	6.	0.	0.	206.42	0.		0.			386.	518.
83-32-9	Acenaphthene	6.	0.	0.	206.42	0.		0.			386.	518.
208-96-8	Acenaphthylene	6.	0.	0.	206.42	0.		0.			386.	518.
120-12-7	Anthracene	6.	0.	0.	206.42	0.		0.			386.	518.
56-55-3	Benz[a]anthracene	6.	0.	0.	206.42	0.		0.			386.	518.
50-32-8	Benzo[a]pyrene	6.	0.	0.	206.42	0.		0.			386.	518.
205-99-2	Benzo[b]fluoranthene	6.	0.	0.	206.42	0.		0.			386.	518.
191-24-2	Benzo[g,h,i]perylene	6.	0.	0.	206.42	0.		0.			386.	518.
207-08-9	Benzo[k]fluoranthene	6.	0.	0.	206.42	0.		0.			386.	518.
86-74-8	Carbazole	6.	0.	0.	206.42	0.		0.			386.	518.
218-01-9	Chrysene	6.	0.	0.	206.42	0.		0.			386.	518.
53-70-3	Dibenz[a,h]anthracene	6.	0.	0.	206.42	0.		0.			386.	518.
132-64-9	Dibenzofuran	6.	0.	0.	206.42	0.		0.			386.	518.
206-44-0	Fluoranthene	6.	0.	0.	206.42	0.		0.			386.	518.
86-73-7	Fluorene	6.	0.	0.	206.42	0.		0.			386.	518.
193-39-5	Indeno[1,2,3-cd]pyrene	6.	0.	0.	206.42	0.		0.			386.	518.
91-20-3	Naphthalene	6.	0.	0.	206.42	0.		0.			386.	518.
85-01-8	Phenanthrene	6.	0.	0.	206.42	0.		0.			386.	518.
129-00-0	Pyrene	6.	0.	0.	206.42	0.		0.			386.	518.
	HPAH	6.		0.	2,064.17	1,930.		2,590.		SR-RB-80		
	LPAH	6.		0.	1,444.92	1,351.		1,813.		SR-RB-80		
Percent Lipid	**PCT Lipid Analysis**	**12.**	**12.**	**100.**	**0.92492**	**0.625**		**1.4**		**SR-RB-82**	**0.**	**0.**

Table A-7. White Sucker Tissue Data - Area A/B
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value[a]	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Metals (mg/kg)												
7429-90-5	Aluminum	10.	8.	80	31.28	23.	J	82.6	J	SR-WS-07	5.54	11.
7440-36-0	Antimony	12.	0.	0	0.95	0.		0.			1.64	2.65
7440-38-2	Arsenic	12.	0.	0	0.93	0.		0.			1.64	2.14
7440-39-3	Barium	12.	12.	100	1.56	1.11		2.12		SR-WS-15	0.	0.
7440-41-7	Beryllium	12.	0.	0	0.09	0.		0.			0.164	0.214
7440-43-9	Cadmium	12.	0.	0	0.09	0.		0.			0.164	0.214
7440-70-2	Calcium	12.	12.	100	10,592.5	5,540.		15,800.		SR-WS-08	0.	0.
7440-47-3	Chromium	12.	4.	33	0.38	0.475		1.08		SR-WS-17	0.44	0.535
7440-48-4	Cobalt	12.	1.	8	0.1	0.202		0.202		SR-WS-15	0.164	0.214
7440-50-8	Copper	12.	12.	100	0.87	0.643		1.37		SR-WS-07	0.	0.
7439-89-6	Iron	12.	12.	100	58.48	41.3	J	152.	J	SR-WS-07	0.	0.
7439-92-1	Lead	12.	0.	0	0.47	0.		0.			0.822	1.07
7439-95-4	Magnesium	12.	12.	100	390.	294.		462.		SR-WS-08, SR-WS-15	0.	0.
7439-96-5	Manganese	12.	12.	100	24.3	17.		42.9		SR-WS-15	0.	0.
7439-97-6	Mercury	12.	12.	100	0.07	0.0423		0.0863		SR-WS-07	0.	0.
7440-02-0	Nickel	12.	1.	8	0.26	0.552		0.552		SR-WS-17	0.411	0.535
7440-09-7	Potassium	12.	12.	100	2,984.17	2,790.		3,190.		SR-WS-07	0.	0.
7440-22-4	Silver	12.	0.	0	0.23	0.		0.			0.411	0.535
7440-23-5	Sodium	12.	12.	100	817.83	766.		895.		SR-WS-08	0.	0.
7440-28-0	Thallium	12.	0.	0	0.93	0.		0.			1.64	2.14
7440-62-2	Vanadium	12.	0.	0	0.23	0.		0.			0.411	0.535
7440-66-6	Zinc	12.	12.	100	21.73	17.9		24.3		SR-WS-35	0.	0.
PCBs (ug/kg)												
12674-11-2	Aroclor 1016	24.	0.	0	210.93	0.		0.			40.	3,200.
11104-28-2	Aroclor 1221	24.	0.	0	210.93	0.		0.			40.	3,200.
11141-16-5	Aroclor 1232	24.	0.	0	210.93	0.		0.			40.	3,200.
53469-21-9	Aroclor 1242	24.	10.	42	1,081.46	98.		7,400.		SR-WS-01	50.	3,200.
12672-29-6	Aroclor 1248	24.	22.	92	5,383.19	221.		39,500.		SR-WS-03	40.	50.
11097-69-1	Aroclor 1254	24.	3.	13	220.17	79.5		130.		SR-WS-35	40.	3,200.
11096-82-5	Aroclor 1260	24.	0.	0	210.93	0.		0.			40.	3,200.
32598-13-3	Cl4-BZ#77	12.	12.	100	46.92	0.98	J	190.	J	SR-WS-03	0.	0.
70362-50-4	Cl4-BZ#81	12.	9.	75	4.21	1.1	J	15.	J	SR-WS-03	0.85	0.95
32598-14-4	Cl5-BZ#105	12.	12.	100	71.7	2.		280.		SR-WS-03	0.	0.
70424-68-9/65510-44-3	Cl5-BZ#107/#123	12.	11.	92	22.2	2.8		87.		SR-WS-03	1.9	1.9
74472-37-0	Cl5-BZ#114	12.	11.	92	8.8	1.1		34.		SR-WS-03	0.95	0.95
31508-00-6	Cl5-BZ#118	11.	11.	100	133.35	4.9		410.		SR-WS-06	0.	0.
57465-28-8	Cl5-BZ#126	12.	0.	0	0.46	0.		0.			0.85	0.95
38380-08-4	Cl6-BZ#156	12.	11.	92	4.98	1.2		16.		SR-WS-03	0.95	0.95
69782-90-7	Cl6-BZ#157	12.	6.	50	1.28	1.3		3.7		SR-WS-03	0.85	0.95
52663-72-6	Cl6-BZ#167	12.	8.	67	2.03	1.2		6.4		SR-WS-03	0.85	0.95
32774-16-6	Cl6-BZ#169	12.	0.	0	0.46	0.		0.			0.85	0.95
35065-30-6	Cl7-BZ#170	12.	11.	92	4.44	1.6		12.		SR-WS-03	0.95	0.95
35065-29-3	Cl7-BZ#180	12.	12.	100	8.63	1.1		24.		SR-WS-03	0.	0.
39635-31-9	Cl7-BZ#189	12.	0.	0	0.46	0.		0.			0.85	0.95
TOTAL_PCB congener	Total PCB congener	12.	12.	100	10,470.	290.	J	38,000.	J	SR-WS-03	0.	0.
TOTAL_PCB_AROCLOR	Total PCB Aroclor	24.	24.	100	5,809.73	243.		39,500.		SR-WS-03	0.	0.
	PCB_TEQ_BIRD	12.			2.82	0.14489		11.07925		SR-WS-03		
	PCB_TEQ_FISH	12.			0.01	0.00279		0.03088		SR-WS-03		
	PCB_TEQ_MAMMAL	12.			0.07	0.05733		0.09418		SR-WS-03		
Pesticides (ug/kg)												
72-55-9	4,4'- DDE	12.	12.	100	18.64	15.3	N	23.4	N	SR-WS-07	0.	0.
72-54-8	4,4'-DDD	12.	12.	100	2.71	1.71	NJ	6.15	N	SR-WS-16	0.	0.
	TOTAL_DDX	12.			21.35	17.79		26.86		SR-WS-07		
309-00-2	Aldrin	12.	0.	0	1.25	0.		0.			2.5	2.5
5103-71-9	alpha-Chlordane	12.	0.	0	1.25	0.		0.			2.5	2.5
57-74-9	Chlordane	12.	0.	0	62.5	0.		0.			125.	125.
319-84-6	Alpha-BHC	10.	0.	0	1.25	0.		0.			2.5	2.5
319-85-7	Beta-BHC	12.	5.	42	1.3	0.91	J	2.52		SR-WS-35	2.5	2.5
319-86-8	delta-BHC	12.	0.	0	1.25	0.		0.			2.5	2.5
58-89-9	Gamma-BHC	12.	0.	0	1.25	0.		0.			2.5	2.5
	TOTAL_BHC	12.			4.84	3.7		6.27		SR-WS-35		
60-57-1	Dieldrin	12.	0.	0	1.25	0.		0.			2.5	2.5
959-98-8	Endosulfan I	12.	0.	0	1.25	0.		0.			2.5	2.5
33213-65-9	Endosulfan II	11.	0.	0	1.25	0.		0.			2.5	2.5
1031-07-8	Endosulfan Sulfate	12.	0.	0	1.25	0.		0.			2.5	2.5
72-20-8	Endrin	12.	0.	0	1.25	0.		0.			2.5	2.5
7421-93-4	Endrin Aldehyde	12.	0.	0	1.25	0.		0.			2.5	2.5
53494-70-5	Endrin Ketone	12.	0.	0	1.25	0.		0.			2.5	2.5
76-44-8	Heptachlor	12.	0.	0	1.25	0.		0.			2.5	2.5

Table A-7. White Sucker Tissue Data - Area A/B
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value[a]	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
72-43-5	Methoxychlor	12.	0.	0	1.25	0.		0.			2.5	2.5
8001-35-2	Toxaphene	12.	0.	0	125.	0.		0.			250.	250.
SVOCs (ug/kg)												
91-58-7	2-Chloronaphthalene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
91-57-6	2-Methylnaphthalene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
83-32-9	Acenaphthene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
208-96-8	Acenaphthylene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
120-12-7	Anthracene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
56-55-3	Benz[a]anthracene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
50-32-8	Benzo[a]pyrene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
205-99-2	Benzo[b]fluoranthene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
191-24-2	Benzo[g,h,i]perylene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
207-08-9	Benzo[k]fluoranthene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
86-74-8	Carbazole	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
218-01-9	Chrysene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
53-70-3	Dibenz[a,h]anthracene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
132-64-9	Dibenzofuran	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
206-44-0	Fluoranthene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
86-73-7	Fluorene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
193-39-5	Indeno[1,2,3-cd]pyrene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
91-20-3	Naphthalene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
85-01-8	Phenanthrene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
129-00-0	Pyrene	12.	0.	0	185.38	0.		0.		SR-WS-08	367.	376.
Percent Lipid (%)		24.	24.	100	5.6	2.08		10.		SR-WS-03		

[a] Average values based on original data and includes both detected and non-detected data.

Table A-8. White Sucker Tissue Data - Area C
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value[a]	Min Value	Min Qual	Max Value	Max Qual	Max Sample ID	Min DL	Max DL
Metals (mg/kg)												
7429-90-5	Aluminum	6.	6.	100	22.45	14.7	J	25.2	J	SR-WS-	0.	0.
7440-36-0	Antimony	6.	0.	0	0.86	0.		0.			1.27	2.25
7440-38-2	Arsenic	6.	0.	0	0.86	0.		0.			1.27	2.25
7440-39-3	Barium	6.	6.	100	1.27	0.782		2.33		SR-WS-	0.	0.
7440-41-7	Beryllium	6.	0.	0	0.09	0.		0.			0.127	0.225
7440-43-9	Cadmium	6.	0.	0	0.09	0.		0.			0.127	0.225
7440-70-2	Calcium	6.	6.	100	9,040.	4,710.	J	16,200.	J	SR-WS-	0.	0.
7440-47-3	Chromium	6.	1.	17	0.251	0.416		0.416		SR-WS-	0.317	0.563
7440-48-4	Cobalt	6.	0.	0	0.086	0.		0.			0.127	0.225
7440-50-8	Copper	6.	2.	33	0.313	0.411		0.531		SR-WS-	0.4	0.563
7439-89-6	Iron	6.	6.	100	46.73	42.1		52.4		SR-WS-	0.	0.
7439-92-1	Lead	6.	0.	0	0.43	0.		0.			0.634	1.13
7439-95-4	Magnesium	6.	6.	100	347.17	282.		467.		SR-WS-	0.	0.
7439-96-5	Manganese	6.	6.	100	24.	12.2	J	40.5	J	SR-WS-	0.	0.
7439-97-6	Mercury	6.	6.	100	0.07	0.0634		0.0785		SR-WS-	0.	0.
7440-02-0	Nickel	6.	6.	100	0.641	0.496		0.762		SR-WS-	0.	0.
7440-09-7	Potassium	6.	6.	100	######	2,820.		3,380.		SR-WS-	0.	0.
7782-49-2	Selenium	6.	0.	0	1.29	0.		0.			1.9	3.38
7440-22-4	Silver	6.	0.	0	0.21	0.		0.			0.317	0.563
7440-23-5	Sodium	6.	6.	100	850.17	659.		1,020.		SR-WS-	0.	0.
7440-28-0	Thallium	6.	0.	0	0.86	0.		0.			1.27	2.25
7440-62-2	Vanadium	6.	0.	0	0.21	0.		0.			0.317	0.563
7440-66-6	Zinc	6.	6.	100	19.6	16.1		23.7		71	0.	0.
PCBs (ug/kg)												
12674-11-2	Aroclor 1016	12.	0.	0	27.19	0.		0.			40.	160.
11104-28-2	Aroclor 1221	12.	3.	25	341.52	577.		2,680.		SR-WS-	40.	50.
11141-16-5	Aroclor 1232	12.	3.	25	451.04	45.		5,000.		SR-WS-	40.	50.
53469-21-9	Aroclor 1242	12.	6.	50	565.43	82.9		4,180.		SR-WS-	40.	50.
12672-29-6	Aroclor 1248	12.	7.	58	160.7	46.8	J	558.		SR-WS-	40.	160.
11097-69-1	Aroclor 1254	12.	9.	75	113.26	43.8	J	346.5		SR-WS-	50.	50.
11096-82-5	Aroclor 1260	12.	0.	0	27.19	0.		0.			40.	160.
32598-13-3	Cl4-BZ#77	6.	4.	67	2.04	1.4	J	4.8	J	SR-WS-	0.93	0.94
70362-50-4	Cl4-BZ#81	6.	1.	17	1.36	5.9	J	5.9	J	SR-WS-	0.87	0.94
32598-14-4	Cl5-BZ#105	6.	6.	100	5.5	2.6		10.		SR-WS-	0.	0.
70424-68-9/65510-44-3	Cl5-BZ#107/#123	6.	3.	50	2.32	1.8		5.9		SR-WS-	1.8	1.9
74472-37-0	Cl5-BZ#114	6.	4.	67	1.59	0.99		4.7		SR-WS-	0.93	0.94
31508-00-6	Cl5-BZ#118	6.	6.	100	14.62	7.5	J	30.	J	SR-WS-	0.	0.
57465-28-8	Cl5-BZ#126	6.	1.	17	1.21	5.	J	5.	J	SR-WS-	0.87	0.94
38380-08-4	Cl6-BZ#156	6.	3.	50	1.66	1.4		5.2		SR-WS-	0.87	0.94
69782-90-7	Cl6-BZ#157	6.	2.	33	1.26	0.92		4.8		SR-WS-	0.87	0.94
52663-72-6	Cl6-BZ#167	6.	2.	33	1.42	1.1		5.6		SR-WS-	0.87	0.94
32774-16-6	Cl6-BZ#169	6.	1.	17	1.4	6.1	J	6.1	J	SR-WS-	0.87	0.94
35065-30-6	Cl7-BZ#170	6.	5.	83	2.38	1.2		6.2		SR-WS-	0.93	0.93
35065-29-3	Cl7-BZ#180	6.	6.	100	4.83	2.4	J	7.5	J	SR-WS-	0.	0.
39635-31-9	Cl7-BZ#189	6.	1.	17	1.36	5.9		5.9		SR-WS-	0.87	0.94
TOTAL_PCB congener	Total PCB congener	6.	6.	100	######	130.		4,200.	J	SR-WS-	0.	0.
TOTAL_PCB_AROCLOR	Total PCB Aroclor	12.	12.	100	1,115.2	46.8	J	7,090.		SR-WS-	0.	0.
	PCB_TEQ_BIRD	6.		0	0.362	######		######		SR-WS-		
	PCB_TEQ_FISH	6.		0	0.0072	######		######		SR-WS-		
	PCB_TEQ_MAMMAL	6.		0	0.165	######		######		53		
Pesticides (ug/kg)												
72-55-9	4,4'- DDE	6.	6.	100	18.17	14.8	N	21.8	N	SR-WS-	0.	0.
50-29-3	4,4'- DDT	1.	0.	0	1.25	0.		0.			2.5	2.5
72-54-8	4,4'-DDD	6.	6.	100	2.42	1.84	N	3.08	NJ	SR-WS-	0.	0.
	TOTAL_DDX	6.		0	20.8	18.63		24.88		SR-WS-		
309-00-2	Aldrin	6.	0.	0	1.25	0.		0.			2.5	2.5
319-84-6	Alpha-BHC	4.	0.	0	1.25	0.		0.			2.5	2.5
319-85-7	Beta-BHC	6.	1.	17	1.26	1.3	J	1.3	J	SR-WS-	2.5	2.5
319-86-8	delta-BHC	6.	0.	0	1.25	0.		0.			2.5	2.5
58-89-9	Gamma-BHC	6.	0.	0	1.25	0.		0.			2.5	2.5
	TOTAL_BHC	6.		0	4.59	0.		0.				
5103-71-9	alpha-Chlordane	6.	0.	0	1.25	0.		0.			2.5	2.5

Table A-8. White Sucker Tissue Data - Area C
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value[a]	Min Value	Min Qual	Max Value	Max Qual	Max Sample ID	Min DL	Max DL
57-74-9	Chlordane	6.	0.	0	62.5	0.		0.			125.	125.
60-57-1	Dieldrin	6.	0.	0	1.25	0.		0.			2.5	2.5
959-98-8	Endosulfan I	6.	0.	0	1.25	0.		0.			2.5	2.5
33213-65-9	Endosulfan II	6.	0.	0	1.25	0.		0.			2.5	2.5
1031-07-8	Endosulfan Sulfate	6.	0.	0	1.25	0.		0.			2.5	2.5
72-20-8	Endrin	6.	0.	0	1.25	0.		0.			2.5	2.5
7421-93-4	Endrin Aldehyde	6.	0.	0	1.25	0.		0.			2.5	2.5
53494-70-5	Endrin Ketone	6.	0.	0	1.25	0.		0.			2.5	2.5
76-44-8	Heptachlor	6.	0.	0	1.25	0.		0.			2.5	2.5
1024-57-3	Heptachlor epoxide (B)	2.	0.	0	1.25	0.		0.			2.5	2.5
72-43-5	Methoxychlor	6.	0.	0	1.25	0.		0.			2.5	2.5
8001-35-2	Toxaphene	6.	0.	0	125.	0.		0.			250.	250.
SVOCs (ug/kg)												
91-58-7	2-Chloronaphthalene	6.	0.	0	186.25	0.		0.			367.	377.
91-57-6	2-Methylnaphthalene	6.	0.	0	186.25	0.		0.			367.	377.
83-32-9	Acenaphthene	6.	0.	0	186.25	0.		0.			367.	377.
208-96-8	Acenaphthylene	6.	0.	0	186.25	0.		0.			367.	377.
120-12-7	Anthracene	6.	0.	0	186.25	0.		0.			367.	377.
56-55-3	Benz[a]anthracene	6.	0.	0	186.25	0.		0.			367.	377.
50-32-8	Benzo[a]pyrene	6.	0.	0	186.25	0.		0.			367.	377.
205-99-2	Benzo[b]fluoranthene	6.	0.	0	186.25	0.		0.			367.	377.
191-24-2	Benzo[g,h,i]perylene	6.	0.	0	186.25	0.		0.			367.	377.
207-08-9	Benzo[k]fluoranthene	6.	0.	0	186.25	0.		0.			367.	377.
86-74-8	Carbazole	6.	0.	0	186.25	0.		0.			367.	377.
218-01-9	Chrysene	6.	0.	0	186.25	0.		0.			367.	377.
53-70-3	Dibenz[a,h]anthracene	6.	0.	0	186.25	0.		0.			367.	377.
132-64-9	Dibenzofuran	6.	0.	0	186.25	0.		0.			367.	377.
206-44-0	Fluoranthene	6.	0.	0	186.25	0.		0.			367.	377.
86-73-7	Fluorene	6.	0.	0	186.25	0.		0.			367.	377.
193-39-5	Indeno[1,2,3-cd]pyrene	6.	0.	0	186.25	0.		0.			367.	377.
91-20-3	Naphthalene	6.	0.	0	186.25	0.		0.			367.	377.
85-01-8	Phenanthrene	6.	0.	0	186.25	0.		0.			367.	377.
129-00-0	Pyrene	6.	0.	0	186.25	0.		0.			367.	377.
Percent Lipid (%)		12.	12.	100	5.87	2.8		13.		49	0.	0.

[a] Average values based on original data and includes both detected and non-detected data.

Table A-9. White Sucker Data - Area A (Hot Spot Area)
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Detected Results	Frequency of Detect (%)	Avg Value[a]	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Metals (mg/kg)												
7429-90-5	Aluminum	4.	2.	50.	29.49	27.1	J	82.6	J	SR-WS-07	5.54	11.
7440-36-0	Antimony	6.	0.	0.	0.87	0.		0.			1.64	1.81
7440-38-2	Arsenic	6.	0.	0.	0.87	0.		0.			1.64	1.81
7440-39-3	Barium	6.	6.	100.	1.74	1.55		2.12		SR-WS-15	0.	0.
7440-41-7	Beryllium	6.	0.	0.	0.09	0.		0.			0.164	0.181
7440-43-9	Cadmium	6.	0.	0.	0.09	0.		0.			0.164	0.181
7440-70-2	Calcium	6.	6.	100.	13,101.67	9,300.		15,800.		SR-WS-08	0.	0.
7440-47-3	Chromium	6.	4.	67	0.51	0.475		1.08		SR-WS-17	0.441	0.452
7440-48-4	Cobalt	6.	1.	17	0.11	0.202		0.202		SR-WS-15	0.164	0.181
7440-50-8	Copper	6.	6.	100.	0.84	0.643		1.37		SR-WS-07	0.	0.
7439-89-6	Iron	6.	6.	100.	67.92	42.8	J	152.	J	SR-WS-07	0.	0.
7439-92-1	Lead	6.	0.	0.	0.44	0.		0.			0.822	0.904
7439-95-4	Magnesium	6.	6.	100.	425.5	374.		462.		SR-WS-08, SR-WS-15	0.	0.
7439-96-5	Manganese	6.	6.	100.	26.33	18.1		42.9		SR-WS-15	0.	0.
7439-97-6	Mercury	6.	6.	100.	0.07	0.0633		0.0863		SR-WS-07	0.	0.
7440-02-0	Nickel	6.	1.	17	0.27	0.552		0.552		SR-WS-17	0.411	0.452
7440-09-7	Potassium	6.	6.	100.	3,071.67	2,960.		3,190.		SR-WS-07	0.	0.
7440-22-4	Silver	6.	0.	0.	0.22	0.		0.			0.411	0.452
7440-23-5	Sodium	6.	6.	100.	858.	790.		895.		SR-WS-08	0.	0.
7440-28-0	Thallium	6.	0.	0.	0.87	0.		0.			1.64	1.81
7440-62-2	Vanadium	6.	0.	0.	0.22	0.		0.			0.411	0.452
7440-66-6	Zinc	6.	6.	100.	21.55	20.		23.6		SR-WS-18	0.	0.
PCBs (ug/kg)												
12674-11-2	Aroclor 1016	12.	0.	0.	343.71	0.		0.			40.	3,200.
11104-28-2	Aroclor 1221	12.	0.	0.	343.71	0.		0.			40.	3,200.
11141-16-5	Aroclor 1232	12.	0.	0.	343.71	0.		0.			40.	3,200.
53469-21-9	Aroclor 1242	12.	4.	33	1,636.08	228.		7,400.		SR-WS-01	50.	3,200.
12672-29-6	Aroclor 1248	12.	11.	92	8,431.88	221.		39,500.		SR-WS-03	40.	40.
11097-69-1	Aroclor 1254	12.	2.	17	353.45	79.5		81.9		SR-WS-15	50.	3,200.
11096-82-5	Aroclor 1260	12.	0.	0.	343.71	0.		0.			40.	3,200.
32598-13-3	Cl4-BZ#77	6.	6.	100.	72.25	0.98	J	190.	J	SR-WS-03	0.	0.
70362-50-4	Cl4-BZ#81	6.	5.	83	6.18	1.1	J	15.	J	SR-WS-03	0.95	0.95
32598-14-4	Cl5-BZ#105	6.	6.	100.	110.5	2.		280.		SR-WS-03	0.	0.
70424-68-9/65510-44-3	Cl5-BZ#107/#123	6.	5.	83	34.56	4.4		87.		SR-WS-03	1.9	1.9
74472-37-0	Cl5-BZ#114	6.	5.	83	13.58	2.		34.		SR-WS-03	0.95	0.95
31508-00-6	Cl5-BZ#118	5.	5.	100.	194.18	4.9		410.		SR-WS-06	0.	0.
57465-28-8	Cl5-BZ#126	6.	0.	0.	0.46	0.		0.			0.85	0.95
38380-08-4	Cl6-BZ#156	6.	5.	83	6.85	1.2		16.		SR-WS-03	0.95	0.95
69782-90-7	Cl6-BZ#157	6.	4.	67	1.77	1.4		3.7		SR-WS-03	0.94	0.95
52663-72-6	Cl6-BZ#167	6.	4.	67	2.77	2.2		6.4		SR-WS-03	0.94	0.95
32774-16-6	Cl6-BZ#169	6.	0.	0.	0.46	0.		0.			0.85	0.95
35065-30-6	Cl7-BZ#170	6.	5.	83	5.56	2.		12.		SR-WS-03	0.95	0.95
35065-29-3	Cl7-BZ#180	6.	6.	100.	10.87	1.1		24.		SR-WS-03	0.	0.
39635-31-9	Cl7-BZ#189	6.	0.	0.	0.46	0.		0.			0.85	0.95
TOTAL_PCB congener	Total PCB congener	6.	6.	100.	16,131.67	290.	J	38,000.	J	SR-WS-03	0.	0.
TOTAL_PCB_AROCLOR	Total PCB Aroclor	12.	12.	100.	8,984.2	285.5		39,500.		SR-WS-03	0.	0.
	PCB_TEQ_BIRD	6.			4.2919	0.14489		11.0793		SR-WS-03		
	PCB_TEQ_FISH	6.			0.0143	0.00279		0.03088		SR-WS-03		
	PCB_TEQ_MAMMAL	6.			0.0787	0.0623		0.09418		SR-WS-03		
Pesticides (ug/kg)												
72-55-9	4,4'- DDE	6.	6.	100.	19.45	17.7	N	23.4	N	SR-WS-07	0.	0.
72-54-8	4,4'-DDD	6.	6.	100.	2.98	1.71	NJ	6.15	N	SR-WS-16	0.	0.
309-00-2	Aldrin	6.	0.	0.	1.25	0.		0.			2.5	2.5
319-84-6	Alpha-BHC	4.	0.	0.	1.25	0.		0.			2.5	2.5
5103-71-9	alpha-Chlordane	6.	0.	0.	1.25	0.		0.			2.5	2.5
319-85-7	Beta-BHC	6.	3.	50.	1.195	0.91	J	1.31	J	SR-WS-17	2.5	2.5
57-74-9	Chlordane	6.	0.	0.	62.5	0.		0.			125.	125.
319-86-8	delta-BHC	6.	0.	0.	1.25	0.		0.			2.5	2.5
60-57-1	Dieldrin	6.	0.	0.	1.25	0.		0.			2.5	2.5
959-98-8	Endosulfan I	6.	0.	0.	1.25	0.		0.			2.5	2.5
33213-65-9	Endosulfan II	5.	0.	0.	1.25	0.		0.			2.5	2.5
1031-07-8	Endosulfan Sulfate	6.	0.	0.	1.25	0.		0.			2.5	2.5
72-20-8	Endrin	6.	0.	0.	1.25	0.		0.			2.5	2.5
7421-93-4	Endrin Aldehyde	6.	0.	0.	1.25	0.		0.			2.5	2.5
53494-70-5	Endrin Ketone	6.	0.	0.	1.25	0.		0.			2.5	2.5
58-89-9	Gamma-BHC	6.	0.	0.	1.25	0.		0.			2.5	2.5
76-44-8	Heptachlor	6.	0.	0.	1.25	0.		0.			2.5	2.5

Table A-9. White Sucker Data - Area A (Hot Spot Area)
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Detected Results	Frequency of Detect (%)	Avg Value[a]	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
72-43-5	Methoxychlor	6.	0.	0.	1.25	0.		0.			2.5	2.5
8001-35-2	Toxaphene	6.	0.	0.	125.	0.		0.			250.	250.
TOTAL_BHC		6.			4.53	3.7		5.06		SR-WS-17		
Total_Chlordane		6.			1.25	1.25		1.25		07, SR-WS-08, SR-WS-15, SR-WS-16, SR-WS-		
TOTAL_DDX		6.			22.43	19.6		26.86		SR-WS-07		
Total Endrin		6.			3.75	3.75		3.75		07, SR-WS-08, SR-WS-15, SR-WS-16, SR-WS-		
Total Endosulfan		6.			3.54	2.5		3.75		07, SR-WS-15, SR-WS-16, SR-WS-17,		
SVOCs (ug/kg)												
91-58-7	2-Chloronaphthalene	6.	0.	0.	185.5	0.		0.			367.	376.
91-57-6	2-Methylnaphthalene	6.	0.	0.	185.5	0.		0.			367.	376.
83-32-9	Acenaphthene	6.	0.	0.	185.5	0.		0.			367.	376.
208-96-8	Acenaphthylene	6.	0.	0.	185.5	0.		0.			367.	376.
120-12-7	Anthracene	6.	0.	0.	185.5	0.		0.			367.	376.
56-55-3	Benz[a]anthracene	6.	0.	0.	185.5	0.		0.			367.	376.
50-32-8	Benzo[a]pyrene	6.	0.	0.	185.5	0.		0.			367.	376.
205-99-2	Benzo[b]fluoranthene	6.	0.	0.	185.5	0.		0.			367.	376.
191-24-2	Benzo[g,h,i]perylene	6.	0.	0.	185.5	0.		0.			367.	376.
207-08-9	Benzo[k]fluoranthene	6.	0.	0.	185.5	0.		0.			367.	376.
86-74-8	Carbazole	6.	0.	0.	185.5	0.		0.			367.	376.
218-01-9	Chrysene	6.	0.	0.	185.5	0.		0.			367.	376.
53-70-3	Dibenz[a,h]anthracene	6.	0.	0.	185.5	0.		0.			367.	376.
132-64-9	Dibenzofuran	6.	0.	0.	185.5	0.		0.			367.	376.
206-44-0	Fluoranthene	6.	0.	0.	185.5	0.		0.			367.	376.
86-73-7	Fluorene	6.	0.	0.	185.5	0.		0.			367.	376.
193-39-5	Indeno[1,2,3-cd]pyrene	6.	0.	0.	185.5	0.		0.			367.	376.
91-20-3	Naphthalene	6.	0.	0.	185.5	0.		0.			367.	376.
85-01-8	Phenanthrene	6.	0.	0.	185.5	0.		0.			367.	376.
129-00-0	Pyrene	6.	0.	0.	185.5	0.		0.			367.	376.
HPAH		6.			1,855.	1,835.		1,880.		SR-WS-08		
LPAH		6.			1,298.5	1,284.5		1,316.		SR-WS-08		
Percent Lipid (%)		12.	12.	100.	5.665	3.17		10.		SR-WS-03	0.	0.

[a] Average values based on original data and includes both detected and non-detected data.

Table A-10. Deep Sediment Data - Area A/B
Fletcher's Paint Superfund Site

	Samples	Num Detected Results	Frequency of Detect	Avg Value	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Sediment 6 to 14 inches											
Total PCB congener	11.	9.	82	32,160.77	12.	J	180,000.	J	SD-27 RE	0.22	2.7
Total PCB Aroclor	34.	26.	76	14,792.57	8.35	J	190,000.	J	SD-27 RE	20.2	24.5
PCB_TEQ_BIRD	11	8	73	1.89	0.028		12.60		SD-27		
PCB_TEQ_FISH	11	8	73	0.01	0.001		0.04		SD-27 RE		
PCB_TEQ_MAMMAL	11	8	73	0.06	0.011		0.42		SD-27 RE		
TOT PCB-PCB_DIOX	11	8	73	31,974.27	-2.05		179139.78		SD-27 RE		
Sediment 12 to 27 inches											
Total PCB congener	5.	5.	100.	10,124.	310.	J	27,000.	J	T-15-6	0.	0.
Total PCB Aroclor	28.	17.	61	2,598.87	14.	J	33,500.	J	T-15-6	21.2	26.9
PCB_TEQ_BIRD	5	5	100	4.29	0.185		19.46		T-15-6		
PCB_TEQ_FISH	5	5	100	0.02	0.002		0.07		T-15-6		
PCB_TEQ_MAMMAL	5	5	100	0.12	0.027		0.49		T-15-6		
TOT PCB-PCB_DIOX	5	5	100	9,827.71	301.01		25686.6		T-15-6		
Sediment 24 to 39 inches											
Total PCB congener	4.	4.	100.	3,574.05	6.2		12,000.	J	T-15-7-A	0.	0.
Total PCB Aroclor	11.	8.	73	1,437.918	17.4	J	12,750.		T-15-7-A	26.3	27.6
PCB_TEQ_BIRD	4	3	75	1.619	0.01463		5.504		T-15-7-A		
PCB_TEQ_FISH	4	3	75	0.004	0.00004		0.012		T-15-7-A		
PCB_TEQ_MAMMAL	4	3	75	0.005	0.0001		0.017		T-15-7-A		
TOT PCB-PCB_DIOX	4	3	75	3,479.599	3.57		11682.41		T-15-7-A		
Sediment 36 to 56 inches											
Total PCB congener	1.	1.	100.	45,000.	45,000.	J	45,000.	J	T-15-7-A	0.	0.
Total PCB Aroclor	4.	2.	50.	21,393.75	17,500.		68,050.		T-15-7-A	23.4	26.6
PCB_TEQ_BIRD	1	1	100.	8.25	8.25		8.25		T-15-7-A		
PCB_TEQ_FISH	1	1	100.	0.03	0.03		0.03		T-15-7-A		
PCB_TEQ_MAMMAL	1	1	100.	0.26	0.26		0.26		T-15-7-A		
TOT PCB-PCB_DIOX	1	1	100.	44270.56	44,270.56		44,270.56		T-15-7-A		

Note: Values in µg/kg

Table A-11. Deep Sediment Data - Area C
Fletcher's Paint Superfund Site

	Samples	Num Detected Results	Frequency of Detect	Avg Value	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Sediment 6 to 12 inches											
Total PCB congener	1.	1.	100.	20.	20.		20.		T-20-7-A	0.	0.
Total PCB Aroclor	4.	4.	100.	27.1	19.4	J	32.6	J	T-20-7-A	0.	0.
PCB_TEQ_BIRD	1	1	100.	0.091	0.091		0.091		T-20-7-A		
PCB_TEQ_FISH	1	1	100.	0.002	0.002		0.002		T-20-7-A		
PCB_TEQ_MAMMAL	1	1	100.	0.037	0.037		0.037		T-20-7-A		
TOT PCB-PCB_DIOX	1	1	100.	13.46	13.46		13.46		T-20-7-A		
Sediment 12 to 24 inches											
Total PCB congener	2.	2.	100.	54.5	17.	J	92.	J	DEP-8	0.	0.
Total PCB Aroclor	4.	3.	75.	26.275	14.5	J	56.8		DEP-8	28.8	28.8
PCB_TEQ_BIRD	2	2	100.	0.086	0.083		0.088		DEP-8		
PCB_TEQ_FISH	2	2	100.	0.002	0.002		0.002		DEP-8		
PCB_TEQ_MAMMAL	2	2	100.	0.034	0.034		0.035		DEP-8		
TOT PCB-PCB_DIOX	2	2	100.	47.4075	12.165		82.65		DEP-8		
Sediment 24 to 36 inches											
Total PCB Aroclor	2.	2.	100.	18.55	11.1	J	26.		T-22-3	0.	0.
Sediment 36 to 56 inches											
Total PCB Aroclor	2.	2.	100.	158.4	77.6		239.2		T-22-3	0.	0.

Note: Values in µg/kg

Table A-12. Deep Sediment Data - Rope Swing/Hot Spot Area
Fletcher's Paint Superfund Site

	Samples	Num Detected Results	Frequency of Detect	Avg Value	Min Detect Value	Min Qual	Max Detect Value	Max Qual	Max Sample ID	Min DL	Max DL
Sediment 6 to 14 inches											
Total PCB congener	3	3	100	57,237.33	12	J	170,000	J	SD-27		
Total PCB Aroclor	7	6	86	24,319.64	18.8	J	166,600		SD-27	20.2	20.2
PCB_TEQ_BIRD	3	2	67	4.364	0.065		12.601		SD-27		
PCB_TEQ_FISH	3	2	67	0.012	0.001		0.031		SD-27		
PCB_TEQ_MAMMAL	3	2	67	0.047	0.026		0.084		SD-27		
TOT PCB-PCB_DIOX	3			56856.778	8.9		168886.83		SD-27		
Sediment 12 to 27 inches											
Total PCB congener	2	2	100	24,500	22,000	J	27,000.	J	T-15-6		
Total PCB Aroclor	5	4	80	12,234.76	52.1		33,500.	J	T-15-6		
PCB_TEQ_BIRD	2	2	100	10.287	1.113		19.46		T-15-6		
PCB_TEQ_FISH	2	2	100	0.036	0.004		0.07		T-15-6		
PCB_TEQ_MAMMAL	2	2	100	0.261	0.035		0.49		T-15-6		
TOT PCB-PCB_DIOX	2	2	100	23788.5	21890.4		25686.6		T-15-6		
Sediment 24 to 39 inches											
Total PCB congener	2	2	100	6,900	1,800	J	12,000.	J	T-15-7-A	0.	0.
Total PCB Aroclor	4	4	100	3,683.38	43.7	J	12,750.		T-15-7-A	26.3	27.6
PCB_TEQ_BIRD	2	2	100	3.1276	0.75089		5.50437		T-15-7-A		
PCB_TEQ_FISH	2	2	100	0.0068	0.00162		0.01204		T-15-7-A		
PCB_TEQ_MAMMAL	2	2	100	0.0097	0.00221		0.01723		T-15-7-A		
TOT PCB-PCB_DIOX	2	2	100	6721.8275	1761.245		11682.41		T-15-7-A		
Sediment 36 to 56 inches											
Total PCB congener	1.	1.	100.	45,000.	45,000.	J	45,000.	J	T-15-7-A		
Total PCB Aroclor	2.	2.	100.	42,775	17,500.		68,050.		T-15-7-A		
PCB_TEQ_BIRD	1	1	100	8.25	8.25001		8.25001		T-15-7-A		
PCB_TEQ_FISH	1	1	100	0.03	0.03034		0.03034		T-15-7-A		
PCB_TEQ_MAMMAL	1	1	100	0.26	0.26301		0.26301		T-15-7-A		
TOT PCB-PCB_DIOX	1	1	100	44,270.56	44,270.56		44,270.56		T-15-7-A		

Note: Values in µg/kg

Table A-13. Bank Soil Data - Area A/B
Fletcher's Paint Superfund Site

Parameter	Samples	Num Detected Results	Avg Value	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Bank Soil Data										
TOTAL_PCB congener	24.	16.	55.989	0.79		380.		SS-14	0.19	0.36
Total Aroclor	24	5	89.102	27.3		463		SS-09		
PCB_TEQ_BIRD	24	15	0.07	0.02504		0.47137		SS-04		
PCB_TEQ_FISH	24	15	0.001	0.00055		0.00265		SS-04		
PCB_TEQ_MAMMAL	24	15	0.012	0.00959		0.03		SS-04		
TOT PCB-PCB_DIOX	24		50.751	-1.055		353.71		SS-14		

Note: Values in µg/kg

Table A-14. Sandbar Soil Data - Area A
Fletcher's Paint Superfund Site

Parameter	Samples	Num Detected Results	Avg Value	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Sandbar Soil 0 to 12 inches										
TOTAL_PCB congener	2.	2.	0.95	0.25		1.65		SS-13	0.2	0.2
Total Aroclor	2	0	27.7375	27.65		27.825		SS-13		
PCB_TEQ_BIRD	2	0	0.02514	0.02514		0.02515		SS-12		
PCB_TEQ_FISH	2	0	0.00057	0.00057		0.00057		SS-12		
PCB_TEQ_MAMMAL	2	0	0.01307	0.01307		0.01307		SS-12		
Sandbar Soil 12 to 24 inches										
TOTAL_PCB congener	2.	1.	0.315	0.52		0.52		SS-13	0.2	0.22
Total Aroclor	2	0	29.925	28.7		31.15		SS-12		
PCB_TEQ_BIRD	2	1	2E-06	0.0000011		0.0000029		SS-13		
PCB_TEQ_FISH	2	1	1E-06	5.5E-07		1.45E-06		SS-13		
PCB_TEQ_MAMMAL	2	1	6E-06	0.0000033		0.0000087		SS-13		
TOT PCB-PCB_DIOX	2	1	0.115	0		0.23		SS-13		

Note: Values in µg/kg

Table A-15. Bullhead Tissue Data - Areas A/B and C
Fletcher's Paint Superfund Site

Area	Parameter	Samples	Num Detected Results	Avg Value	Min Detected Value	Min Qual	Max Detected Value	Max Qual	Max Sample ID	Min DL	Max DL
Yellow Bullhead Data											
AREA A/B	TOTAL_PCB congener	12.	12.	320.725	2.6	J	1,800.	J	SR-YB-12	0.	0.
AREA A/B	TOTAL_PCB_AROCLOR	12.	10.	617.525	100.		2,790.		SR-YB-12	40.	40.
AREA A/B	PCB_TEQ_BIRD	12	11	0.05892	0.02215		0.2975		SR-YB-12		
AREA A/B	PCB_TEQ_FISH	12	11	0.00021	0.00006		0.0009		SR-YB-12		
AREA A/B	PCB_TEQ_MAMMAL	12	11	0.00067	0.00013		0.00245		SR-YB-12		
AREA A/B	TOT PCB-PCB_DIOX	12		301.124167	-0.675		1732.2		SR-YB-12		
Yellow Bullhead Data											
AREA C	TOTAL_PCB congener	6.	6.	59.2	4.6		260.		SR-YB-72	0.	0.
AREA C	TOTAL_PCB_AROCLOR	6.	6.	124.41667	9.1	J	538.		SR-YB-72	0.	0.
AREA C	PCB_TEQ_BIRD	6	6	0.02299	0.02165		0.02417		SR-YB-74		
AREA C	PCB_TEQ_FISH	6	6	0.00008	0.00006		0.00014		SR-YB-72		
AREA C	PCB_TEQ_MAMMAL	6	6	0.00026	0.00014		0.00061		SR-YB-72		
AREA C	TOT PCB-PCB_DIOX	6	6	51.6516667	0.93		240.78		SR-YB-72		
Brown Bullhead Data											
AREA C	TOTAL_PCB congener	4.	4.	9.375	3.5		12.		SR-BB-56	0.	0.
AREA C	TOTAL_PCB_AROCLOR	4.	3.	79.8	50.9	J	190.	J	SR-BB-56	40.	40.
AREA C	PCB_TEQ_BIRD	4	4	0.000016	0.000011		0.000019		SR-BB-58		
AREA C	PCB_TEQ_FISH	4	4	0.000008	0.0000055		0.0000095		SR-BB-58		
AREA C	PCB_TEQ_MAMMAL	4	4	0.000048	0.000033		0.000057		SR-BB-58		
AREA C	TOT PCB-PCB_DIOX	4	4	7.775	2.4		10.4		SR-BB-56		

Note: Values in µg/kg

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APPENDIX B

Rationale and Approach for Estimating PCB Congener Data

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Rationale and Approach for Estimating PCB Congener Data

Most of the data available for the Fletcher's Paint Site are concentrations of individual Aroclors and total PCBs calculated as the sum of Aroclors, and only limited PCB congener data are available. Samples collected in 2004 were only analyzed for Aroclors. Additional samples collected in 2006 were analyzed for both Aroclors and PCB congeners, but only six samples had both Aroclor and congener data. All 2007 samples collected had both congener and Aroclor analyses (nine samples).

While Aroclor analysis is useful as a screening tool to identify the presence of PCBs and for estimating total PCBs, there are a number of reasons why congener data are better suited for estimating PCBs exposures in risk assessment. Individual PCB congener data are necessary in order to determine the potential cancer risks to human receptors and ecological effects from dioxin-like PCB congeners (i.e., TEQs). Different Aroclors are mixtures of PCBs, and different Aroclors may contain some of the same congeners; therefore, PCB congeners may be double counted when summing Aroclors to estimate total PCB concentration, potentially over-estimating risk from total PCB Aroclors. Furthermore, most Aroclors only contain about 130 of the 209 PCB congeners, and failure to detect Aroclors in site media does not necessarily mean that PCBs are not present. Lastly, detection limits for PCB Aroclor analysis are much less sensitive than those for PCB congener analysis.

Guidance from the United States Environmental Protection Agency (USEPA, 1996) states:

> "Although PCB exposures are often characterized in terms of Aroclors, this can be both imprecise and inappropriate. Total PCBs or congener or isomer analyses are recommended."

Due to the more complete temporal and spatial coverage of the dataset, Aroclor results were used as the primary basis for characterizing exposures in the risk assessments. However, there is a higher degree of uncertainty associated with risk assessments based on Aroclor data. This is related to the fact that Aroclors collectively only contain 130 of the 209 PCB congeners and coul potentially underestimate PCB risks, are mixtures of PCBs and could result in overestimating risk because different Aroclors may contain some of the same congeners and result in double-counting, and evaluating risks from Aroclors does not account for cancer risks to human receptors or risks to ecological receptors from the most toxic dioxin-like congeners. Furthermore, risk from exposure to PCB Aroclors is based on comparison with risks from Aroclor 1248 and 1254 only.

To address the uncertainty associated with estimating risk using Aroclor data, ecological and human health risks associated with PCBs in sediments at the Fletcher's Paint Site were also estimated using available congener data. In addition, because only limited congener data were collected, TEQs and total PCBs as the sum of congeners were estimated for 37 sample locations where these data were not collected out of 43 locations sampled. This was expected to fill data gaps and increase the spatial coverage for congener data, and was intended to supplement the

assessment of risks from exposure to PCBs based on PCB Aroclors and the limited PCB congener data collected.

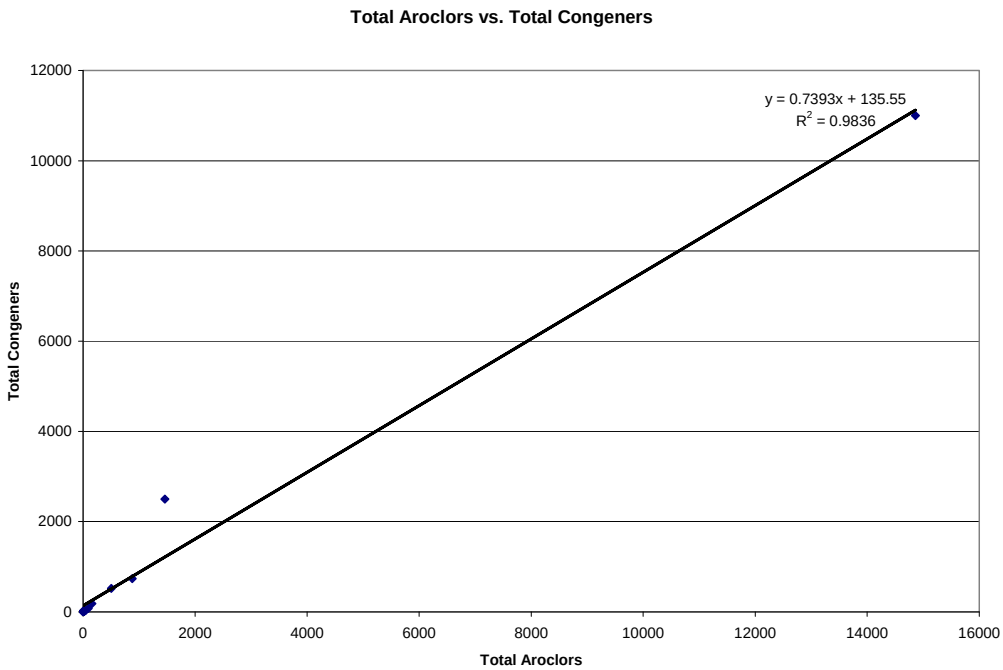
There is a strong relationship between PCB congeners and PCB Aroclors that can be established using regression analysis, and this relationship is commonly established to estimate PCB congeners and TEQs for sample locations where typically less sensitive, less accurate Aroclor data were collected. A modification of this approach was used to estimate Total PCB congeners and TEQs at the Fletcher's Paint Site. The following approach was used to estimate total PCB congeners and TEQs for 37 sample locations where only Aroclor data were collected:

1. APPROACH

1.1 Develop a Statistical Relationship Between Total PCBs (sum Aroclors) and Total PCBs (sum congeners).

Both Aroclor and congener data were available for 14 sample locations (five sampled in 2006 and nine sampled in 2007) that have been influenced by Site-related activities. Data for sample T-20-7-A, collected in 2006, were not included in the analysis because this sample was collected from the upstream background area (Area C) and therefore is expected to have a different PCB signature. Results indicate that there is a strong statistical relationship between total PCBs Aroclors and total PCBs congeners ($p < 0.0001$, $R^2 = 0.984$) that can be expressed as shown in Equation 3-2:

Total PCB congeners (µg/kg) = 135.55 + (0.739*Total PCB Aroclors [µg/kg])
(Equation 3-2)



The regression equation above was used to estimate total PCB congeners for the sample locations where only Aroclor data were collected.

1.2 Calculate TEQs.

For each location where congener analysis was performed, TEQs were calculated for each of the WHO dioxin-like PCB congeners that were detected in at least one sample. Each concentration was multiplied by its respective TEF (Van den Berg et al., 2006) and summed to obtain a total TEQ for that sample. Any congener that was not detected in any sample was removed from the calculation; for all congeners detected in at least one sample, concentrations below MDLs were included in the calculations at a value of one-half the MDL.

1.3 Calculate Ratio of TEQs to Total PCBs (Aroclor).

The ratio of TEQs to total PCB Aroclors was calculated for the 14 sample locations where both congener and Aroclor data were collected.

1.4 Estimate TEQs.

The mean of the ratios was calculated and was multiplied by total Aroclor concentrations at the 37 locations where only Aroclors were analyzed to estimate the TEQs at those locations. The ratio of TEQs to total PCB congeners was not used because that would require estimating TEQs from estimated total PCB congener concentrations at the other 37 locations, thereby increasing the uncertainty associated with the TEQ estimates.

1.5 Estimate Non Dioxin-Like PCB Concentrations.

For each location where congener data were measured, the concentrations of the individual congeners were subtracted from the total PCB congener concentration to yield a non-dioxin-like PCB concentration. This step could not be performed for locations where total PCB congeners and TEQs were estimated because there were insufficient data to estimate concentrations of the individual congeners using regression analysis, and only TEQs could be estimated. The resulting total PCB congener minus the dioxin-like congener concentration was used to estimate non-dioxin-like risks to human receptors.

Congener analysis was only performed for one sample location in Area C (T-20-7-A collected in 2006). Because PCB sources upstream from the Fletcher's Paint Site are different from sources adjacent to and downstream from the site, the relative concentrations of PCB congeners is expected to be different at this sampling location. Therefore, the data from Area C could not be included in any of the analyses for determining relationships between Aroclor, TEQ, and total PCB data. The methods proposed for estimating TEQs and total PCBs (sum congeners) could not be applied to Area C data, and EPCs for total PCBs (sum congeners) and TEQs were not calculated. Area C data were only used as a qualitative reference for comparing PCB concentrations between upstream and site-influenced areas based on Total PCB Aroclors. Risks from sediment exposures to PCB congeners in Area C were not evaluated.

2 RESULTS

The estimated PCB data summary data are presented in Appendix A. Table B-1 presents the exposure point concentrations (EPCs) for both measured PCB congener data and measure and estimated PCB congeners combined. Exposure point concentrations based on measured and estimated congener data were only calculated for sediment, as congener data were collected for all tissue samples.

3 HUMAN HEALTH RISKS

Tables B-2 and B-3 present the summary statistics for sediment concentrations for Mammal TEQ (based on Mean Aroclor Ratio) and Total PCB Congeners (measured and estimated) from Areas A/B and the Hot Spot/Rope Swing Area, respectively.

Tables B-4 and B-5 present the EPCs for the sediment concentrations for Mammal TEQ (based on Mean Aroclor Ratio) and Total PCB Congeners (measured and estimated) from Areas A/B and the Hot Spot/Rope Swing Area, respectively.

Cancer risk for Total PCB Congeners (measured and estimated) was estimated by multiplying the LADD by the oral CSF_o for high risk and persistence PCBs of 2.0E+00 $(mg/kg\text{-}day)^{-1}$ (USEPA, 2008). Cancer risk for dioxin-like PCBs was estimated by multiplying the LADD for TEQs by the CSF_o for 2,3,7,8-TCDD of 1.5E+05 $(mg/kg\text{-}day)^{-1}$ (USEPA, 1997b).

The non-cancer risk was calculated by dividing the LADD for total PCB Congeners (measured and estimated) by the RfD_o for Aroclor 1254 of 2E-05 mg/kg/day (USEPA, 2008). There was not RfD available for 2,3,7,8-TCDD.

Tables B-6 through B-12 present the sediment cancer risks and HQs for the RME scenario. The CTE sediment cancer risks are presented in Tables B-13 through X-19.

A summary of the RME cancer risks and HQs calculated using the "estimated" concentrations for Area A/B are presented below.

	PCB-related Cancer Risks – RME Case		
	Sediment Contact		
COPC	**Angler/Wader**	**Swimmer**	**Rope Swinger**
Total PCB Congeners (Measured and Estimated)	3E-07	4E-07	2E-07
Mammal TEQ based on Mean Aroclor Ratio	1E-6	2E-06	2E-06

	Total PCB Congeners (Measured and Estimated) Hazard Quotients/Indices – RME Case		
	Sediment Contact		
Receptor	**Angler/Wader**	**Swimmer**	**Rope Swinger**
Child	0.2	0.2	NE
Adolescent	NE	NE	0.3
Adult	0.06	0.1	NE

These results varied with respect to the risk estimated based solely on measured PCB data (Section 4.7.2.1), but not in any predictable way, and confused the interpretation of results.

4 ECOLOGICAL RISKS

Risk to the belted kingfisher were not calculated based on measured and estimated PCB congener data because risk from sediment exposures is considered a negligible exposure route, and PCB congener data were measured for all fish tissue samples. For the mink and the heron, which were both assumed to be exposed via the sediment ingestion pathway, the measured sediment data (including Aroclor, congener, and TEQs) were evaluated separately from the combined estimated and measured PCB congener data and TEQs. This allows for a comparison of risk estimates using the actual collected data in sediment, and the potential risks if congener-specific sediment data were available throughout the Site. Risks to mink and heron from exposure to measured sediment PCB concentrations and measured and estimated sediment PCB concentrations combined in addition to exposure to PCBs in white sucker tissue in Area A/B are summarized as follows:

	Measured PCBs		**Measured and Estimated PCBs**	
Analyte	**NOAEL-Based HQ**	**LOAEL-Based HQ**	**NOAEL-Based HQ**	**LOAEL-Based HQ**
Mink				
Total PCB (Aroclor)	5.3E+01	4.4E+01	na	na
Total PCB (Congener)	4.5E+01	3.8E+01	4.5E+01	3.8E+01
PCB_TEQ_MAMMAL	1.6E+02	5.9E+00	1.6E+02	5.9E+00
Heron				
Total PCB (Aroclor)	1.0E+01	8.1E+00	na	na
Total PCB (Congener)	9.1E+00	7.3E+00	8.5E+00	6.8E+00
PCB_TEQ_BIRD	6.8E+01	6.8E+00	7.5E+01	7.5E+00
No sediment data used for Kingfisher na = not applicable; all PCB Aroclor data were measured				

Only risks from exposure to white sucker were considered for the additional analysis, because the collection of whole-body tissue data for white sucker is more appropriate for ecological exposures. Only fillet data were collected for redbreast sunfish. The additional analysis using estimated PCB congeners (as described in the methods section above) in order to obtain better spatial coverage for PCB congener data resulted in the same general conclusions derived from evaluation of the Aroclor data and the limited congener data collected (i.e., that PCBs pose low to moderate risk (1.0<HQs<100).

5 UNCERTAINTIES

The primary sources of uncertainty associated with the use of estimated PCB congener data to estimate risks are as follows:

1. There is uncertainty in the estimates of total PCBs (sum congeners) from the statistical equation developed from the relationship between total PCBs (sum congeners) and total PCBs (sum Aroclors). There is a significant relationship between these two parameters ($p < 0.0001$, $R^2 = 0.983$); however, this relationship is based largely on total PCB (sum Aroclors)

data calculated as the sum of individual Aroclors, and a high percentage of the individual Aroclors were below analytical detection limits (DLs). Calculations of total PCBs (sum Aroclors) were made mostly using ½ DL substituted values for analytes below the detection limit. This results in a high degree of uncertainty in the total PCB (sum Aroclor) calculations that can be expressed as the range of possible values from zero to the DL summed for each Aroclor in the calculation that is below the detection limit. Also, residual analysis demonstrated that most residuals have negative values (i.e., lab-calculated concentrations of total PCBs [sum congeners] are lower than concentrations predicted by the regression equation). Also, as total PCBs (sum Aroclors) increases, the ability to predict total PCBs (sum congeners) deteriorates. This is demonstrated by the total PCBs (sum Aroclors) exceeding the predicted concentration of total PCBs (sum congeners), which is not possible. These lines of evidence indicate that the slope of the regression line may be too shallow and/or the intercept is too high, most likely because of the large influence of the highest values on the equation. To quantify uncertainty in the risk assessment, calculate the 95% UCL based only on the 2006 Total PCB (Aroclors) data and estimate the 95% UCL (sum of congeners). The regression uncertainty can be quantified as the 95% confidence intervals on the estimate UCL value.

2. There is uncertainty associated with calculating TEQs substituting ½ DL for congeners below analytical detection limits. This uncertainty is quantified by the range from zero to the detection limit. Each congener in a TEQ for which substituted data are used additively expands the range of uncertainty in the TEQ for that sample. The uncertainty associated with each descriptive statistic for all TEQs can be expressed as the corresponding statistic for the ranges.
3. There is uncertainty in using the ratio of TEQs/total PCBs (sum congeners) from some locations to predict the TEQs at other locations. This uncertainty comes from:
   a. Variability in the ratio of TEQs/total PCBs (sum congeners) between sample locations, expressed as the standard deviation for the calculated ratios, and;
   b. Uncertainty in the estimated total PCBs (sum congeners), expressed as 95% confidence interval as discussed above.
4. The use of regression analysis and ratios makes several assumptions: 1) it assumes a linear relationship between parameters; 2) it assumes that the parameters being correlated are independent; and 3) it assumes that the data are normally distributed. The correlating parameters (total Aroclors with total congeners and TEQs with total Aroclors) are not truly independent, because the same components are found in both parameters (i.e., total Aroclors, total PCBs, and TEQ are comprised of individual PCB congeners). Also, data analysis shows that, in most cases, data follow gamma, lognormal, or indeterminate distributions and are rarely normally distributed. Therefore, the assumptions of regression analysis are violated, resulting in a less robust regression equation.

6 CONCLUSIONS

Based on the comparison of the results described above with those presented in Sections 4 and 5 it is concluded that the additional risk assessment based on measured and estimated PCB data did not bring any additional value to the risk assessment. Results varied inconsistently with respect to estimated human health risks, and risk conclusions for wildlife receptors were the similar as without the estimated data. Given the additional uncertainties that would be introduced, estimated PCB data (congeners and TEQs) were not included in the ERA.

Table B-1 Exposure concentrations estimated based on measure PCB Data and measured and estimated PCB data.

		White Sucker		Sediment		
COPEC	**Units**	**Area A/B[a]**	**Area C[b]**	**Area A/B[a]**	**Hotspot[a]**	**Area C[b]**
Measured Data						
Total PCB Aroclors	µg/kg	25320	2427[c]	3368	3820	17.3
Total PCB Congeners	µg/kg	21707	1107	5382	3560[d]	8
Fish TEQ	µg/kg	0.0162	0.0072	0.00324[f]	0.00181[d]	0.0000037[e]
Bird TEQ	µg/kg	5.735	0.362	1.233[f]	0.672[d]	0.0000074[e]
Mammal TEQ	µg/kg	0.0788	0.165	0.00491[f]	0.00261[d]	0.0000222[e]
Estimated Data						
Total PCB Congeners	µg/kg	nc	nc	1895	4917	nc
Fish TEQ	µg/kg	nc	nc	0.0119	0.0298	nc
Bird TEQ	µg/kg	nc	nc	3.059	7.213	nc
Mammal TEQ	µg/kg	nc	nc	0.0128	0.306	nc

nc = not calculated

[a] Based on 95%UCL, unless noted

[b] Based on mean data, unless noted

[c] Value based on 95%UCL

[d] Based on mean value

[e] Based on 1 congener detected in 1 sample. To avoid overestimating the TEQ by using 1/2 MDL for congeners that were not detected, only the congener that was detected was used to calculate the TEQ. In Area A/B congeners that were below detection limits were included as 1/2 MDL to calculate TEQs because the proportion of non-detect data was generally lower than in Area C (i.e., PCB concentrations overall were higher).

[f] Based on maximum concentration because 95% UCL was higher.

Table B-2
RAGS Part D TABLE 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment - Areas A and B
Exposure Medium: Surface Sediments (0-6")

Exposure Point	CAS Number	Analyte	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (3) (N/C)	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Areas A and B	---	Mammal TEQ (Based on Mean Aroclor Ratio) (5)	3.73E-06	8.15E-03	mg/kg	SRSD13	74/79	7.48E-06 - 2.01E-05	8.15E-03	NA	4.50E-05 C	Yes	ASL
	---	Total PCB Congeners (Measured and Estimated)	1.20E-03	1.10E+01	mg/kg	SED-02A	78/79	7.18E-03 - 7.18E-03	1.10E+01	NA	2.00E+00 N	Yes	ASL

(1) Maximum concentration used for screening.
(2) See text for a discussion on background concentrations.
(3) All analytes were screened against the lower value of the ORNL residential soil regional screening levels (RSLs) (EPA, 2009) and the New Hampshire Soil Category S-1 Direct Contact Risk-based Concentrations (NHDES, 2007).
(4) Rationale Codes:
Above Screening Levels (ASL)
(5) ORNL RSL for 2,3,7,8-TCDD used as a surrogate.

Definitions: ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic, Based on a TR = 1E-05
COPC = Contaminant of Potential Concern
N = Non-Carcinogenic, Based on a THQ = 1.0
NA = Not Applicable

Table B-3
RAGS Part D TABLE 2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment - Rope Swing Area
Exposure Medium: Surface Sediments (0-6")

Exposure Point	CAS Number	Analyte	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (3) (N/C)		COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Rope Swing Area	---	Mammal TEQ (Based on Mean Aroclor Ratio) (5)	3.07E-08	1.58E-04	mg/kg	SRSD12	26/26	NA	1.58E-04	NA	4.50E-05	C	Yes	ASL
	---	Total PCB Congeners (Measured and Estimated)	5.10E-03	1.10E+01	mg/kg	SED-02A	25/26	-	1.10E+01	NA	2.00E+00	N	Yes	ASL

(1) Maximum concentration used for screening.
(2) See text for a discussion on background concentrations.
(3) All analytes were screened against the lower value of the ORNL residential soil regional screening levels (RSLs) (EPA, 2009) and the New Hampshire Soil Category S-1 Direct Contact Risk-based Concentrations (NHDES, 2007).
(4) Rationale Codes:
Above Screening Levels (ASL)
(5) ORNL RSL for 2,3,7,8-TCDD used as a surrogate.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic, Based on a TR = 1E-05
COPC = Contaminant of Potential Concern
N = Non-Carcinogenic, Based on a THQ = 1.0
NA = Not Applicable

Table B-4

RAGS Part D TABLE 3.1

EXPOSURE POINT CONCENTRATION SUMMARY

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediments (0-6")

Exposure Point	Contaminant of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (1) (Distribution)	Maximum Concentration	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Areas A and B	Mammal TEQ (Based on Mean Aroclor Ratio)	mg/kg	5.71E-06	1.28E-05 (L)	8.15E-03	1.28E-05	mg/kg	95% H-UCL	(2)
	Total PCB Congeners (Measured and Estimated)	mg/kg	6.50E-01	1.89E+00 (ND)	1.10E+01	1.89E+00	mg/kg	97.5% Chebyshev (Mean, SD) UCL	(3)

Note: The EPC is based on the 95% UCL or the maximum detected concentration, whichever value is lower.

(1) Nondetects were included at half the detection limit, except when substitution was made for PCBs.

(2) Based on ProUCL recommendation, data is lognormally distributed.

(5) Data distribution is not discernable, UCL selection is based on ProUCL recommendation.

Definitions: L = Lognormal
ND = not discernable

Table B-5

RAGS Part D TABLE 3.2

EXPOSURE POINT CONCENTRATION SUMMARY

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediments (0-6")

Exposure Point	Contaminant of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (1) (Distribution)	Maximum Concentration	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Rope Swing Area	Mammal TEQ (Based on Mean Aroclor Ratio)	mg/kg	1.65E-05	3.06E-05 (G)	1.58E-04	3.06E-05	mg/kg	95% Adjusted Gamma UCL	(2)
	Total PCB Congeners (Measured and Estimated)	mg/kg	1.67E+00	4.92E+00 (L)	1.10E+01	4.92E+00	mg/kg	95% Chebyshev (MVUE) UCL	(3)

Note: The EPC is based on the 95% UCL or the maximum detected concentration, whichever value is lower.

(1) Nondetects were included at half the detection limit, except when substitution was made for PCBs.

(2) Based on ProUCL recommendation, data has gamma distribution.

(3) Based on ProUCL recommendation, data is lognormally distributed.

Definitions: G = Gamma
L = Lognormal

Table B-6

RAGS Part D TABLE 7.1

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	1.49E-12	mg/kg/day	1.50E+05	1/mg/kg/day	2.23E-07	---	---	---	---	---
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	2.20E-07	mg/kg/day	2.00E+00	1/mg/kg/day	4.40E-07	---	---	---	---	---
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	6.33E-13	mg/kg/day	1.50E+05	1/mg/kg/day	9.50E-08	---	---	---	---	---
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	4.37E-07	mg/kg/day	2.00E+00	1/mg/kg/day	8.74E-07	---	---	---	---	---
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											3.18E-07					---
Sediment Total (Total PCB Congeners Measured and Estimated)											1.31E-06					---

Table B-7

RAGS Part D TABLE 7.2

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	1.22E-11	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	1.80E-06	mg/kg/day	2.00E-05	mg/kg/day	8.99E-02
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	2.04E-12	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	1.41E-06	mg/kg/day	2.00E-05	mg/kg/day	7.05E-02
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											---					---
Sediment Total (Total PCB Congeners Measured and Estimated)											---					1.60E-01

Table B-8

RAGS Part D TABLE 7.3

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	1.30E-12	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	1.93E-07	mg/kg/day	2.00E-05	mg/kg/day	9.63E-03
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	1.34E-12	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	9.22E-07	mg/kg/day	2.00E-05	mg/kg/day	4.61E-02
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											---					---
Sediment Total (Total PCB Congeners Measured and Estimated)											---					5.57E-02

Table B-9

RAGS Part D TABLE 7.7

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	1.12E-12	mg/kg/day	1.50E+05	1/mg/kg/day	1.67E-07	---	---	---	---	---
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	1.65E-07	mg/kg/day	2.00E+00	1/mg/kg/day	3.30E-07	---	---	---	---	---
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	1.39E-12	mg/kg/day	1.50E+05	1/mg/kg/day	2.09E-07	---	---	---	---	---
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	9.63E-07	mg/kg/day	2.00E+00	1/mg/kg/day	1.93E-06	---	---	---	---	---
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											3.77E-07					---
Sediment Total (Total PCB Congeners Measured and Estimated)											2.26E-06					---

Table B-10

RAGS Part D TABLE 7.8

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	9.12E-12	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	1.35E-06	mg/kg/day	2.00E-05	mg/kg/day	6.74E-02
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	3.61E-12	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	2.49E-06	mg/kg/day	2.00E-05	mg/kg/day	1.25E-01
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											---					---
Sediment Total (Total PCB Congeners Measured and Estimated)											---					1.92E-01

Table B-11

RAGS Part D TABLE 7.9

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	9.77E-13	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	1.44E-07	mg/kg/day	2.00E-05	mg/kg/day	7.22E-03
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	3.17E-12	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	2.18E-06	mg/kg/day	2.00E-05	mg/kg/day	1.09E-01
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											---					---
Sediment Total (Total PCB Congeners Measured and Estimated)											---					1.16E-01

Table B-12

RAGS Part D TABLE 7.13

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Rope Swing
Receptor Age: Adolescent (10-18 yrs)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Subarea A	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	3.06E-05	mg/kg	3.59E-13	mg/kg/day	1.50E+05	1/mg/kg/day	5.39E-08	3.14E-12	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	4.92E+00	mg/kg	5.77E-08	mg/kg/day	2.00E+00	1/mg/kg/day	1.15E-07	5.05E-07	mg/kg/day	2.00E-05	mg/kg/day	2.53E-02
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	3.06E-05	mg/kg	9.70E-13	mg/kg/day	1.50E+05	1/mg/kg/day	1.46E-07	8.49E-12	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	4.92E+00	mg/kg	7.27E-07	mg/kg/day	2.00E+00	1/mg/kg/day	1.45E-06	6.37E-06	mg/kg/day	2.00E-05	mg/kg/day	3.18E-01
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											1.99E-07					---
Sediment Total (Total PCB Congeners Measured and Estimated)											1.57E-06					3.44E-01

Table B-13

RAGS Part D TABLE 7.4

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	1.51E-13	mg/kg/day	1.50E+05	1/mg/kg/day	2.27E-08	---	---	---	---	---
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	2.24E-08	mg/kg/day	2.00E+00	1/mg/kg/day	4.47E-08	---	---	---	---	---
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	1.08E-13	mg/kg/day	1.50E+05	1/mg/kg/day	1.61E-08	---	---	---	---	---
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	7.42E-08	mg/kg/day	2.00E+00	1/mg/kg/day	1.48E-07	---	---	---	---	---
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											3.88E-08					---
Sediment Total (Total PCB Congeners Measured and Estimated)											1.93E-07					---

Table B-14

RAGS Part D TABLE 7.5

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	1.52E-12	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	2.25E-07	mg/kg/day	2.00E-05	mg/kg/day	1.12E-02
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	1.02E-12	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	7.05E-07	mg/kg/day	2.00E-05	mg/kg/day	3.52E-02
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											---					---
Sediment Total (Total PCB Congeners Measured and Estimated)											---					4.65E-02

Table B-15

RAGS Part D TABLE 7.6

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	1.63E-13	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	2.41E-08	mg/kg/day	2.00E-05	mg/kg/day	1.20E-03
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	1.56E-13	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	1.08E-07	mg/kg/day	2.00E-05	mg/kg/day	5.38E-03
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											---					---
Sediment Total (Total PCB Congeners Measured and Estimated)											---					6.58E-03

Table B-16

RAGS Part D TABLE 7.10

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	7.56E-14	mg/kg/day	1.50E+05	1/mg/kg/day	1.13E-08	---	---	---	---	---
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	1.12E-08	mg/kg/day	2.00E+00	1/mg/kg/day	2.24E-08	---	---	---	---	---
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	1.35E-13	mg/kg/day	1.50E+05	1/mg/kg/day	2.02E-08	---	---	---	---	---
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	9.30E-08	mg/kg/day	2.00E+00	1/mg/kg/day	1.86E-07	---	---	---	---	---
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											3.16E-08					---
Sediment Total (Total PCB Congeners Measured and Estimated)											2.08E-07					---

Table B-17

RAGS Part D TABLE 7.11

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	7.60E-13	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	1.12E-07	mg/kg/day	2.00E-05	mg/kg/day	5.62E-03
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	1.20E-12	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	8.31E-07	mg/kg/day	2.00E-05	mg/kg/day	4.15E-02
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											---					---
Sediment Total (Total PCB Congeners Measured and Estimated)											---					4.72E-02

Table B-18

RAGS Part D TABLE 7.12

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	8.14E-14	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	1.20E-08	mg/kg/day	2.00E-05	mg/kg/day	6.02E-04
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	1.28E-05	mg/kg	---	---	---	---	---	2.46E-13	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	1.89E+00	mg/kg	---	---	---	---	---	1.70E-07	mg/kg/day	2.00E-05	mg/kg/day	8.50E-03
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											---					---
Sediment Total (Total PCB Congeners Measured and Estimated)											---					9.10E-03

Table B-19

RAGS Part D TABLE 7.14

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Rope Swing
Receptor Age: Adolescent (10-18 yrs)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Subarea A	Ingestion	Mammal TEQ (Based on Mean Aroclor Ratio)	3.06E-05	mg/kg	2.99E-14	mg/kg/day	1.50E+05	1/mg/kg/day	4.49E-09	2.62E-13	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	4.92E+00	mg/kg	4.81E-09	mg/kg/day	2.00E+00	1/mg/kg/day	9.62E-09	4.21E-08	mg/kg/day	2.00E-05	mg/kg/day	2.10E-03
			Dermal	Mammal TEQ (Based on Mean Aroclor Ratio)	3.06E-05	mg/kg	7.55E-14	mg/kg/day	1.50E+05	1/mg/kg/day	1.13E-08	6.60E-13	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured and Estimated)	4.92E+00	mg/kg	5.66E-08	mg/kg/day	2.00E+00	1/mg/kg/day	1.13E-07	4.95E-07	mg/kg/day	2.00E-05	mg/kg/day	2.48E-02
Sediment Total (Mammal TEQ Based on Mean Aroclor Ratio)											1.58E-08					---
Sediment Total (Total PCB Congeners Measured and Estimated)											1.23E-07					2.69E-02

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APPENDIX C

COPC Screening Tables

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Table C-1
RAGS Part D TABLE 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment - Areas A and B
Exposure Medium: Surface Sediments (0-6")

Exposure Point	CAS Number	Analyte	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (3)	(N/C)	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Areas A and B	91-57-6	2-Methylnaphthalene	3.70E-02	3.70E-02	mg/kg	T-2-8	1/37	3.30E-01 - 6.10E-01	3.70E-02	NA	3.10E+02	N	No	BSL
	83-32-9	Acenaphthene	2.00E-02	4.30E-02	mg/kg	T-17-7	5/37	3.30E-01 - 6.10E-01	4.30E-02	NA	3.40E+03	N	No	BSL
	208-96-8	Acenaphthylene	9.20E-03	3.80E-01	mg/kg	DEP-5	41/71	7.80E-03 - 6.10E-01	3.80E-01	NA	3.40E+03	N	No	BSL
	120-12-7	Anthracene	2.20E-02	2.40E-01	mg/kg	DEP-5	17/37	3.30E-01 - 6.10E-01	2.40E-01	NA	1.70E+04	N	No	BSL
	56-55-3	Benz[a]anthracene	1.90E-02	1.20E+00	mg/kg	DEP-5	67/71	7.80E-03 - 3.80E-01	1.20E+00	NA	1.50E+00	C	No	BSL
	50-32-8	Benzo[a]pyrene	2.10E-02	1.40E+00	mg/kg	DEP-5	67/71	7.80E-03 - 3.80E-01	1.40E+00	NA	1.50E-01	C	Yes	ASL
	205-99-2	Benzo[b]fluoranthene	1.70E-02	1.90E+00	mg/kg	DEP-5	69/71	7.80E-03 - 3.80E-01	1.90E+00	NA	1.50E+00	C	Yes	ASL
	191-24-2	Benzo[g,h,i]perylene	1.40E-02	6.20E-01	mg/kg	DEP-5	65/71	7.80E-03 - 3.80E-01	6.20E-01	NA	3.90E+01	C	No	BSL
	207-08-9	Benzo[k]fluoranthene	1.80E-02	8.20E-01	mg/kg	T-2-8	62/71	7.80E-03 - 3.90E-01	8.20E-01	NA	1.50E+01	C	No	BSL
	218-01-9	Chrysene	2.70E-02	1.20E+00	mg/kg	DEP-5	67/71	7.80E-03 - 3.80E-01	1.20E+00	NA	1.50E+02	C	No	BSL
	53-70-3	Dibenz[a,h]anthracene	9.40E-03	1.90E-01	mg/kg	DEP-5	43/71	7.80E-03 - 6.10E-01	1.90E-01	NA	1.50E-01	C	Yes	ASL
	206-44-0	Fluoranthene	2.40E-02	2.00E+00	mg/kg	DEP-5	37/37	NA	2.00E+00	NA	2.30E+03	N	No	BSL
	86-73-7	Fluorene	2.70E-02	7.70E-02	mg/kg	DEP-5	6/37	3.30E-01 - 6.10E-01	7.70E-02	NA	2.30E+03	N	No	BSL
	193-39-5	Indeno[1,2,3-cd]pyrene	1.30E-02	6.20E-01	mg/kg	DEP-5	64/71	7.80E-03 - 3.80E-01	6.20E-01	NA	1.50E+00	C	No	BSL
	91-20-3	Naphthalene	2.00E-02	5.90E-02	mg/kg	T-2-8	3/71	7.80E-03 - 6.10E-01	5.90E-02	NA	3.90E+01	C	No	BSL
	85-01-8	Phenanthrene	2.00E-02	7.30E-01	mg/kg	DEP-5	68/71	7.80E-03 - 3.80E-01	7.30E-01	NA	1.70E+03	N	No	BSL
	129-00-0	Pyrene	1.90E-02	1.70E+00	mg/kg	DEP-5	37/37	NA	1.70E+00	NA	1.70E+03	N	No	BSL
	72-54-8	4,4'-DDD	1.20E-03	6.50E-02	mg/kg	DEP-5	9/37	3.40E-03 - 4.20E-01	6.50E-02	NA	2.00E+01	C	No	BSL
	72-55-9	4,4'-DDE	8.00E-04	2.00E-02	mg/kg	T-15-6	3/19	3.40E-03 - 5.80E-03	2.00E-02	NA	1.40E+01	C	No	BSL
	50-29-3	4,4'-DDT	9.40E-04	6.60E-02	mg/kg	DEP-5	15/37	3.40E-03 - 4.20E-01	6.60E-02	NA	1.70E+01	C	No	BSL
	319-84-6	alpha-BHC	9.10E-03	9.10E-03	mg/kg	T-15-6	1/37	1.70E-03 - 2.20E-01	9.10E-03	NA	7.70E-01	C	No	BSL
	319-85-7	beta-BHC	9.00E-04	6.10E-02	mg/kg	T-15-6	5/37	1.70E-03 - 2.20E-01	6.10E-02	NA	2.70E+00	C	No	BSL
	319-86-8	delta-BHC (5)	7.30E-04	1.30E-03	mg/kg	SD-9	2/37	1.70E-03 - 2.20E-01	1.30E-03	NA	7.70E-01	C	No	BSL
	60-57-1	Dieldrin	1.20E-03	1.20E-03	mg/kg	T-17-7	1/65	3.10E-04 - 4.20E-01	1.20E-03	NA	3.00E-01	C	No	BSL
	959-98-8	Endosulfan I (6)	5.90E-04	7.90E-03	mg/kg	T-15-6	4/34	1.70E-03 - 6.30E-03	7.90E-03	NA	3.70E+02	N	No	BSL
	33213-65-9	Endosulfan II (6)	1.00E-03	2.60E-02	mg/kg	T-15-6	6/36	3.40E-03 - 4.20E-01	2.60E-02	NA	3.70E+02	N	No	BSL
	1031-07-8	Endosulfan sulfate (6)	1.20E-03	3.80E-03	mg/kg	DEP-5	3/37	3.40E-03 - 4.20E-01	3.80E-03	NA	3.70E+02	N	No	BSL
	72-20-8	Endrin	1.00E-03	9.10E-03	mg/kg	SD-27	6/34	3.40E-03 - 4.20E-01	9.10E-03	NA	1.80E+01	N	No	BSL
	7421-93-4	Endrin aldehyde (7)	8.60E-04	8.60E-04	mg/kg	SD-9	1/37	3.40E-03 - 4.20E-01	8.60E-04	NA	1.80E+01	N	No	BSL
	53494-70-5	Endrin ketone (7)	2.20E-03	3.40E-02	mg/kg	T-15-6	2/37	3.40E-03 - 4.20E-01	3.40E-02	NA	1.80E+01	N	No	BSL
	58-89-9	gamma-BHC	9.40E-03	1.20E-02	mg/kg	T-15-6	2/30	1.70E-03 - 2.00E-02	1.20E-02	NA	5.20E+00	C	No	BSL
	76-44-8	Heptachlor	7.50E-04	2.70E-03	mg/kg	T-12-1	2/37	1.80E-03 - 2.20E-01	2.70E-03	NA	1.10E+00	C	No	BSL
	1024-57-3	Heptachlor Epoxide	6.40E-04	1.30E-03	mg/kg	T-12-1	2/69	3.10E-04 - 2.20E-01	1.30E-03	NA	5.30E-01	C	No	BSL
	72-43-5	Methoxychlor	1.00E-03	5.80E-03	mg/kg	T-12-1	8/37	1.70E-02 - 2.20E+00	5.80E-03	NA	3.10E+02	N	No	BSL
	11104-28-2	Aroclor 1221	6.14E-03	8.69E+00	mg/kg	SED-02A	7/79	6.20E-03 - 9.18E-02	8.69E+00	NA	1.70E+00	C	Yes	See Text
	11141-16-5	Aroclor 1232	6.10E-01	1.30E+01	mg/kg	SED-02A	3/79	6.20E-03 - 6.64E-02	1.30E+01	NA	1.70E+00	C	Yes	See Text
	53469-21-9	Aroclor 1242	1.28E-02	2.60E+01	mg/kg	SED-02A	30/79	6.20E-03 - 9.18E-02	2.60E+01	NA	2.20E+00	C	Yes	See Text

Table C-1
RAGS Part D TABLE 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment - Areas A and B
Exposure Medium: Surface Sediments (0-6")

Exposure Point	CAS Number	Analyte	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (3)	(N/C)	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	12672-29-6	Aroclor 1248	1.38E-02	6.80E+00	mg/kg	SRSD8	26/79	6.20E-03 - 4.65E-01	6.80E+00	NA	2.20E+00	C	Yes	See Text
	11097-69-1	Aroclor 1254	3.00E-02	1.40E+00	mg/kg	SRSD13	16/79	6.20E-03 - 4.65E-01	1.40E+00	NA	1.10E+00	N	Yes	See Text
	32598-13-3	PCB 77	2.40E-04	2.20E-02	mg/kg	SED-02A	8/13	2.20E-04 - 5.00E-04	2.20E-02	NA	3.40E-01	C	Yes	See Text
	70362-50-4	PCB 81	1.30E-03	1.80E-03	mg/kg	SD-27	2/13	2.20E-04 - 6.70E-04	1.80E-03	NA	3.40E-01	C	Yes	See Text
	32598-14-4	PCB 105	2.60E-04	2.20E-02	mg/kg	SED-02A	8/13	2.20E-04 - 5.00E-04	2.20E-02	NA	3.40E-01	C	Yes	See Text
	70424-68-9/65510-44-3	PCB 107/PCB 123	4.80E-03	5.60E-03	mg/kg	SED-02A	2/13	4.30E-04 - 1.30E-03	5.60E-03	NA	NBA		Yes	See Text
	74472-37-0	PCB 114	2.00E-03	2.40E-03	mg/kg	SED-02A	2/13	2.20E-04 - 6.70E-04	2.40E-03	NA	6.80E-03	C	Yes	See Text
	31508-00-6	PCB 118	6.10E-04	4.50E-02	mg/kg	SED-02A	8/13	2.20E-04 - 5.00E-04	4.50E-02	NA	3.40E-01	C	Yes	See Text
	38380-08-4	PCB 156	2.60E-04	1.70E-03	mg/kg	SD-27	4/13	2.20E-04 - 5.40E-04	1.70E-03	NA	6.80E-03	C	Yes	See Text
	69782-90-7	PCB 157	7.20E-04	7.20E-04	mg/kg	SD-27	1/13	2.20E-04 - 6.70E-04	7.20E-04	NA	6.80E-03	C	Yes	See Text
	52663-72-6	PCB 167	6.40E-04	6.80E-04	mg/kg	SD-27	2/13	2.20E-04 - 6.70E-04	6.80E-04	NA	3.40E-01	C	Yes	See Text
	35065-30-6	PCB 170	2.80E-04	2.20E-03	mg/kg	SD-27, SED-02A	5/13	2.20E-04 - 5.40E-04	2.20E-03	NA	NBA		Yes	See Text
	35065-29-3	PCB 180	4.10E-04	5.00E-03	mg/kg	SED-02A	6/13	2.20E-04 - 5.00E-04	5.00E-03	NA	NBA		Yes	See Text
	---	Total PCB Aroclors	6.14E-03	1.49E+01	mg/kg	SED-02A	30/37	2.00E-02 - 2.54E-02	1.49E+01	NA	2.00E+00	N	Yes	ASL
	---	Total PCB Congeners (Measured)	1.20E-03	1.10E+01	mg/kg	SED-02A	12/13	2.20E-04 - 2.50E-04	1.10E+01	NA	2.00E+00	N	Yes	ASL
	---	Mammal TEQ (Measured) (8)	7.00E-08	4.91E-06	mg/kg	SED-02A	8/13	-	4.91E-06	NA	4.50E-05	C	Yes	See Text
	---	Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	0.00E+00	1.09E+01	mg/kg	SED-02A	9/13	-	1.09E+01	NA	2.00E+00	N	Yes	ASL
	7429-90-5	Aluminum	2.26E+03	6.77E+03	mg/kg	T-9-4	37/37	NA	6.77E+03	NA	7.70E+04	N	No	BSL
	7440-36-0	Antimony	8.40E-02	9.10E+00	mg/kg	DEP-4	4/71	7.70E-02 - 2.21E+01	9.10E+00	NA	3.10E+01	N	No	BSL
	7440-38-2	Arsenic	2.40E+00	1.33E+01	mg/kg	DEP-4	68/71	3.30E-02 - 2.50E+00	1.33E+01	NA	3.90E+00	C	Yes	ASL
	7440-39-3	Barium	8.50E+00	4.02E+01	mg/kg	T-11-7-A	37/37	NA	4.02E+01	NA	1.50E+04	N	No	BSL
	7440-41-7	Beryllium	1.00E-01	9.60E+00	mg/kg	DEP-4	29/37	1.40E-01 - 4.00E-01	9.60E+00	NA	5.00E-01	C	Yes	ASL
	7440-43-9	Cadmium	1.80E-02	9.50E+00	mg/kg	DEP-4	55/71	1.60E-02 - 1.40E+00	9.50E+00	NA	7.00E+01	N	No	BSL
	7440-70-2	Calcium	1.63E+02	1.10E+03	mg/kg	T-4-4-A	37/37	NA	1.10E+03	NA	NBA		No	NUT
	7440-47-3	Chromium (9)	3.40E+00	1.82E+01	mg/kg	T-6-8	71/71	NA	1.82E+01	NA	5.50E+02	N	No	BSL
	7440-48-4	Cobalt	9.90E-01	1.14E+01	mg/kg	DEP-4	37/37	NA	1.14E+01	NA	2.30E+01	N	No	BSL
	7440-50-8	Copper	1.50E+00	1.22E+01	mg/kg	DEP-4	37/37	NA	1.22E+01	NA	3.10E+03	N	No	BSL
	7439-89-6	Iron	3.37E+03	1.27E+04	mg/kg	T-9-4	37/37	NA	1.27E+04	NA	5.50E+04	N	No	BSL
	7439-92-1	Lead	2.70E+00	8.09E+01	mg/kg	T-2-8	71/71	NA	8.09E+01	NA	4.00E+02		No	BSL
	7439-95-4	Magnesium	6.25E+02	3.23E+03	mg/kg	T-9-4	37/37	NA	3.23E+03	NA	NBA		No	NUT
	7439-96-5	Manganese	4.10E+01	2.30E+02	mg/kg	SRSD37	71/71	NA	2.30E+02	NA	1.80E+03	N	No	BSL
	7439-97-6	Mercury	1.30E-03	4.90E-02	mg/kg	T-14-8	44/71	6.30E-03 - 1.50E-01	4.90E-02	NA	4.30E+00	N	No	BSL
	7440-02-0	Nickel	2.00E+00	1.24E+01	mg/kg	DEP-4	71/71	NA	1.24E+01	NA	1.50E+03	N	No	BSL
	7440-09-7	Potassium	3.50E+02	2.62E+03	mg/kg	DEP-2	37/37	NA	2.62E+03	NA	NBA		No	NUT

Table C-1
RAGS Part D TABLE 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment - Areas A and B
Exposure Medium: Surface Sediments (0-6")

Exposure Point	CAS Number	Analyte	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (3) (N/C)	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	7782-49-2	Selenium	9.50E+00	9.50E+00	mg/kg	DEP-4	1/37	7.00E+00 - 1.29E+01	9.50E+00	NA	3.90E+02 N	No	BSL
	7440-22-4	Silver	4.10E-01	1.70E+00	mg/kg	DEP-4	2/37	2.00E+00 - 3.20E+00	1.70E+00	NA	3.90E+02 N	No	BSL
	7440-23-5	Sodium	3.15E+01	4.62E+02	mg/kg	DEP-4	20/37	1.32E+02 - 1.62E+03	4.62E+02	NA	NBA	No	NUT
	7440-28-0	Thallium	7.60E-01	9.70E+00	mg/kg	DEP-4	3/37	5.00E+00 - 9.20E+00	9.70E+00	NA	5.10E+00 N	Yes	ASL
	7440-62-2	Vanadium	4.30E+00	1.59E+01	mg/kg	DEP-4	71/71	NA	1.59E+01	NA	5.50E+02 N	No	BSL
	7440-66-6	Zinc	1.09E+01	9.33E+01	mg/kg	T-11-7-A	37/37	NA	9.33E+01	NA	2.30E+04 N	No	BSL

(1) Maximum concentration used for screening.
(2) See text for a discussion on background concentrations.
(3) All analytes were screened against the lower value of the ORNL residential soil regional screening levels (RSLs) (EPA, 2009) and the New Hampshire Soil Category S-1 Direct Contact Risk-based Concentrations (NHDES, 2007).
(4) Rationale Codes:
Above Screening Levels (ASL)
Below Screening Level (BSL)
Essential Nutrient (NUT)
(5) ORNL RSL for alpha-BHC used as a surrogate.
(6) ORNL RSL for endosulfan used as a surrogate.
(7) ORNL RSL for endrin used as a surrogate.
(8) ORNL RSL for 2,3,7,8-TCDD used as a surrogate.
(9) NHDES for chromium VI used as a surrogate.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic, Based on a TR = 1E-05
COPC = Contaminant of Potential Concern
N = Non-Carcinogenic, Based on a THQ = 1.0
NA = Not Applicable
NBA = No benchmark available

Table C-2
RAGS Part D TABLE 2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment - Rope Swing/Hot Spot Area
Exposure Medium: Surface Sediments (0-6")

Exposure Point	CAS Number	Analyte	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (3) (N/C)		COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Rope Swing Area	208-96-8	Acenaphthylene	9.30E-03	3.60E-02	mg/kg	SRSD13	19/26	7.80E-03 - 3.80E-01	3.60E-02	NA	3.40E+03	N	No	BSL
	120-12-7	Anthracene	2.20E-02	5.80E-02	mg/kg	SD-27	3/8	3.40E-01 - 3.80E-01	5.80E-02	NA	1.70E+04	N	No	BSL
	56-55-3	Benz[a]anthracene	2.50E-02	2.60E-01	mg/kg	SRSD13	25/26	7.80E-03 - 3.80E-01	2.60E-01	NA	1.50E+00	C	No	BSL
	50-32-8	Benzo[a]pyrene	2.20E-02	2.80E-01	mg/kg	SRSD13	25/26	7.80E-03 - 3.80E-01	2.80E-01	NA	1.50E-01	C	Yes	ASL
	205-99-2	Benzo[b]fluoranthene	2.00E-02	3.60E-01	mg/kg	SD-27	26/26	NA	3.60E-01	NA	1.50E+00	C	No	BSL
	191-24-2	Benzo[g,h,i]perylene	1.80E-02	1.90E-01	mg/kg	SRSD13	25/26	7.80E-03 - 3.80E-01	1.90E-01	NA	3.90E+01	C	No	BSL
	207-08-9	Benzo[k]fluoranthene	1.90E-02	3.30E-01	mg/kg	SD-27	24/26	7.80E-03 - 3.80E-01	3.30E-01	NA	1.50E+01	C	No	BSL
	218-01-9	Chrysene	3.40E-02	3.30E-01	mg/kg	SRSD13	25/26	7.80E-03 - 3.80E-01	3.30E-01	NA	1.50E+02	C	No	BSL
	53-70-3	Dibenz[a,h]anthracene	9.40E-03	4.50E-02	mg/kg	SRSD13	19/26	7.80E-03 - 4.20E-01	4.50E-02	NA	1.50E-01	C	No	BSL
	206-44-0	Fluoranthene	2.40E-02	4.20E-01	mg/kg	SD-27	8/8	NA	4.20E-01	NA	2.30E+03	N	No	BSL
	193-39-5	Indeno[1,2,3-cd]pyrene	1.70E-02	1.80E-01	mg/kg	SRSD13	24/26	7.80E-03 - 3.80E-01	1.80E-01	NA	1.50E+00	C	No	BSL
	85-01-8	Phenanthrene	2.60E-02	2.90E-01	mg/kg	SRSD13	25/26	7.80E-03 - 3.80E-01	2.90E-01	NA	1.70E+03	N	No	BSL
	129-00-0	Pyrene	2.20E-02	3.10E-01	mg/kg	SD-14	8/8	NA	3.10E-01	NA	1.70E+03	N	No	BSL
	72-55-9	4,4'-DDE	2.00E-02	2.00E-02	mg/kg	T-15-6	1/4	3.40E-03 - 3.75E-03	2.00E-02	NA	1.40E+01	C	No	BSL
	50-29-3	4,4'-DDT	9.40E-04	2.00E-03	mg/kg	SD-18	2/8	3.50E-03 - 4.20E-01	2.00E-03	NA	1.70E+01	C	No	BSL
	319-84-6	alpha-BHC	9.10E-03	9.10E-03	mg/kg	T-15-6	1/8	1.80E-03 - 2.20E-01	9.10E-03	NA	7.70E-01	C	No	BSL
	319-85-7	beta-BHC	6.10E-02	6.10E-02	mg/kg	T-15-6	1/8	1.80E-03 - 2.20E-01	6.10E-02	NA	2.70E+00	C	No	BSL
	959-98-8	Endosulfan I (5)	7.90E-03	7.90E-03	mg/kg	T-15-6	1/5	1.80E-03 - 1.95E-03	7.90E-03	NA	3.70E+02	N	No	BSL
	33213-65-9	Endosulfan II (5)	3.30E-03	2.60E-02	mg/kg	T-15-6	2/8	3.40E-03 - 4.20E-01	2.60E-02	NA	3.70E+02	N	No	BSL
	1031-07-8	Endosulfan sulfate (5)	1.60E-03	1.60E-03	mg/kg	SD-26	1/8	3.40E-03 - 4.20E-01	1.60E-03	NA	3.70E+02	N	No	BSL
	72-20-8	Endrin	2.70E-03	9.10E-03	mg/kg	SD-27	3/8	3.40E-03 - 4.20E-01	9.10E-03	NA	1.80E+01	N	No	BSL
	53494-70-5	Endrin ketone (6)	3.40E-02	3.40E-02	mg/kg	T-15-6	1/8	3.40E-03 - 4.20E-01	3.40E-02	NA	1.80E+01	N	No	BSL
	58-89-9	gamma-BHC	9.40E-03	1.20E-02	mg/kg	T-15-6	2/6	1.80E-03 - 2.00E-02	1.20E-02	NA	5.20E+00	C	No	BSL
	72-43-5	Methoxychlor	3.30E-03	3.30E-03	mg/kg	T-15-6	1/8	1.80E-02 - 2.20E+00	3.30E-03	NA	3.10E+02	N	No	BSL
	11104-28-2	Aroclor 1221	1.78E-01	8.69E+00	mg/kg	SED-02A	4/26	6.20E-03 - 9.18E-02	8.69E+00	NA	1.70E+00	C	Yes	See Text
	11141-16-5	Aroclor 1232	6.10E-01	1.30E+01	mg/kg	SED-02A	3/26	6.20E-03 - 6.64E-02	1.30E+01	NA	1.70E+00	C	Yes	See Text
	53469-21-9	Aroclor 1242	1.36E-02	2.60E+01	mg/kg	SED-02A	20/26	6.20E-03 - 9.18E-02	2.60E+01	NA	2.20E+00	C	Yes	See Text
	12672-29-6	Aroclor 1248	8.60E-02	6.80E+00	mg/kg	SRSD8	5/26	6.20E-03 - 4.65E-01	6.80E+00	NA	2.20E+00	C	Yes	See Text
	11097-69-1	Aroclor 1254	3.00E-02	1.40E+00	mg/kg	SRSD13	14/26	6.20E-03 - 4.65E-01	1.40E+00	NA	1.10E+00	N	Yes	See Text
	32598-13-3	PCB 77	4.15E-03	2.20E-02	mg/kg	SED-02A	3/4	5.00E-04 - 5.00E-04	2.20E-02	NA	3.40E-01	C	Yes	See Text
	70362-50-4	PCB 81	1.30E-03	1.80E-03	mg/kg	SD-27	2/4	5.00E-04 - 5.40E-04	1.80E-03	NA	3.40E-01	C	Yes	See Text
	32598-14-4	PCB 105	3.25E-03	2.20E-02	mg/kg	SED-02A	3/4	5.00E-04 - 5.00E-04	2.20E-02	NA	3.40E-01	C	Yes	See Text
	70424-68-9/65510-44-3	PCB 107/PCB 123	4.80E-03	5.60E-03	mg/kg	SED-02A	2/4	1.00E-03 - 1.00E-03	5.60E-03	NA	NBA		Yes	See Text
	74472-37-0	PCB 114	2.00E-03	2.40E-03	mg/kg	SED-02A	2/4	5.00E-04 - 5.40E-04	2.40E-03	NA	6.80E-03	C	Yes	See Text
	31508-00-6	PCB 118	7.15E-03	4.50E-02	mg/kg	SED-02A	3/4	5.00E-04 - 5.00E-04	4.50E-02	NA	3.40E-01	C	Yes	See Text
	38380-08-4	PCB 156	1.50E-03	1.70E-03	mg/kg	SD-27	2/4	5.00E-04 - 5.40E-04	1.70E-03	NA	6.80E-03	C	Yes	See Text
	69782-90-7	PCB 157	7.20E-04	7.20E-04	mg/kg	SD-27	1/4	5.00E-04 - 5.80E-04	7.20E-04	NA	6.80E-03	C	Yes	See Text
	52663-72-6	PCB 167	6.40E-04	6.80E-04	mg/kg	SD-27	2/4	5.00E-04 - 5.40E-04	6.80E-04	NA	3.40E-01	C	Yes	See Text
	35065-30-6	PCB 170	2.20E-03	2.20E-03	mg/kg	SD-27, SED-02A	2/4	5.00E-04 - 5.40E-04	2.20E-03	NA	NBA		Yes	See Text
	35065-29-3	PCB 180	5.90E-04	5.00E-03	mg/kg	SED-02A	3/4	5.00E-04 - 5.00E-04	5.00E-03	NA	NBA		Yes	See Text
	---	Total PCB Aroclors	2.60E-03	1.49E+01	mg/kg	SED-02A	26/26	NA	1.49E+01	NA	2.00E+00	N	Yes	ASL

Table C-2
RAGS Part D TABLE 2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment - Rope Swing/Hot Spot Area
Exposure Medium: Surface Sediments (0-6")

Exposure Point	CAS Number	Analyte	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (3) (N/C)	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	---	Total PCB Congeners (Measured)	5.10E-03	1.10E+01	mg/kg	SED-02A	4/4	NA	1.10E+01	NA	2.00E+00 N	Yes	ASL
	---	Mammal TEQ (Measured) (7)	1.60E-07	4.91E-06	mg/kg	SED-02A	3/4	NA	4.91E-06	NA	4.50E-05 C	Yes	See Text
	---	Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	2.60E-03	1.09E+01	mg/kg	SED-02A	4/4	NA	1.09E+01	NA	2.00E+00 N	Yes	ASL
	7429-90-5	Aluminum	2.26E+03	3.34E+03	mg/kg	SED-02A	8/8	NA	3.34E+03	NA	7.70E+04 N	No	BSL
	7440-36-0	Antimony	1.20E-01	1.20E-01	mg/kg	SRSD27	1/26	8.30E-02 - 1.42E+01	1.20E-01	NA	3.10E+01 N	No	BSL
	7440-38-2	Arsenic	2.40E+00	1.10E+01	mg/kg	SRSD22	24/26	3.30E-02 - 2.20E+00	1.10E+01	NA	3.90E+00 C	Yes	ASL
	7440-39-3	Barium	8.50E+00	1.99E+01	mg/kg	SED-02A	8/8	NA	1.99E+01	NA	1.50E+04 N	No	BSL
	7440-41-7	Beryllium	1.60E-01	2.20E-01	mg/kg	SED-02A	8/8	NA	2.20E-01	NA	5.00E-01 C	No	BSL
	7440-43-9	Cadmium	1.80E-02	6.10E-01	mg/kg	SRSD22	22/26	1.60E-02 - 1.15E+00	6.10E-01	NA	7.00E+01 N	No	BSL
	7440-70-2	Calcium	2.41E+02	3.29E+02	mg/kg	SED-11	8/8	NA	3.29E+02	NA	NBA	No	NUT
	7440-47-3	Chromium (8)	3.40E+00	1.60E+01	mg/kg	SRSD22	26/26	NA	1.60E+01	NA	5.50E+02 N	No	BSL
	7440-48-4	Cobalt	1.20E+00	2.20E+00	mg/kg	SED-02A	8/8	NA	2.20E+00	NA	2.30E+01 N	No	BSL
	7440-50-8	Copper	2.00E+00	4.00E+00	mg/kg	SED-02A	8/8	NA	4.00E+00	NA	3.10E+03 N	No	BSL
	7439-89-6	Iron	4.27E+03	5.59E+03	mg/kg	SED-02A	8/8	NA	5.59E+03	NA	5.50E+04 N	No	BSL
	7439-92-1	Lead	3.00E+00	2.20E+01	mg/kg	SRSD22	26/26	NA	2.20E+01	NA	4.00E+02	No	BSL
	7439-95-4	Magnesium	7.42E+02	1.22E+03	mg/kg	SED-02A	8/8	NA	1.22E+03	NA	NBA	No	NUT
	7439-96-5	Manganese	4.18E+01	1.50E+02	mg/kg	SRSD13	26/26	NA	1.50E+02	NA	1.80E+03 N	No	BSL
	7439-97-6	Mercury	1.60E-03	3.40E-02	mg/kg	SRSD22	18/26	6.50E-03 - 1.40E-01	3.40E-02	NA	4.30E+00 N	No	BSL
	7440-02-0	Nickel	2.60E+00	6.90E+00	mg/kg	SRSD22	26/26	NA	6.90E+00	NA	1.50E+03 N	No	BSL
	7440-09-7	Potassium	3.50E+02	6.48E+02	mg/kg	SD-18	8/8	NA	6.48E+02	NA	NBA	No	NUT
	7440-23-5	Sodium	4.36E+01	4.67E+01	mg/kg	SED-02A	2/8	1.05E+03 - 1.14E+03	4.67E+01	NA	NBA	No	NUT
	7440-28-0	Thallium	8.90E-01	8.90E-01	mg/kg	T-15-7-A	1/8	5.20E+00 - 5.70E+00	8.90E-01	NA	5.10E+00 N	No	BSL
	7440-62-2	Vanadium	4.70E+00	1.40E+01	mg/kg	SRSD22	26/26	NA	1.40E+01	NA	5.50E+02 N	No	BSL
	7440-66-6	Zinc	1.17E+01	1.99E+01	mg/kg	SED-02A	8/8	NA	1.99E+01	NA	2.30E+04 N	No	BSL

(1) Maximum concentration used for screening.
(2) See text for a discussion on background concentrations.
(3) All analytes were screened against the lower value of the ORNL residential soil regional screening levels (RSLs) (EPA, 2009) and the New Hampshire Soil Category S-1 Direct Contact Risk-based Concentrations (NHDES, 2007).
(4) Rationale Codes:
Above Screening Levels (ASL)
Below Screening Level (BSL)
Essential Nutrient (NUT)
(5) ORNL RSL for endosulfan used as a surrogate.
(6) ORNL RSL for endrin used as a surrogate.
(7) ORNL RSL for 2,3,7,8-TCDD used as a surrogate.
(8) NHDES for chromium VI used as a surrogate.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic, Based on a TR = 1E-05
COPC = Contaminant of Potential Concern
N = Non-Carcinogenic, Based on a THQ = 1.0
NA = Not Applicable
NBA = No benchmark available

Table C-3
RAGS Part D TABLE 2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment - Area C
Exposure Medium: Surface Sediments (0-6")

Exposure Point	CAS Number	Analyte	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (3)	(N/C)	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Area C	120-12-7	Anthracene	4.70E-02	5.40E-02	mg/kg	T-20-7-A	2/5	4.20E-01 - 4.30E-01	5.40E-02	NA	1.70E+04	N	No	BSL
	56-55-3	Benz[a]anthracene	6.20E-02	2.70E-01	mg/kg	T-20-7-A	5/5	NA	2.70E-01	NA	1.50E+00	C	No	BSL
	50-32-8	Benzo[a]pyrene	6.50E-02	2.60E-01	mg/kg	T-20-7-A	5/5	NA	2.60E-01	NA	1.50E-01	C	Yes	ASL
	205-99-2	Benzo[b]fluoranthene	7.30E-02	4.40E-01	mg/kg	T-20-7-A	5/5	NA	4.40E-01	NA	1.50E+00	C	No	BSL
	191-24-2	Benzo[g,h,i]perylene	4.80E-02	1.80E-01	mg/kg	T-20-7-A	5/5	NA	1.80E-01	NA	3.90E+01	C	No	BSL
	207-08-9	Benzo[k]fluoranthene	3.00E-02	4.60E-01	mg/kg	T-20-7-A	5/5	NA	4.60E-01	NA	1.50E+01	C	No	BSL
	218-01-9	Chrysene	7.10E-02	3.00E-01	mg/kg	T-20-7-A	5/5	NA	3.00E-01	NA	1.50E+02	C	No	BSL
	53-70-3	Dibenz[a,h]anthracene	3.60E-02	4.50E-02	mg/kg	T-20-7-A	2/5	4.20E-01 - 4.30E-01	4.50E-02	NA	1.50E-01	C	No	BSL
	206-44-0	Fluoranthene	1.30E-01	6.50E-01	mg/kg	T-20-7-A	5/5	NA	6.50E-01	NA	2.30E+03	N	No	BSL
	193-39-5	Indeno[1,2,3-cd]pyrene	4.50E-02	1.60E-01	mg/kg	T-20-7-A	5/5	NA	1.60E-01	NA	1.50E+00	C	No	BSL
	85-01-8	Phenanthrene	7.80E-02	3.20E-01	mg/kg	T-20-7-A	5/5	NA	3.20E-01	NA	1.70E+03	N	No	BSL
	129-00-0	Pyrene	1.10E-01	5.00E-01	mg/kg	T-20-7-A	5/5	NA	5.00E-01	NA	1.70E+03	N	No	BSL
	72-55-9	4,4'-DDE	1.00E-03	1.20E-03	mg/kg	T-20-7-A	2/3	4.20E-03 - 4.20E-03	1.20E-03	NA	1.40E+01	C	No	BSL
	50-29-3	4,4'-DDT	1.40E-03	2.70E-03	mg/kg	DEP-10	3/5	4.20E-03 - 4.20E-03	2.70E-03	NA	1.70E+01	C	No	BSL
	1031-07-8	Endosulfan sulfate (5)	7.80E-04	7.80E-04	mg/kg	DEP-10	1/5	4.20E-03 - 5.60E-03	7.80E-04	NA	3.70E+02	N	No	BSL
	11104-28-2	Aroclor 1221	1.10E-02	1.93E-02	mg/kg	T-20-7-A	3/5	2.40E-02 - 3.37E-02	1.93E-02	NA	1.70E+00	C	Yes	See Text
	53469-21-9	Aroclor 1242	1.08E-02	1.08E-02	mg/kg	T-20-7-A	1/5	2.37E-02 - 3.37E-02	1.08E-02	NA	2.20E+00	C	Yes	See Text
	12672-29-6	Aroclor 1248	2.08E-02	2.08E-02	mg/kg	DEP-8	1/5	2.37E-02 - 2.72E-02	2.08E-02	NA	2.20E+00	C	Yes	See Text
	31508-00-6	PCB 118	7.40E-04	7.40E-04	mg/kg	T-20-7-A	1/1	NA	7.40E-04	NA	3.40E-01	C	Yes	See Text
	---	Total PCB Aroclors	1.10E-02	3.01E-02	mg/kg	T-20-7-A	4/5	2.40E-02 - 2.40E-02	3.01E-02	NA	2.00E+00	N	Yes	See Text
	---	Total PCB Congeners (Measured)	8.00E-03	8.00E-03	mg/kg	T-20-7-A	1/1	NA	8.00E-03	NA	2.00E+00	N	Yes	See Text
	---	Mammal TEQ (Measured) (6)	2.22E-08	2.22E-08	mg/kg	T-20-7-A	1/1	NA	2.22E-08	NA	4.50E-05	C	Yes	See Text
	---	Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	7.26E-06	7.26E-03	mg/kg	T-20-7-A	1/1	NA	7.26E-03	NA	2.00E+00	N	Yes	See Text
	7429-90-5	Aluminum	2.82E+03	6.35E+03	mg/kg	T-20-7-A	5/5	NA	6.35E+03	NA	7.70E+04	N	No	BSL
	7440-38-2	Arsenic	4.10E+00	9.20E+00	mg/kg	T-20-7-A	5/5	NA	9.20E+00	NA	3.90E+00	C	Yes	ASL
	7440-39-3	Barium	1.24E+01	3.66E+01	mg/kg	T-20-7-A	5/5	NA	3.66E+01	NA	1.50E+04	N	No	BSL
	7440-41-7	Beryllium	2.00E-01	6.70E-01	mg/kg	T-20-7-A	5/5	NA	6.70E-01	NA	5.00E-01	C	Yes	ASL
	7440-43-9	Cadmium	1.20E-01	6.30E-01	mg/kg	DEP-8	5/5	NA	6.30E-01	NA	7.00E+01	N	No	BSL
	7440-70-2	Calcium	2.63E+02	1.25E+03	mg/kg	DEP-8	5/5	NA	1.25E+03	NA	NBA		No	NUT
	7440-47-3	Chromium (7)	6.00E+00	1.52E+01	mg/kg	T-20-7-A	5/5	NA	1.52E+01	NA	5.50E+02	N	No	BSL
	7440-48-4	Cobalt	1.70E+00	5.40E+00	mg/kg	DEP-8	5/5	NA	5.40E+00	NA	2.30E+01	N	No	BSL
	7440-50-8	Copper	2.30E+00	9.20E+00	mg/kg	DEP-8	5/5	NA	9.20E+00	NA	3.10E+03	N	No	BSL
	7439-89-6	Iron	5.09E+03	8.87E+03	mg/kg	T-20-7-A	5/5	NA	8.87E+03	NA	5.50E+04	N	No	BSL
	7439-92-1	Lead	3.60E+00	2.05E+01	mg/kg	DEP-8	5/5	NA	2.05E+01	NA	4.00E+02		No	BSL
	7439-95-4	Magnesium	8.95E+02	1.68E+03	mg/kg	T-20-7-A	5/5	NA	1.68E+03	NA	NBA		No	NUT

Table C-3
RAGS Part D TABLE 2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Sediment - Area C
Exposure Medium: Surface Sediments (0-6")

Exposure Point	CAS Number	Analyte	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (3) (N/C)	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
	7439-96-5	Manganese	7.38E+01	1.08E+02	mg/kg	T-20-7-A	5/5	NA	1.08E+02	NA	1.80E+03 N	No	BSL
	7439-97-6	Mercury	1.30E-02	2.40E-02	mg/kg	DEP-8	2/5	1.20E-01 - 1.30E-01	2.40E-02	NA	4.30E+00 N	No	BSL
	7440-02-0	Nickel	3.00E+00	6.40E+00	mg/kg	DEP-8, T-20-7-A	5/5	NA	6.40E+00	NA	1.50E+03 N	No	BSL
	7440-09-7	Potassium	4.10E+02	8.51E+02	mg/kg	T-20-7-A	5/5	NA	8.51E+02	NA	NBA	No	NUT
	7440-23-5	Sodium	3.83E+01	7.17E+01	mg/kg	T-20-7-A	4/5	1.31E+03 - 1.31E+03	7.17E+01	NA	NBA	No	NUT
	7440-62-2	Vanadium	6.20E+00	1.30E+01	mg/kg	T-20-7-A	5/5	NA	1.30E+01	NA	5.50E+02 N	No	BSL
	7440-66-6	Zinc	1.73E+01	6.77E+01	mg/kg	DEP-8	5/5	NA	6.77E+01	NA	2.30E+04 N	No	BSL

(1) Maximum concentration used for screening.
(2) See text for a discussion on background concentrations.
(3) All analytes were screened against the lower value of the EPA residential soil regional screening levels (RSLs) (EPA, 2009) and the New Hampshire Soil Category S-1 Direct Contact Risk-based Concentrations (NHDES, 2007).
(4) Rationale Codes:
Above Screening Levels (ASL)
Below Screening Level (BSL)
Essential Nutrient (NUT)
(5) ORNL RSL for endosulfan used as a surrogate.
(6) ORNL RSL for 2,3,7,8-TCDD used as a surrogate.
(7) NHDES for chromium VI used as a surrogate.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic, Based on a TR = 1E-05
COPC = Contaminant of Potential Concern
N = Non-Carcinogenic, Based on a THQ = 1.0
NA = Not Applicable
NBA = No benchmark available

Table C-4
RAGS Part D TABLE 2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Fish Tissue - Areas A and B
Exposure Medium: Redbreast Sunfish Fillet

Exposure Point	CAS Number	Analyte	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (3) (N/C)	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Areas A and B	72-54-8	4,4'-DDD	9.00E-04	9.00E-04	mg/kg	SR-RB-92	1/12	2.53E-03 - 2.61E-03	9.00E-04	NA	1.31E-02 C	No	BSL
	72-55-9	4,4'-DDE	5.23E-03	1.16E-02	mg/kg	SR-RB-92	10/10	NA	1.16E-02	NA	9.28E-03 C	Yes	ASL
	12672-29-6	Aroclor 1248	3.83E-02	3.97E+00	mg/kg	SR-RB-37	12/12	NA	3.97E+00	NA	1.58E-03 C	Yes	See Text
	11097-69-1	Aroclor 1254	3.34E-02	2.09E-01	mg/kg	SR-RB-43	5/12	4.00E-02 - 2.40E-01	2.09E-01	NA	1.58E-03 C	Yes	See Text
	32598-13-3	PCB 77	9.80E-04	2.80E-02	mg/kg	SR-RB-37	5/12	8.90E-04 - 9.60E-04	2.80E-02	NA	2.40E-04 C	Yes	See Text
	32598-14-4	PCB 105	1.20E-03	5.00E-02	mg/kg	SR-RB-37	10/12	8.90E-04 - 8.90E-04	5.00E-02	NA	2.40E-04 C	Yes	See Text
	70424-68-9/65510-44-3	PCB 107/PCB 123	2.00E-03	1.30E-02	mg/kg	SR-RB-37	3/12	1.80E-03 - 1.90E-03	1.30E-02	NA	2.40E-04 C	Yes	See Text
	74472-37-0	PCB 114	1.20E-03	5.00E-03	mg/kg	SR-RB-37	2/12	8.90E-04 - 9.60E-04	5.00E-03	NA	4.90E-06 C	Yes	See Text
	31508-00-6	PCB 118	2.10E-03	1.10E-01	mg/kg	SR-RB-37	11/12	8.90E-04 - 8.90E-04	1.10E-01	NA	2.40E-04 C	Yes	See Text
	38380-08-4	PCB 156	3.20E-03	3.20E-03	mg/kg	SR-RB-37	1/12	8.90E-04 - 9.60E-04	3.20E-03	NA	4.90E-06 C	Yes	See Text
	69782-90-7	PCB 157	1.00E-03	1.00E-03	mg/kg	SR-RB-37	1/12	8.90E-04 - 9.60E-04	1.00E-03	NA	4.90E-06 C	Yes	See Text
	52663-72-6	PCB 167	1.20E-03	1.20E-03	mg/kg	SR-RB-37	1/12	8.90E-04 - 9.60E-04	1.20E-03	NA	2.40E-04 C	Yes	See Text
	35065-30-6	PCB 170	2.20E-03	2.20E-03	mg/kg	SR-RB-37	1/12	8.90E-04 - 9.60E-04	2.20E-03	NA	NBA	Yes	See Text
	35065-29-3	PCB 180	1.40E-03	4.30E-03	mg/kg	SR-RB-37	3/12	8.90E-04 - 9.60E-04	4.30E-03	NA	NBA	Yes	See Text
	---	Total PCB Aroclors	3.83E-02	5.43E+00	mg/kg	SR-RB-37	12/12	NA	5.43E+00	NA	1.58E-03 C	Yes	ASL
	---	Total PCB Congeners (Measured)	8.10E-03	4.00E+00	mg/kg	SR-RB-37	12/12	NA	4.00E+00	NA	1.58E-03 C	Yes	ASL
	---	Mammal TEQ (Measured) (5)	1.50E-07	8.30E-06	mg/kg	SR-RB-37	11/12	-	8.30E-06	NA	2.40E-08 C	Yes	ASL
	---	Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	4.09E-03	3.79E+00	mg/kg	SR-RB-37	12/12	NA	3.79E+00	NA	1.58E-03 C	Yes	ASL
	7429-90-5	Aluminum	2.18E+00	7.01E+00	mg/kg	SR-RB-89	9/12	1.71E+00 - 1.76E+00	7.01E+00	NA	1.35E+02 N	No	BSL
	7440-70-2	Calcium	2.49E+02	2.97E+03	mg/kg	SR-RB-87	12/12	NA	2.97E+03	NA	NBA	No	NUT
	7440-50-8	Copper	3.88E-01	7.27E-01	mg/kg	SR-RB-89	5/12	3.97E-01 - 5.27E-01	7.27E-01	NA	5.41E+00 N	No	BSL
	7439-89-6	Iron	2.06E+00	4.89E+00	mg/kg	SR-RB-85	11/12	2.11E+00 - 2.11E+00	4.89E+00	NA	9.46E+01 N	No	BSL
	7439-95-4	Magnesium	2.65E+02	3.22E+02	mg/kg	SR-RB-87	12/12	NA	3.22E+02	NA	NBA	No	NUT
	7439-96-5	Manganese	3.62E-01	3.31E+00	mg/kg	SR-RB-87	12/12	NA	3.31E+00	NA	1.89E+01 N	No	BSL
	7439-97-6	Mercury	8.45E-02	1.75E-01	mg/kg	SR-RB-86	12/12	NA	1.75E-01	NA	2.20E-02 N	Yes	ASL
	7440-09-7	Potassium	3.13E+03	3.65E+03	mg/kg	SR-RB-93	12/12	NA	3.65E+03	NA	NBA	No	NUT
	7440-23-5	Sodium	5.68E+02	7.96E+02	mg/kg	SR-RB-92	12/12	NA	7.96E+02	NA	NBA	No	NUT
	7440-66-6	Zinc	5.35E+00	8.14E+00	mg/kg	SR-RB-87	12/12	NA	8.14E+00	NA	4.06E+01 N	No	BSL

(1) Maximum concentration used for screening.
(2) See text for a discussion on background concentrations.
(3) All analytes were screened against the Region 3 Fish RBCs (EPA, 2009)
(4) Rationale Codes:
Above Screening Levels (ASL)
No benchmark available (NBA)
Below Screening Level (BSL)
Essential Nutrient (NUT)
(5) Region 3 RBC value for 2,3,7,8-TCDD used as a surrogate.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic, Based on a TR = 1E-06
COPC = Contaminant of Potential Concern
N = Non-Carcinogenic, Based on a THQ = 0.1
NA = Not Applicable
NBA = No benchmark available

Table C-5
RAGS Part D TABLE 2.5
OCCURRENCE, DISTRIBUTION AND SELECTION OF CONTAMINANTS OF POTENTIAL CONCERN
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Medium: Fish Tissue - Area C
Exposure Medium: Redbreast Sunfish Fillet

Exposure Point	CAS Number	Analyte	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value (2)	Screening Toxicity Value (3) (N/C)	COPC Flag (Y/N)	Rationale for Selection or Deletion (4)
Area C	72-54-8	4,4'-DDD	1.15E-03	1.15E-03	mg/kg	SR-RB-82	1/6	2.53E-03 - 2.60E-03	1.15E-03	NA	1.31E-02 C	No	BSL
	72-55-9	4,4'-DDE	2.80E-03	7.20E-03	mg/kg	SR-RB-82	6/6	NA	7.20E-03	NA	9.28E-03 C	No	BSL
	60-57-1	Dieldrin	1.15E-02	1.15E-02	mg/kg	SR-RB-80	1/6	2.53E-03 - 2.60E-03	1.15E-02	NA	1.97E-04 C	Yes	See Text
	12672-29-6	Aroclor 1248	2.05E-02	3.24E-02	mg/kg	SR-RB-63	3/6	4.00E-02 - 4.00E-02	3.24E-02	NA	1.58E-03 C	Yes	See Text
	11097-69-1	Aroclor 1254	1.16E-02	3.12E-02	mg/kg	SR-RB-63	3/6	4.00E-02 - 4.00E-02	3.12E-02	NA	1.58E-03 C	Yes	See Text
	31508-00-6	PCB 118	9.60E-04	1.90E-03	mg/kg	SR-RB-63	6/6	NA	1.90E-03	NA	2.40E-04 C	Yes	See Text
	---	Total PCB Aroclors	1.16E-02	6.36E-02	mg/kg	SR-RB-63	5/6	4.00E-02 - 4.00E-02	6.36E-02	NA	1.58E-03 C	Yes	ASL
	---	Total PCB Congeners (Measured)	3.20E-03	2.50E-02	mg/kg	SR-RB-63	6/6	NA	2.50E-02	NA	1.58E-03 C	Yes	ASL
	---	Mammal TEQ (Measured) (5)	2.88E-08	5.70E-08	mg/kg	SR-RB-63	6/6	NA	5.70E-08	NA	2.40E-08 C	Yes	ASL
	---	Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	2.20E-03	2.31E-02	mg/kg	SR-RB-63	6/6	NA	2.31E-02	NA	1.58E-03 C	Yes	ASL
	7429-90-5	Aluminum	3.19E+00	8.05E+00	mg/kg	SR-RB-84	6/6	NA	8.05E+00	NA	1.35E+02 N	No	BSL
	7440-70-2	Calcium	2.51E+02	2.44E+03	mg/kg	SR-RB-80	6/6	NA	2.44E+03	NA	NBA	No	NUT
	7440-47-3	Chromium (6)	6.83E-01	6.83E-01	mg/kg	SR-RB-80	1/6	4.29E-01 - 4.94E-01	6.83E-01	NA	4.06E-01 N	No	See Text
	7440-50-8	Copper	5.33E-01	5.33E-01	mg/kg	SR-RB-82	1/6	4.29E-01 - 4.94E-01	5.33E-01	NA	5.41E+00 N	No	BSL
	7439-89-6	Iron	2.69E+00	5.61E+00	mg/kg	SR-RB-80	6/6	NA	5.61E+00	NA	9.46E+01 N	No	BSL
	7439-95-4	Magnesium	2.82E+02	3.16E+02	mg/kg	SR-RB-83	6/6	NA	3.16E+02	NA	NBA	No	NUT
	7439-96-5	Manganese	7.00E-01	3.48E+00	mg/kg	SR-RB-81	6/6	NA	3.48E+00	NA	1.89E+01 N	No	BSL
	7439-97-6	Mercury	9.18E-02	2.76E-01	mg/kg	SR-RB-79	6/6	NA	2.76E-01	NA	2.20E-02 N	Yes	ASL
	7440-02-0	Nickel	5.19E-01	5.19E-01	mg/kg	SR-RB-80	1/6	4.29E-01 - 4.94E-01	5.19E-01	NA	2.70E+00 N	No	BSL
	7440-09-7	Potassium	3.09E+03	3.24E+03	mg/kg	SR-RB-79	6/6	NA	3.24E+03	NA	NBA	No	NUT
	7440-23-5	Sodium	5.82E+02	7.23E+02	mg/kg	SR-RB-84	6/6	NA	7.23E+02	NA	NBA	No	NUT
	7440-66-6	Zinc	5.52E+00	8.13E+00	mg/kg	SR-RB-80	6/6	NA	8.13E+00	NA	4.06E+01 N	No	BSL

(1) Maximum concentration used for screening.
(2) See text for a discussion on background concentrations.
(3) All analytes were screened against the Region 3 Fish RBCs (EPA, 2009)
(4) Rationale Codes:
Above Screening Levels (ASL)
Below Screening Level (BSL)
Essential Nutrient (NUT)
(5) Region 3 RBC value for 2,3,7,8-TCDD used as a surrogate.
(6) Region 3 RBC value for chromium VI used as a surrogate.

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
C = Carcinogenic, Based on a TR = 1E-06
COPC = Contaminant of Potential Concern
N = Non-Carcinogenic, Based on a THQ = 0.1
NA = Not Applicable
NBA = No benchmark available

Table C-6. Sediment COPC Screen
Ecological Risk Assessment
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Max Value	Max Qual	Max Sample ID	Benchmark	Benchmark Reference	COPC[a]	Reason for Deletion[b]
Metals (mg/kg)											
7429-90-5	Aluminum	37.	37.	100	6,770.	J	T-9-4	na	na	Y	
7439-89-6	Iron	37.	37.	100	12,700.	J	T-9-4	20000	Persaud et al., 1993	N	3
7439-92-1	**Lead**	71.	71.	100	80.9		T-2-8	35.8	MacDonald et al., 2000	Y	
7439-95-4	Magnesium	37.	37.	100	3,230.	J	T-9-4	na	na	N	2
7439-96-5	Manganese	71.	71.	100	230.		SRSD37	460	Persaud et al., 1993	N	3
7439-97-6	**Mercury**	71.	44.	62	0.049	J	T-14-1-A	0.18	MacDonald et al., 2000	N[c]	3
7440-02-0	**Nickel**	71.	71.	100	12.4		DEP-4	22.7	MacDonald et al., 2000	N[c]	3
7440-09-7	Potassium	37.	37.	100	2,620.	J	DEP-2	na	na	N	2
7440-22-4	**Silver**	37.	2.	5	1.7		DEP-4	1	Long et al., 1995	Y	
7440-23-5	Sodium	37.	20.	54	462.		DEP-4	na	na	N	2
7440-28-0	Thallium	37.	3.	8	9.7		DEP-4	na	na	Y	
7440-36-0	Antimony	71.	4.	6	9.1		DEP-4	na	na	Y	
7440-38-2	**Arsenic**	71.	68.	96	13.3		DEP-4	9.79	MacDonald et al., 2000	Y	
7440-39-3	Barium	37.	37.	100	40.2		T-11-7-A	na	na	Y	
7440-41-7	Beryllium	37.	29.	78	9.6		DEP-4	na	na	Y	
7440-43-9	**Cadmium**	71.	55.	77	9.5		DEP-4	0.99	MacDonald et al., 2000	Y	
7440-47-3	**Chromium**	71.	71.	100	18.2		T-6-8	43.4	MacDonald et al., 2000	N[c]	3
7440-48-4	Cobalt	37.	37.	100	11.4		DEP-4	na	na	Y	
7440-50-8	**Copper**	37.	37.	100	12.2		DEP-4	31.6	MacDonald et al., 2000	N[c]	3
7440-62-2	Vanadium	71.	71.	100	15.9		DEP-4	na	na	Y	
7440-66-6	**Zinc**	37.	37.	100	93.3	J	T-11-7-A	121	MacDonald et al., 2000	N[c]	3
7440-70-2	Calcium	37.	37.	100	1,100.	J	T-4-4-A	na	na	N	2
7782-49-2	**Selenium**	37.	1.	3	9.5		DEP-4	na	na	Y	
PCBs (ug/kg)											
11096-82-5	**Aroclor 1260**	79.	0.	0	0.			5	Persaud et al., 1993	N	1
11097-69-1	**Aroclor 1254**	79.	16.	20	1,400.	E	SRSD13	60	Persaud et al., 1993	Y	
11104-28-2	**Aroclor 1221**	79.	7.	9	8,690.		SED-02A	120	Jones et al., 1997	Y	
11141-16-5	**Aroclor 1232**	79.	3.	4	13,000.		SED-02A	600	Jones et al., 1997	Y	
12672-29-6	**Aroclor 1248**	79.	26.	33	6,800.	E	SRSD8	30	Persaud et al., 1993	Y	
12674-11-2	**Aroclor 1016**	79.	0.	0	0.			7	Persaud et al., 1993	N	1
53469-21-9	**Aroclor 1242**	79.	30.	38	26,000.		SED-02A	170	Jones et al., 1997	Y	
31508-00-6	**Cl5-BZ#118**	13.	8.	62	45.		SED-02A	na	na	Y	
32598-13-3	**Cl4-BZ#77**	13.	8.	62	22.	J	SED-02A	na	na	Y	
32598-14-4	**Cl5-BZ#105**	13.	8.	62	22.		SED-02A	na	na	Y	
32774-16-6	**Cl6-BZ#169**	13.	0.	0	0.			na	na	N	1
35065-29-3	**Cl7-BZ#180**	13.	6.	46	5.		SED-02A	na	na	Y	
35065-30-6	**Cl7-BZ#170**	13.	5.	38	2.2		SD-27, SED-02A	na	na	Y	
38380-08-4	**Cl6-BZ#156**	13.	4.	31	1.7		SD-27	na	na	Y	
39635-31-9	**Cl7-BZ#189**	13.	0.	0	0.			na	na	N	1
52663-72-6	**Cl6-BZ#167**	13.	2.	15	0.68		SD-27	na	na	Y	
57465-28-8	**Cl5-BZ#126**	13.	0.	0	0.			na	na	N	1
69782-90-7	**Cl6-BZ#157**	13.	1.	8	0.72		SD-27	na	na	Y	
70362-50-4	**Cl4-BZ#81**	13.	2.	15	1.8	J	SD-27	na	na	Y	
70424-68-9/65510-44-3	**Cl5-BZ#107/#123**	13.	2.	15	5.6		SED-02A	na	na	Y	
74472-37-0	**Cl5-BZ#114**	13.	2.	15	2.4		SED-02A	na	na	Y	
TOTAL_PCB	**Total PCB**	13.	13.	100	11,000.	J	SED-02A	59.8	MacDonald et al., 2000	Y	
TOTAL_PCB_AROCLOR	**Total PCB Aroclor**	37.	30.	81	14,860.		SED-02A	na	na	Y	
	PCB_TEQ_BIRD	13.			1.233		SED-02A			Y	
	PCB_TEQ_FISH	13.			0.00324		SED-02A			Y	
	PCB_TEQ_MAMMAL	13.			0.00491		T-2-8			Y	
Pesticides (ug/kg)											
309-00-2	**Aldrin**	37.	0.	0	0.			2	Persaud et al., 1993	N	1
319-84-6	**Alpha-BHC**	37.	1.	3	9.1		T-15-6	6	Persaud et al., 1993	Y	
319-85-7	**Beta-BHC**	37.	5.	14	61.		T-15-6	5	Persaud et al., 1993	Y	
319-86-8	**delta-BHC**	37.	2.	5	1.3	JN	SD-9	120	Jones et al., 1997	N	3
58-89-9	**Gamma-BHC**	30.	2.	7	12.		T-15-6	2.37	MacDonald et al., 2000	Y	
	TOTAL_BHC	37.			330.		SED-02A	na	na	Y	
5103-71-9	alpha-Chlordane	34.	0.	0	0.			7	Persaud et al., 1993	N	1
5103-74-2	gamma-Chlordane	34.	0.	0	0.			na	na	N	1
57-74-9	**Chlordane**	37.	0.	0	0.			3.24	MacDonald et al., 2000	N	1
12789-03-6	Technical Chlordane	34.	0.	0	0.			na	na	N	1
60-57-1	**Dieldrin**	65.	1.	2	1.2	J	T-17-7	1.9	MacDonald et al., 2000	N	3

Table C-6. Sediment COPC Screen
Ecological Risk Assessment
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Max Value	Max Qual	Max Sample ID	Benchmark	Benchmark Reference	COPC[a]	Reason for Deletion[b]
72-20-8	**Endrin**	34.	6.	18	9.1	JN	SD-27	2.22	MacDonald et al., 2000	Y	
53494-70-5	Endrin Ketone	37.	2.	5	34.		T-15-6	na	na	Y	
7421-93-4	Endrin Aldehyde	37.	1.	3	0.86	JN	SD-9	na	na	Y	
	TOTAL_ENDRIN	37.			630.		SED-02A	na	na	Y	
72-43-5	**Methoxychlor**	37.	8.	22	5.8	JN	T-12-1	19	USEPA, 1996	N	3
72-54-8	**4,4'-DDD**	37.	9.	24	65.	J	DEP-5	4.88	MacDonald et al., 2000	Y	
72-55-9	**4,4'- DDE**	19.	3.	16	20.		T-15-6	3.16	MacDonald et al., 2000	Y	
50-29-3	**4,4'- DDT**	37.	15.	41	66.	JN	DEP-5	4.16	MacDonald et al., 2000	Y	
	TOTAL_DDX	37.			212.7		SED-02A	na	na	Y	
76-44-8	**Heptachlor**	37.	2.	5	2.7	JN	T-12-1	68	Jones et al., 1997	N	3
1024-57-3	**Heptachlor epoxide (B)**	69.	2.	3	1.3	JN	T-12-1	2.47	MacDonald et al., 2000	N	3
8001-35-2	**Toxaphene**	37.	0.	0	0.			28	USEPA, 1996	N	1
959-98-8	**Endosulfan I**	34.	4.	12	7.9	J	T-15-6	2.9	USEPA, 1996	Y	
33213-65-9	**Endosulfan II**	36.	6.	17	26.		T-15-6	14	USEPA, 1996	Y	
1031-07-8	Endosulfan Sulfate	37.	3.	8	3.8	JN	DEP-5	na	na	Y	
	TOTAL_ENDOSULFAN	37.			420.		SED-02A	na	na	Y	
SVOCs (ug/kg)											
120-12-7	**Anthracene**	37.	17.	46	240.	J	DEP-5	57.2	MacDonald et al., 2000	Y	
129-00-0	**Pyrene**	37.	37.	100	1,700.		DEP-5	195	MacDonald et al., 2000	Y	
191-24-2	**Benzo[g,h,i]perylene**	71.	65.	92	620.		DEP-5	170	Persaud et al., 1993	Y	
193-39-5	**Indeno[1,2,3-cd]pyrene**	71.	64.	90	620.		DEP-5	200	Persaud et al., 1993	Y	
205-99-2	**Benzo[b]fluoranthene**	71.	69.	97	1,900.		DEP-5	na	na	Y	
206-44-0	**Fluoranthene**	37.	37.	100	2,000.		DEP-5	423	MacDonald et al., 2000	Y	
207-08-9	**Benzo[k]fluoranthene**	71.	62.	87	820.		T-2-8	240	Persaud et al., 1993	Y	
208-96-8	**Acenaphthylene**	71.	41.	58	380.	J	DEP-5	44	Long et al., 1995	Y	
218-01-9	**Chrysene**	71.	67.	94	1,200.		DEP-5	166	MacDonald et al., 2000	Y	
50-32-8	**Benzo[a]pyrene**	71.	67.	94	1,400.		DEP-5	150	MacDonald et al., 2000	Y	
53-70-3	**Dibenz[a,h]anthracene**	71.	43.	61	190.	J	DEP-5	33	MacDonald et al., 2000	Y	
56-55-3	**Benz[a]anthracene**	71.	67.	94	1,200.		DEP-5	108	MacDonald et al., 2000	Y	
83-32-9	**Acenaphthene**	37.	5.	14	43.	J	T-11-7	620	USEPA, 1996	N	3
85-01-8	**Phenanthrene**	71.	68.	96	730.		DEP-5	204	MacDonald et al., 2000	Y	
86-73-7	**Fluorene**	37.	6.	16	77.	J	DEP-5	77.4	MacDonald et al., 2000	N	3
91-20-3	Naphthalene	71.	3.	4	59.	J	T-2-8	176	MacDonald et al., 2000	N	3
91-57-6	2-Methylnaphthalene	37.	1.	3	37.	J	T-2-8	70	Long et al., 1995	N	3
	HPAH	71.			11,470.		DEP-5	1700	Long et al., 1995	Y	
	LPAH	71.			2,000.		DEP-5	552	Long et al., 1995	Y	

Bolded values indicate bioaccumulative compounds (USEPA, 2000)

[a] Chemicals were selected as COPCs if they exceeded the screening benchmark or if no screening benchmark was available.

[b] Reason codes for eliminating chemicals as follows:

1 Not detected in any sample.
2 Common salts and nutrients not toxic at anticipated environmental concentrations.
3 Maximum value lower than screening benchmark.

[c] Although the maximum detected concentrations of Hg, Ni, Cr, Cu, and Zn were all below sediment screening benchmarks, they were retained as COPCs for wildlife receptors because they are bioaccumulators and were detected in fish tissue.

Table C-7. Fish Tissue COPC Screen
Ecological Risk Assessment
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value	Max Value	Max Qual	COPC?[a]
Metals (mg/kg)								
7429-90-5	Aluminum	10.	8.	80	31.28	82.6	J	Y
7440-36-0	Antimony	12.	0.	0	0.95	1.325	U	N
7440-38-2	Arsenic	12.	0.	0	0.93	1.07	U	N
7440-39-3	Barium	12.	12.	100	1.56	2.12		Y
7440-41-7	Beryllium	12.	0.	0	0.09	0.107	U	N
7440-43-9	Cadmium	12.	0.	0	0.09	0.107	U	N
7440-70-2	Calcium	12.	12.	100	10,592.5	15,800.		N
7440-47-3	Chromium	12.	4.	33	0.38	1.08		Y
7440-48-4	Cobalt	12.	1.	8	0.1	0.202		Y
7440-50-8	Copper	12.	12.	100	0.87	1.37		Y
7439-89-6	Iron	12.	12.	100	58.48	152.	J	N
7439-95-4	Magnesium	12.	12.	100	390.	462.		N
7439-96-5	Manganese	12.	12.	100	24.3	42.9		Y
7439-97-6	Mercury	12.	12.	100	0.07	0.0863		Y
7440-02-0	Nickel	12.	1.	8	0.26	0.552		Y
7440-09-7	Potassium	12.	12.	100	2,984.17	3,190.		N
7440-22-4	Silver	12.	0.	0	0.23	0.2675	U	N
7440-23-5	Sodium	12.	12.	100	817.83	895.		N
7440-28-0	Thallium	12.	0.	0	0.93	1.07	U	N
7440-62-2	Vanadium	12.	0.	0	0.23	0.2675	U	N
7440-66-6	Zinc	12.	12.	100	21.73	24.3		Y
PCBs (ug/kg)								
12674-11-2	Aroclor 1016	24.	0.	0	210.93	1,600.	U	N
11104-28-2	Aroclor 1221	24.	0.	0	210.93	1,600.	U	N
11141-16-5	Aroclor 1232	24.	0.	0	210.93	1,600.	U	N
53469-21-9	Aroclor 1242	24.	10.	42	1,081.46	7,400.		Y
12672-29-6	Aroclor 1248	24.	22.	92	5,383.19	39,500.		Y
11097-69-1	Aroclor 1254	24.	3.	13	220.17	130.		Y
11096-82-5	Aroclor 1260	24.	0.	0	210.93	1,600.	U	N
32598-13-3	Cl4-BZ#77	12.	12.	100	46.92	190.	J	Y
70362-50-4	Cl4-BZ#81	12.	9.	75	4.21	15.	J	Y
32598-14-4	Cl5-BZ#105	12.	12.	100	71.7	280.		Y
70424-68-9/65510-44-3	Cl5-BZ#107/#123	12.	11.	92	22.2	87.		Y
74472-37-0	Cl5-BZ#114	12.	11.	92	8.8	34.		Y
31508-00-6	Cl5-BZ#118	11.	11.	100	133.35	410.		Y
57465-28-8	Cl5-BZ#126	12.	0.	0	0.46	0.475	U	N
38380-08-4	Cl6-BZ#156	12.	11.	92	4.98	16.		Y
69782-90-7	Cl6-BZ#157	12.	6.	50	1.28	3.7		Y
52663-72-6	Cl6-BZ#167	12.	8.	67	2.03	6.4		Y
32774-16-6	Cl6-BZ#169	12.	0.	0	0.46	0.475	U	N
35065-30-6	Cl7-BZ#170	12.	11.	92	4.44	12.		Y
35065-29-3	Cl7-BZ#180	12.	12.	100	8.63	24.		Y
39635-31-9	Cl7-BZ#189	12.	0.	0	0.46	0.475	U	N
TOTAL_PCB	Total PCB	12.	12.	100	10,470.	38,000.	J	Y
TOTAL_PCB_Aroclor	Total PCB Aroclor	24.	24.	100	5,809.73	39,500.		Y
	PCB_TEQ_Bird	12.			2.82	11.07925		Y
	PCB_TEQ_Fish	12.			0.01	0.03088		Y
	PCB_TEQ_Mammal	12.			0.07	0.09418		Y
Pesticides (ug/kg)								
72-55-9	4,4'- DDE	12.	12.	100	18.64	23.4	N	Y
72-54-8	4,4'-DDD	12.	12.	100	2.71	6.15	N	Y
	TOTAL_DDX	12.	12.	100	21.35	26.86		Y
309-00-2	Aldrin	12.	0.	0	1.25	1.25	U	N
5103-71-9	alpha-Chlordane	12.	0.	0	1.25	1.25	U	N
57-74-9	Chlordane	12.	0.	0	62.5	62.5	U	N

Table C-7. Fish Tissue COPC Screen
Ecological Risk Assessment
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value	Max Value	Max Qual	COPC?[a]
60-57-1	Dieldrin	12.	0.	0	1.25	2.5	U	N
959-98-8	Endosulfan I	12.	0.	0	1.25	2.5	U	N
33213-65-9	Endosulfan II	11.	0.	0	1.25	2.5	U	N
1031-07-8	Endosulfan Sulfate	12.	0.	0	1.25	2.5	U	N
72-20-8	Endrin	12.	0.	0	1.25	2.5	U	N
7421-93-4	Endrin Aldehyde	12.	0.	0	1.25	2.5	U	N
53494-70-5	Endrin Ketone	12.	0.	0	1.25	2.5	U	N
76-44-8	Heptachlor	12.	0.	0	1.25	2.5	U	N
72-43-5	Methoxychlor	12.	0.	0	1.25	2.5	U	N
8001-35-2	Toxaphene	12.	0.	0	125.	250.	U	N
319-84-6	Alpha-BHC	10.	0.	0	1.25	1.25	U	N
319-85-7	Beta-BHC	12.	5.	42	1.3	2.52		Y
319-86-8	delta-BHC	12.	0.	0	1.25	1.25	U	N
58-89-9	Gamma-BHC	12.	0.	0	1.25	1.25	U	N
	TOTAL_BHC	12.			4.84	6.27		Y
SVOCs (ug/kg)								
91-58-7	2-Chloronaphthalene	12.	0.	0	185.38	188.	U	N
91-57-6	2-Methylnaphthalene	12.	0.	0	185.38	188.	U	N
83-32-9	Acenaphthene	12.	0.	0	185.38	188.	U	N
208-96-8	Acenaphthylene	12.	0.	0	185.38	188.	U	N
120-12-7	Anthracene	12.	0.	0	185.38	188.	U	N
56-55-3	Benz[a]anthracene	12.	0.	0	185.38	188.	U	N
50-32-8	Benzo[a]pyrene	12.	0.	0	185.38	188.	U	N
205-99-2	Benzo[b]fluoranthene	12.	0.	0	185.38	188.	U	N
191-24-2	Benzo[g,h,i]perylene	12.	0.	0	185.38	188.	U	N
207-08-9	Benzo[k]fluoranthene	12.	0.	0	185.38	188.	U	N
86-74-8	Carbazole	12.	0.	0	185.38	188.	U	N
218-01-9	Chrysene	12.	0.	0	185.38	188.	U	N
53-70-3	Dibenz[a,h]anthracene	12.	0.	0	185.38	188.	U	N
132-64-9	Dibenzofuran	12.	0.	0	185.38	188.	U	N
206-44-0	Fluoranthene	12.	0.	0	185.38	188.	U	N
86-73-7	Fluorene	12.	0.	0	185.38	188.	U	N
193-39-5	Indeno[1,2,3-cd]pyrene	12.	0.	0	185.38	188.	U	N
91-20-3	Naphthalene	12.	0.	0	185.38	188.	U	N
85-01-8	Phenanthrene	12.	0.	0	185.38	188.	U	N
129-00-0	Pyrene	12.	0.	0	185.38	188.	U	N

[a] Chemicals were eliminated as COPCs for fish tissue if they were not detected in any sample or if they are considered an essential nutrient (e.g., sodium, potassium, calcium).

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APPENDIX D

ProUCL Output Files*

*Input files are provided on CD

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Data File

Area	A/B
Medium	Sediment
Chemical	Arsenic
Units	mg/kg

GROS_Arsenic

Number of Valid Observations	71
Number of Distinct Observations	40
Minimum	1E-09
Maximum	13.3
Mean	4.773
Median	4.1
SD	2.7
Variance	7.29
Coefficient of Variation	0.566
Skewness	1.523
Mean of log data	1.125
SD of log data	2.692

Data do not follow a Discernable Distribution

95% Useful UCLs

Student's-t UCL	5.307

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	5.362
95% Modified-t UCL	5.317

Non-Parametric UCLs

95% CLT UCL	5.3
95% Jackknife UCL	5.307
95% Standard Bootstrap UCL	5.292
95% Bootstrap-t UCL	5.369
95% Hall's Bootstrap UCL	5.386
95% Percentile Bootstrap UCL	5.292
95% BCA Bootstrap UCL	5.348
95% Chebyshev(Mean, Sd) UCL	6.17
97.5% Chebyshev(Mean, Sd) UCL	6.774
99% Chebyshev(Mean, Sd) UCL	7.961

Potential UCL to Use

99% Chebyshev(Mean, Sd) UCL	**7.961**

Data File

Area	A/B
Medium	Sediment
Chemical	Beryllium
Units	mg/kg

LnROS_Beryllium

Number of Valid Observations	37
Number of Distinct Observations	25
Minimum	0.0829
Maximum	9.6
Mean	0.488
Median	0.192
SD	1.545
Variance	2.387
Coefficient of Variation	3.165
Skewness	6.018
Mean of log data	-1.461
SD of log data	0.782

Data do not follow a Discernable Distribution

95% Useful UCLs

Student's-t UCL	0.917

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1.174
95% Modified-t UCL	0.959

Non-Parametric UCLs

95% CLT UCL	0.906
95% Jackknife UCL	0.917
95% Standard Bootstrap UCL	0.907
95% Bootstrap-t UCL	4.922
95% Hall's Bootstrap UCL	2.606
95% Percentile Bootstrap UCL	0.996
95% BCA Bootstrap UCL	1.274
95% Chebyshev(Mean, Sd) UCL	1.595
97.5% Chebyshev(Mean, Sd) UCL	2.074
99% Chebyshev(Mean, Sd) UCL	3.015

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL	1.595

Data File

Area	A/B
Medium	Sediment
Chemical	Benzo(a)pyrene
Units	µg/kg

Variable: **BaP**

LnROS_Benzo[a]pyrene_HalfMin

Number of Valid Observations	71	Non-Parametric UCLs	
Number of Distinct Observations	49	95% Adjusted-CLT UCL (Adjusted for Skewness)	180.2
Minimum of log data	2.338	95% Modified-t UCL (Adjusted for Skewness)	168.4
Maximum of log data	7.244	95% Hall's Bootstrap UCL	319.1
Mean of log data	4.429	95% Bootstrap t UCL	200.6
SD of log data	0.908	95% BCA Bootstrap UCL	188.1
Variance of log data	0.825	95% Chebyshev (Mean, Sd) UCL	224.2
		97.5% Chebyshev (Mean, Sd) UCL	264.9
Lilliefors Test Statistic	0.0739	99% Chebyshev (Mean, Sd) UCL	344.8
Lilliefors 5% Critical Value	0.105		
Data appear Lognormal at 5% Significance Level		UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	160.2
95% UCL (Assuming Normal Distribution)		95% Chebyshev (MVUE) UCL	194.1
95% Student's-t UCL	166.2	97.5% Chebyshev (MVUE) UCL	223.7
		99% Chebyshev (MVUE) UCL	281.9
ML Estimates Assuming Lognormal Distribution			
Mean	126.6	Potential UCL to Use	
SD	143.3	**Use 95% H-UCL**	**160.2**
Coefficient of Variation	1.132		
Skewness	4.846		
Median	83.85		
80% Quantile	180.1		
90% Quantile	268.5		
95% Quantile	373.4		
99% Quantile	693.4		
MVU Estimate of Median	83.36		
MVU Estimate of Mean	125.6		
MVU Estimate of SD	137.8		
MVU Estimate of Standard Error of Mean	15.71		

Data File

Area	A/B
Medium	Sediment
Chemical	Benzo(b)fluroanthene
Units	µg/kg

Variable: **Benzo(b)fluroanthene**

LnROS_Benzo[b]fluoranthene_HalfMin

Number of Valid Observations	71	Non-Parametric UCLs	
Number of Distinct Observations	51	95% Adjusted-CLT UCL (Adjusted for Skewness)	240.5
Minimum of log data	2.134	95% Modified-t UCL (Adjusted for Skewness)	225.2
Maximum of log data	7.55	95% Hall's Bootstrap UCL	425.3
Mean of log data	4.594	95% Bootstrap t UCL	271.3
SD of log data	1.011	95% BCA Bootstrap UCL	246.8
Variance of log data	1.023	95% Chebyshev (Mean, Sd) UCL	305.8
		97.5% Chebyshev (Mean, Sd) UCL	364.4
Lilliefors Test Statistic	0.0494	99% Chebyshev (Mean, Sd) UCL	479.5
Lilliefors 5% Critical Value	0.105		
Data appear Lognormal at 5% Significance Level		UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	216.7
95% UCL (Assuming Normal Distribution)		95% Chebyshev (MVUE) UCL	264.9
95% Student's-t UCL	222.2	97.5% Chebyshev (MVUE) UCL	308.9
		99% Chebyshev (MVUE) UCL	395.5
ML Estimates Assuming Lognormal Distribution			
Mean	164.8	Potential UCL to Use	
SD	219.9	**Use 95% H-UCL**	**216.7**
Coefficient of Variation	1.334		
Skewness	6.379		
Median	98.86		
80% Quantile	231.5		
90% Quantile	361.3		
95% Quantile	521.7		
99% Quantile	1039		
MVU Estimate of Median	98.15		
MVU Estimate of Mean	163.1		
MVU Estimate of SD	208.8		
MVU Estimate of Standard Error of Mean	23.35		

Data File

Area	A/B
Medium	Sediment
Chemical	Dibenz(a,h)anthracene
Units	µg/kg

Variable: **Dibenz(a,h)anthracene**

LnROS_Dibenz[a,h]anthracene_HalfMin

Number of Valid Observations	71	Non-Parametric UCLs	
Number of Distinct Observations	49	95% Adjusted-CLT UCL (Adjusted for Skewness)	29.75
Minimum of log data	1.138	95% Modified-t UCL (Adjusted for Skewness)	28.37
Maximum of log data	5.247	95% Hall's Bootstrap UCL	49.59
Mean of log data	2.772	95% Bootstrap t UCL	31.7
SD of log data	0.804	95% BCA Bootstrap UCL	30.28
Variance of log data	0.647	95% Chebyshev (Mean, Sd) UCL	36.64
		97.5% Chebyshev (Mean, Sd) UCL	42.62
Lilliefors Test Statistic	0.0522	99% Chebyshev (Mean, Sd) UCL	54.37
Lilliefors 5% Critical Value	0.105		
Data appear Lognormal at 5% Significance Level		UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	26.97
95% UCL (Assuming Normal Distribution)		95% Chebyshev (MVUE) UCL	32.28
95% Student's-t UCL	28.11	97.5% Chebyshev (MVUE) UCL	36.75
		99% Chebyshev (MVUE) UCL	45.52
ML Estimates Assuming Lognormal Distribution			
Mean	22.09	Potential UCL to Use	
SD	21.07	**Use 95% H-UCL**	**26.97**
Coefficient of Variation	0.954		
Skewness	3.729		
Median	15.99		
80% Quantile	31.46		
90% Quantile	44.82		
95% Quantile	60.03		
99% Quantile	103.9		
MVU Estimate of Median	15.91		
MVU Estimate of Mean	21.96		
MVU Estimate of SD	20.47		
MVU Estimate of Standard Error of Mean	2.368		

Data File

Area	A/B
Medium	Sediment
Chemical	Aluminum
Units	mg/kg

Variable: **Aluminum**

Raw Statistics

Number of Valid Observations	37
Number of Distinct Observations	34
Minimum	2260
Maximum	6770
Mean	3448
Median	3010
Standard Deviation	1191
Variance	1419596

Gamma Statistics

k star (bias corrected)	9.288
Theta Star	371.2
nu star	687.3
Approximate Chi Square Value (.05)	627.5
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value (.05)	625

Potential UCL to Use

Use Approximate Gamma UCL	**3777**

Gamma Distribution Test

Anderson-Darling Test Statistic	1.28
Anderson-Darling Critical Value	0.748
Kolmogorov-Smirnov Test Statistic	0.139
Kolmogorov-Smirnov Critical Value	0.145

Data follow Appr. Gamma distribution at 5% Significance Level

95% Gamma UCLs(Assuming Gamma Distribution)

95% Approximate Gamma UCL	3777
95% Adjusted Gamma UCL	3792
95% Adjusted-CLT UCL	3812
95% Modified-t UCL	3785

95% Non-Parametric UCLs

95% Bootstrap-t UCL	3813
95% Hall's Bootstrap UCL	3815

Data File

Area	A/B
Medium	Sediment
Chemical	Total_BHC
Units	µg/kg

Variable: **Total_BHCs**

General Statistics

Number of Valid Observations	37
Number of Distinct Observations	8

Raw Statistics

Minimum	0
Maximum	82.1
Mean	2.85
Median	0
SD	13.55
Coefficient of Variation	4.753
Skewness	5.874

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.229
Shapiro Wilk Critical Value	0.936

Data not Normal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL	6.611

Assuming Normal Distribution

95% Student's-t UCL	6.611

Gamma Distribution Test

Gamma Statistics Not Available

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 12.56

Log-transformed Statistics

Log Statistics Not Avaliable

Lognormal Distribution Test

Not Available

Assuming Lognormal Distribution

95% H-UCL	N/A
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	8.812
95% Modified-t UCL	6.969
95% CLT UCL	6.514
95% Jackknife UCL	6.611
95% Standard Bootstrap UCL	6.459
95% Bootstrap-t UCL	26.87
95% Hall's Bootstrap UCL	26.42
95% Percentile Bootstrap UCL	7.19
95% BCA Bootstrap UCL	11.22
95% Chebyshev(Mean, Sd) UCL	12.56
97.5% Chebyshev(Mean, Sd) UCL	16.76
99% Chebyshev(Mean, Sd) UCL	25.01

Data File

Area	A/B
Medium	Sediment
Chemical	Total_DDX
Units	µg/kg

Variable: **Total_DDX**

Raw Statistics	
Number of Valid Observations	37
Number of Distinct Observations	37
Minimum	3
Maximum	212.7
Mean	16.09
Median	6.094
SD	39.28
Variance	1543
Coefficient of Variation	2.441
Skewness	4.4

Log-transformed Statistics	
Mean of log data	2.019
SD of log data	0.873

Data do not follow a Discernable Distribution

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL **44.24**

95% Useful UCLs	
Student's-t UCL	26.99

95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	31.7
95% Modified-t UCL	27.77

Non-Parametric UCLs	
95% CLT UCL	26.71
95% Jackknife UCL	26.99
95% Standard Bootstrap UCL	26.28
95% Bootstrap-t UCL	95.65
95% Hall's Bootstrap UCL	96.35
95% Percentile Bootstrap UCL	27.87
95% BCA Bootstrap UCL	32.89
95% Chebyshev(Mean, Sd) UCL	44.24
97.5% Chebyshev(Mean, Sd) UCL	56.42
99% Chebyshev(Mean, Sd) UCL	80.34

Data File

Area	A/B
Medium	Sediment
Chemical	Barium
Units	mg/kg

Variable: **Barium**

Raw Statistics	
Number of Valid Observations	37
Number of Distinct Observations	36

Log-Transformed Statistics	
Minimum of log data	2.14
Maximum of log data	3.694
Mean of log data	2.803
SD of log data	0.429
Variance of log data	0.184

ML Estimates Assuming Lognormal Distribution	
Mean	18.09
SD	8.128
Coefficient of Variation	0.449
Skewness	1.439
Median	16.5
80% Quantile	23.67
90% Quantile	28.59
95% Quantile	33.41
99% Quantile	44.75
MVU Estimate of Median	16.46
MVU Estimate of Mean	18.04
MVU Estimate of SD	8.024
MVU Estimate of Standard Error of Mean	1.316

Potential UCL to Use	
Use 95% Student's-t UCL	**20.29**
Or 95% Modified-t UCL	**20.32**
Or 95% H-UCL	**20.66**

Shapiro Wilk Test Statistic	0.938
Shapiro Wilk 5% Critical Value	0.936
Data appear Lognormal at 5% Significance Level	

95% UCL (Assuming Normal Distribution)	
95% Student's-t UCL	20.29

UCLs (Assuming Lognormal Distribution)	
95% H-UCL	20.66
95% Chebyshev (MVUE) UCL	23.78
97.5% Chebyshev (MVUE) UCL	26.26
99% Chebyshev (MVUE) UCL	31.14

Non-Parametric UCLs	
95% Adjusted-CLT UCL (Adjusted for Skewness)	20.43
95% Modified-t UCL (Adjusted for Skewness)	20.32
95% Hall's Bootstrap UCL	20.24
95% Bootstrap t UCL	20.56
95% BCA Bootstrap UCL	20.32
95% Chebyshev (Mean, Sd) UCL	23.81
97.5% Chebyshev (Mean, Sd) UCL	26.3
99% Chebyshev (Mean, Sd) UCL	31.18

Data File

Area	A/B
Medium	Sediment
Chemical	Mercury
Units	mg/kg

Variable: **Mercury_wROS_est_NDs**

Raw Statistics	
Number of Valid Observations	71
Number of Distinct Observations	45

Log-Transformed Statistics	
Minimum of log data	-6.645
Maximum of log data	-3.016
Mean of log data	-5.087
SD of log data	0.903
Variance of log data	0.815

ML Estimates Assuming Lognormal Distribution	
Mean	0.00928
SD	0.0104
Coefficient of Variation	1.122
Skewness	4.78
Median	0.00618
80% Quantile	0.0132
90% Quantile	0.0196
95% Quantile	0.0273
99% Quantile	0.0505
MVU Estimate of Median	0.00614
MVU Estimate of Mean	0.00921
MVU Estimate of SD	0.01
MVU Estimate of Standard Error of Mean	0.00114

Potential UCL to Use

Use 95% H-UCL	**0.0117**

Lilliefors Test Statistic	0.0778
Lilliefors 5% Critical Value	0.105
Data appear Lognormal at 5% Significance Level	

95% UCL (Assuming Normal Distribution)	
95% Student's-t UCL	0.0111

Non-Parametric UCLs	
95% Adjusted-CLT UCL (Adjusted for Skewness)	0.0114
95% Modified-t UCL (Adjusted for Skewness)	0.0111
95% Hall's Bootstrap UCL	0.0114
95% Bootstrap t UCL	0.0116
95% BCA Bootstrap UCL	0.0114
95% Chebyshev (Mean, Sd) UCL	0.0141
97.5% Chebyshev (Mean, Sd) UCL	0.0161
99% Chebyshev (Mean, Sd) UCL	0.0202

UCLs (Assuming Lognormal Distribution)	
95% H-UCL	0.0117
95% Chebyshev (MVUE) UCL	0.0142
97.5% Chebyshev (MVUE) UCL	0.0164
99% Chebyshev (MVUE) UCL	0.0206

Data File

Area	A/B
Medium	Sediment
Chemical	Copper
Units	mg/kg

Variable: **Copper**

Raw Statistics	
Number of Valid Observations	37
Number of Distinct Observations	27
Minimum	1.5
Maximum	12.2
Mean	3.586
Median	2.7
Standard Deviation	2.471
Variance	6.107

Gamma Statistics	
k star (bias corrected)	3.034
Theta Star	1.182
nu star	224.5
Approximate Chi Square Value (.05)	190.8
Adjusted Level of Significance	0.0431
Adjusted Chi Square Value (.05)	189.5

Gamma Distribution Test	
Anderson-Darling Test Statistic	1.472
Anderson-Darling Critical Value	0.754
Kolmogorov-Smirnov Test Statistic	0.145
Kolmogorov-Smirnov Critical Value	0.146

Data follow Appr. Gamma distribution at 5% Significance Level

95% Gamma UCLs(Assuming Gamma Distribution)	
95% Approximate Gamma UCL	4.22
95% Adjusted Gamma UCL	4.249
95% Adjusted-CLT UCL	4.415
95% Modified-t UCL	4.297

95% Non-Parametric UCLs	
95% Bootstrap-t UCL	4.541
95% Hall's Bootstrap UCL	4.692

Potential UCL to Use

Use Approximate Gamma UCL **4.22**

Data File

Area	A/B
Medium	Sediment
Chemical	Chromium
Units	mg/kg

Variable: **Chromium**

Raw Statistics	
Number of Valid Observations	71
Number of Distinct Observations	50
Minimum	3.4
Maximum	18.2
Mean	7.053
Median	5.6
SD	3.512
Variance	12.34
Coefficient of Variation	0.498
Skewness	1.638

Log-Transformed Statistics	
Mean of log data	1.857
SD of log data	0.421

Data do not follow a Discernable Distribution

Potential UCL to Use

Use 95% Student's-t UCL	**7.748**
Or 95% Modified-t UCL	**7.761**

95% Useful UCLs	
Student's-t UCL	7.748
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	7.825
95% Modified-t UCL	7.761
Non-Parametric UCLs	
95% CLT UCL	7.738
95% Jackknife UCL	7.748
95% Standard Bootstrap UCL	7.735
95% Bootstrap-t UCL	7.893
95% Hall's Bootstrap UCL	7.833
95% Percentile Bootstrap UCL	7.725
95% BCA Bootstrap UCL	7.855
95% Chebyshev(Mean, Sd) UCL	8.87
97.5% Chebyshev(Mean, Sd) UCL	9.656
99% Chebyshev(Mean, Sd) UCL	11.2

Data File

Area	A/B
Medium	Sediment
Chemical	Cobalt
Units	mg/kg

Variable: **Cobalt**

Raw Statistics	
Number of Valid Observations	37
Number of Distinct Observations	23
Minimum	0.99
Maximum	11.4
Mean	2.4
Median	1.7
SD	1.923
Variance	3.696
Coefficient of Variation	0.801
Skewness	3.283

Log-Transformed Statistics	
Mean of log data	0.696
SD of log data	0.547

Data do not follow a Discernable Distribution

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL	**3.777**

95% Useful UCLs	
Student's-t UCL	2.933

95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	3.102
95% Modified-t UCL	2.962

Non-Parametric UCLs	
95% CLT UCL	2.92
95% Jackknife UCL	2.933
95% Standard Bootstrap UCL	2.911
95% Bootstrap-t UCL	3.284
95% Hall's Bootstrap UCL	5.418
95% Percentile Bootstrap UCL	2.951
95% BCA Bootstrap UCL	3.178
95% Chebyshev(Mean, Sd) UCL	3.777
97.5% Chebyshev(Mean, Sd) UCL	4.374
99% Chebyshev(Mean, Sd) UCL	5.545

Data File

Area	A/B
Medium	Sediment
Chemical	Nickel
Units	mg/kg

Variable: **Nickel**

Raw Statistics	
Number of Valid Observations	71
Number of Distinct Observations	34
Minimum	2
Maximum	12.4
Mean	3.821
Median	3.3
SD	1.748
Variance	3.056
Coefficient of Variation	0.458
Skewness	2.834

Log-Transformed Statistics	
Mean of log data	1.271
SD of log data	0.348

Data do not follow a Discernable Distribution

Potential UCL to Use

Use 95% Student's-t UCL	**4.167**
Or 95% Modified-t UCL	**4.179**

95% Useful UCLs	
Student's-t UCL	4.167
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	4.237
95% Modified-t UCL	4.179
Non-Parametric UCLs	
95% CLT UCL	4.162
95% Jackknife UCL	4.167
95% Standard Bootstrap UCL	4.162
95% Bootstrap-t UCL	4.305
95% Hall's Bootstrap UCL	4.281
95% Percentile Bootstrap UCL	4.179
95% BCA Bootstrap UCL	4.265
95% Chebyshev(Mean, Sd) UCL	4.725
97.5% Chebyshev(Mean, Sd) UCL	5.117
99% Chebyshev(Mean, Sd) UCL	5.885

Area	A/B
Medium	Sediment
Chemical	Thallium
Units	Pg/kg

Thallium all

General Statistics

Number of Valid Observations 37

Number of Distinct Observations 25

Raw Statistics

Minimum 0.76
Maximum 9.7
Mean 3.149
Median 2.85
SD 1.316
Coefficient of Variation 0.418
Skewness 3.339

Log-transformed Statistics

Minimum of Log Data -0.274
Maximum of Log Data 2.272
Mean of log Data 1.077
SD of log Data 0.392

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.647
Shapiro Wilk Critical Value 0.936
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.748
Shapiro Wilk Critical Value 0.936
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 3.514

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 3.632
95% Modified-t UCL 3.534

Assuming Lognormal Distribution

95% H-UCL 3.574
95% Chebyshev (MVUE) UCL 4.077
97.5% Chebyshev (MVUE) UCL 4.473
99% Chebyshev (MVUE) UCL 5.249

Gamma Distribution Test

k star (bias corrected) 6.758
Theta Star 0.466
nu star 500.1
Approximate Chi Square Value (.05) 449.3
Adjusted Level of Significance 0.0431
Adjusted Chi Square Value 447.2

Anderson-Darling Test Statistic 3.186
Anderson-Darling 5% Critical Value 0.749
Kolmogorov-Smirnov Test Statistic 0.263
Kolmogorov-Smirnov 5% Critical Value 0.145
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 3.505
95% Adjusted Gamma UCL 3.521

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 3.505
95% Jackknife UCL 3.514
95% Standard Bootstrap UCL 3.501
95% Bootstrap-t UCL 3.736
95% Hall's Bootstrap UCL 5.398
95% Percentile Bootstrap UCL 3.533
95% BCA Bootstrap UCL 3.717
95% Chebyshev(Mean, Sd) UCL 4.092
97.5% Chebyshev(Mean, Sd) UCL 4.5
99% Chebyshev(Mean, Sd) UCL 5.302

Potential UCL to Use

Use 95% Student's-t UCL 3.514
or 95% Modified-t UCL 3.534

Area	A/B minus Rope Swing/Hot Spot
Medium	Sediment
Chemical	Thallium
Units	Pg/kg

Thallium

General Statistics

Number of Valid Observations 29

Number of Distinct Observations 24

Raw Statistics

Minimum 0.76
Maximum 9.7
Mean 3.328
Median 3.05
SD 1.402
Coefficient of Variation 0.421
Skewness 3.364

Log-transformed Statistics

Minimum of Log Data -0.274
Maximum of Log Data 2.272
Mean of log Data 1.136
SD of log Data 0.375

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.635
Shapiro Wilk Critical Value 0.926
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.756
Shapiro Wilk Critical Value 0.926
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 3.771

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 3.93
95% Modified-t UCL 3.798

Assuming Lognormal Distribution

95% H-UCL 3.811
95% Chebyshev (MVUE) UCL 4.373
97.5% Chebyshev (MVUE) UCL 4.822
99% Chebyshev (MVUE) UCL 5.705

Gamma Distribution Test

k star (bias corrected) 6.957
Theta Star 0.478
nu star 403.5
Approximate Chi Square Value (.05) 358
Adjusted Level of Significance 0.0407
Adjusted Chi Square Value 355.4

Anderson-Darling Test Statistic 2.276
Anderson-Darling 5% Critical Value 0.747
Kolmogorov-Smirnov Test Statistic 0.228
Kolmogorov-Smirnov 5% Critical Value 0.163
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 3.752
95% Adjusted Gamma UCL 3.779

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 3.756
95% Jackknife UCL 3.771
95% Standard Bootstrap UCL 3.755
95% Bootstrap-t UCL 4.092
95% Hall's Bootstrap UCL 5.905
95% Percentile Bootstrap UCL 3.783
95% BCA Bootstrap UCL 3.998
95% Chebyshev(Mean, Sd) UCL 4.463
97.5% Chebyshev(Mean, Sd) UCL 4.954
99% Chebyshev(Mean, Sd) UCL 5.918

Potential UCL to Use

Use 95% Student's-t UCL 3.771
or 95% Modified-t UCL 3.798

Data File

Area	A/B
Medium	Sediment
Chemical	Zinc
Units	mg/kg

Variable: **Zinc**

Raw Statistics	
Number of Valid Observations	37
Number of Distinct Observations	33
Minimum	10.9
Maximum	93.3
Mean	26.08
Median	18.7
SD	16.37
Variance	268.1
Coefficient of Variation	0.628
Skewness	2.266

Log-Transformed Statistics	
Mean of log data	3.122
SD of log data	0.505

Data do not follow a Discernable Distribution

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL	**37.81**

95% Useful UCLs	
Student's-t UCL	30.62

95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	31.58
95% Modified-t UCL	30.79

Non-Parametric UCLs	
95% CLT UCL	30.51
95% Jackknife UCL	30.62
95% Standard Bootstrap UCL	30.47
95% Bootstrap-t UCL	32.13
95% Hall's Bootstrap UCL	34.22
95% Percentile Bootstrap UCL	30.69
95% BCA Bootstrap UCL	31.9
95% Chebyshev(Mean, Sd) UCL	37.81
97.5% Chebyshev(Mean, Sd) UCL	42.89
99% Chebyshev(Mean, Sd) UCL	52.86

Area	A/B
Medium	Sediment
Chemical	Bird TEQ Mean
Units	µg/kg

BirdTEQMean

Number of Valid Observations	79	Non-Parametric UCLs	
Number of Distinct Observations	64	95% Adjusted-CLT UCL (Adjusted for	2.646
Minimum of log data	-5.966	95% Modified-t UCL (Adjusted for Ske	2.321
Maximum of log data	3.618	95% Hall's Bootstrap UCL	5.272
Mean of log data	-2.185	95% Bootstrap t UCL	3.716
SD of log data	2.194	95% BCA Bootstrap UCL	2.788
Variance of log data	4.812	95% Chebyshev (Mean, Sd) UCL	3.739
		97.5% Chebyshev (Mean, Sd) UCL	4.774
Lilliefors Test Statistic	0.0791	99% Chebyshev (Mean, Sd) UCL	6.809
Lilliefors 5% Critical Value	0.0997		
Data appear Lognormal at 5% Significance Level		UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	3.059
95% UCL (Assuming Normal Distribution)		95% Chebyshev (MVUE) UCL	3.084
95% Student's-t UCL	2.259	97.5% Chebyshev (MVUE) UCL	3.928
		99% Chebyshev (MVUE) UCL	5.587
ML Estimates Assuming Lognormal Distribution			
Mean	1.247	**Potential UCL to Use**	
SD	13.77	Use 95% H-UCL	3.059
Coefficient of Variation	11.05		
Skewness	1381		
Median	0.112		
80% Quantile	0.712		
90% Quantile	1.87		
95% Quantile	4.149		
99% Quantile	18.5		
MVU Estimate of Median	0.109		
MVU Estimate of Mean	1.133		
MVU Estimate of SD	8.315		
MVU Estimate of Standard Error of Mean	0.448		

Area	A/B
Medium	Sediment
Chemical	Fish TEQ Mean
Units	µg/kg

FishTEQMean

Number of Valid Observations	79	Non-Parametric UCLs	
Number of Distinct Observations	66	95% Adjusted-CLT UCL (Adjusted for	0.0109
Minimum of log data	-11.45	95% Modified-t UCL (Adjusted for Ske	0.00955
Maximum of log data	-1.87	95% Hall's Bootstrap UCL	0.0211
Mean of log data	-7.7	95% Bootstrap t UCL	0.0164
SD of log data	2.181	95% BCA Bootstrap UCL	0.0118
Variance of log data	4.758	95% Chebyshev (Mean, Sd) UCL	0.0154
		97.5% Chebyshev (Mean, Sd) UCL	0.0197
Lilliefors Test Statistic	0.095	99% Chebyshev (Mean, Sd) UCL	0.0281
Lilliefors 5% Critical Value	0.0997		
Data appear Lognormal at 5% Significance Level		UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	0.0119
95% UCL (Assuming Normal Distribution)		95% Chebyshev (MVUE) UCL	0.012
95% Student's-t UCL	0.00929	97.5% Chebyshev (MVUE) UCL	0.0153
		99% Chebyshev (MVUE) UCL	0.0218
ML Estimates Assuming Lognormal Distribution			
Mean	0.00489	**Potential UCL to Use**	
SD	0.0525	Use 95% H-UCL	0.0119
Coefficient of Variation	10.75		
Skewness	1273		
Median	0.0004527		
80% Quantile	0.00284		
90% Quantile	0.00741		
95% Quantile	0.0164		
99% Quantile	0.0724		
MVU Estimate of Median	0.0004393		
MVU Estimate of Mean	0.00445		
MVU Estimate of SD	0.032		
MVU Estimate of Standard Error of Mean	0.00174		

Area	A/B
Medium	Sediment
Chemical	Mammal TEQ Mean
Units	µg/kg

MamTEQMean

Number of Valid Observations	79	Non-Parametric UCLs	
Number of Distinct Observations	64	95% Adjusted-CLT UCL (Adjusted for	0.0112
Minimum of log data	-11.43	95% Modified-t UCL (Adjusted for Ske	0.00986
Maximum of log data	-1.842	95% Hall's Bootstrap UCL	0.0222
Mean of log data	-7.642	95% Bootstrap t UCL	0.0166
SD of log data	2.186	95% BCA Bootstrap UCL	0.0122
Variance of log data	4.777	95% Chebyshev (Mean, Sd) UCL	0.0159
		97.5% Chebyshev (Mean, Sd) UCL	0.0203
Lilliefors Test Statistic	0.0769	99% Chebyshev (Mean, Sd) UCL	0.0289
Lilliefors 5% Critical Value	0.0997		
Data appear Lognormal at 5% Significance Level		UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	0.0128
95% UCL (Assuming Normal Distribution)		95% Chebyshev (MVUE) UCL	0.0129
95% Student's-t UCL	0.00959	97.5% Chebyshev (MVUE) UCL	0.0164
		99% Chebyshev (MVUE) UCL	0.0234
ML Estimates Assuming Lognormal Distribution			
Mean	0.00523	**Potential UCL to Use**	
SD	0.0567	Use 95% H-UCL	0.0128
Coefficient of Variation	10.85		
Skewness	1310		
Median	0.0004797		
80% Quantile	0.00302		
90% Quantile	0.0079		
95% Quantile	0.0175		
99% Quantile	0.0775		
MVU Estimate of Median	0.0004654		
MVU Estimate of Mean	0.00475		
MVU Estimate of SD	0.0345		
MVU Estimate of Standard Error of Mean	0.00187		

Area	A/B
Medium	Sediment
Chemical	Meas&Est congeners
Units	µg/kg

Meas&Estim_TotCong

Number of Valid Observations	79	**Non-Parametric UCLs**	
Number of Distinct Observations	66	95% CLT UCL	978.9
Minimum	0.0795	95% Jackknife UCL	982.8
Maximum	11000	95% Standard Bootstrap UCL	971.8
Mean	651.3	95% Bootstrap-t UCL	1316
Median	161.4	95% Hall's Bootstrap UCL	2036
SD	1770	95% Percentile Bootstrap UCL	1004
Variance	3132476	95% BCA Bootstrap UCL	1187
Coefficient of Variation	2.717	95% Chebyshev(Mean, Sd) UCL	1519
Skewness	4.865	97.5% Chebyshev(Mean, Sd) UCL	1895
Mean of log data	5.244	99% Chebyshev(Mean, Sd) UCL	2633
SD of log data	1.659		
		Potential UCL to Use	
Data do not follow a Discernable Distribution		Use 97.5% Chebyshev (Mean, Sd) UCL	1895

95% Useful UCLs

Student's-t UCL	982.8

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1095
95% Modified-t UCL	1001

Area	A/B
Medium	Sediment
Chemical	Measured Bird TEQ
Units	µg/kg

Bird_TEQ

Number of Valid Observations	13	**Non-Parametric UCLs**	
Number of Distinct Observations	12	95% CLT UCL	0.439
Minimum	0.0165	95% Jackknife UCL	0.456
Maximum	1.233	95% Standard Bootstrap UCL	0.432
Mean	0.24	95% Bootstrap-t UCL	1.301
Median	0.0376	95% Hall's Bootstrap UCL	1.504
SD	0.436	95% Percentile Bootstrap UCL	0.439
Variance	0.19	95% BCA Bootstrap UCL	0.513
Coefficient of Variation	1.815	95% Chebyshev(Mean, Sd) UCL	0.767
Skewness	2.058	97.5% Chebyshev(Mean, Sd) UCL	0.995
Mean of log data	-2.73	99% Chebyshev(Mean, Sd) UCL	1.443
SD of log data	1.566		
		Potential UCL to Use	
Data do not follow a Discernable Distribution		99% Chebyshev(Mean, Sd) UCL	1.443
		Recommended UCL exceeds the maximum observation	

95% Useful UCLs

Student's-t UCL	0.456

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.513
95% Modified-t UCL	0.467

Area	A/B
Medium	Sediment
Chemical	Measured Fish TEQ
Units	µg/kg

Fish_TEQ

Number of Valid Observations	13	**Non-Parametric UCLs**	
Number of Distinct Observations	12	95% CLT UCL	0.00119
Minimum	0.0000704	95% Jackknife UCL	0.00123
Maximum	0.00324	95% Standard Bootstrap UCL	0.00117
Mean	0.00066342	95% Bootstrap-t UCL	0.00358
Median	0.00014545	95% Hall's Bootstrap UCL	0.00407
SD	0.00116	95% Percentile Bootstrap UCL	0.00118
Variance	1.3358E-06	95% BCA Bootstrap UCL	0.00141
Coefficient of Variation	1.742	95% Chebyshev(Mean, Sd) UCL	0.00206
Skewness	2.064	97.5% Chebyshev(Mean, Sd) UCL	0.00267
Mean of log data	-8.403	99% Chebyshev(Mean, Sd) UCL	0.00385
SD of log data	1.39		
		Potential UCL to Use	
Data do not follow a Discernable Distribution		99% Chebyshev(Mean, Sd) UCL	0.00385
		Recommended UCL exceeds the maximum observation	

95% Useful UCLs

Student's-t UCL	0.00123

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.00139
95% Modified-t UCL	0.00127

Area	A/B
Medium	Sediment
Chemical	Measured Mammal TEQ
Units	µg/kg

Mammal_TEQ

Number of Valid Observations	13	**Non-Parametric UCLs**	
Number of Distinct Observations	12	95% CLT UCL	0.00172
Minimum	0.0000704	95% Jackknife UCL	0.00179
Maximum	0.00491	95% Standard Bootstrap UCL	0.00169
Mean	0.00094795	95% Bootstrap-t UCL	0.00515
Median	0.00016	95% Hall's Bootstrap UCL	0.00593
SD	0.0017	95% Percentile Bootstrap UCL	0.00174
Variance	2.8794E-06	95% BCA Bootstrap UCL	0.00199
Coefficient of Variation	1.79	95% Chebyshev(Mean, Sd) UCL	0.003
Skewness	2.071	97.5% Chebyshev(Mean, Sd) UCL	0.00389
Mean of log data	-8.194	99% Chebyshev(Mean, Sd) UCL	0.00563
SD of log data	1.522		
		Potential UCL to Use	
Data do not follow a Discernable Distribution		99% Chebyshev(Mean, Sd) UCL	0.00563
		Recommended UCL exceeds the maximum observation	

95% Useful UCLs

Student's-t UCL	0.00179

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.00201
95% Modified-t UCL	0.00183

Area	A/B
Medium	Sediment
Chemical	Total Aroclors
Units	µg/kg

LnROS_Total_Aroclors

Number of Valid Observations	79	**Non-Parametric UCLs**	
Number of Distinct Observations	62	95% CLT UCL	1139
Minimum	0.922	95% Jackknife UCL	1144
Maximum	14860	95% Standard Bootstrap UCL	1117
Mean	697.7	95% Bootstrap-t UCL	1649
Median	37.5	95% Hall's Bootstrap UCL	1503
SD	2385	95% Percentile Bootstrap UCL	1164
Variance	5688874	95% BCA Bootstrap UCL	1384
Coefficient of Variation	3.419	95% Chebyshev(Mean, Sd) UCL	1867
Skewness	5.002	97.5% Chebyshev(Mean, Sd) UCL	2374
Mean of log data	3.848	99% Chebyshev(Mean, Sd) UCL	3368
SD of log data	2.374		
		Potential UCL to Use	
Data do not follow a Discernable Distribution		99% Chebyshev(Mean, Sd) UCL	3368

95% Useful UCLs

Student's-t UCL	1144

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	1300
95% Modified-t UCL	1170

Area	A/B
Medium	Sediment
Chemical	Total Measured Congeners
Units	µg/kg

LnROS_Total_Congeners

Number of Valid Observations	13
Number of Distinct Observations	13
Minimum	0.0795
Maximum	11000
Mean	1162
Median	40
Standard Deviation	3035
Variance	9212397
k star (bias corrected)	0.224
Theta Star	5195
nu star	5.815
Approximate Chi Square Value (.05)	1.546
Adjusted Level of Significance	0.0301
Adjusted Chi Square Value (.05)	1.256
Anderson-Darling Test Statistic	0.567
Anderson-Darling Critical Value	0.859
Kolmogorov-Smirnov Test Statistic	0.19
Kolmogorov-Smirnov Critical Value	0.26
Data appear Gamma distributed at 5% Significance Level	
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	3374
95% Modified-t UCL	2791
95% Non-Parametric UCLs	
95% Bootstrap-t UCL	13539
95% Hall's Bootstrap UCL	10592
95% Gamma UCLs(Assuming Gamma Distribution)	
95% Approximate Gamma UCL	4370
95% Adjusted Gamma UCL	5382
Potential UCL to Use	
Use Adjusted Gamma UCL	5382

Area	A/B
Medium	Sediment
Chemical	Total Congeners - TEQ
Units	µg/kg

Sed_TotCong-TEQ_for_EPC

Number of Valid Observations	13
Number of Distinct Observations	13
Minimum	0
Maximum	10899
Mean	1143
Median	38.1
SD	3006
Variance	9035643
Coefficient of Variation	2.629
Skewness	3.329

Data do not follow a Discernable Distribution

95% Useful UCLs	
Student's-t UCL	2629
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	3337
95% Modified-t UCL	2757
Non-Parametric UCLs	
95% CLT UCL	2515
95% Jackknife UCL	2629
95% Standard Bootstrap UCL	2474
95% Bootstrap-t UCL	14776
95% Hall's Bootstrap UCL	10462
95% Percentile Bootstrap UCL	2679
95% BCA Bootstrap UCL	3621
95% Chebyshev(Mean, Sd) UCL	4777
97.5% Chebyshev(Mean, Sd) UCL	6350
99% Chebyshev(Mean, Sd) UCL	9438
Potential UCL to Use	
Use 95% Chebyshev (Mean, Sd) UCL	4777

Area	5 RSH 6 Z LQJ Hot 6 pot
Medium	Sediment
Chemical	Total Aroclors
Units	µg/kg

HS_LnROS_Total_Aroclors

Number of Valid Observations	26	95% Gamma UCLs(Assuming Gamma Distribution)	
Number of Distinct Observations	25	95% Approximate Gamma UCL	3667
Minimum	2.596	95% Adjusted Gamma UCL	3820
Maximum	14860		
Mean	2022	**Potential UCL to Use**	
Median	640.5	Use Adjusted Gamma UCL	3820
Standard Deviation	3875		
Variance	15017029		
k star (bias corrected)	0.402		
Theta Star	5025		
nu star	20.92		
Approximate Chi Square Value (.05)	11.53		
Adjusted Level of Significance	0.0398		
Adjusted Chi Square Value (.05)	11.07		
Anderson-Darling Test Statistic	0.763		
Anderson-Darling Critical Value	0.824		
Kolmogorov-Smirnov Test Statistic	0.161		
Kolmogorov-Smirnov Critical Value	0.183		
Data appear Gamma distributed at 5% Significance Level			
95% UCLs (Adjusted for Skewness)			
95% Adjusted-CLT UCL	3702		
95% Modified-t UCL	3387		
95% Non-Parametric UCLs			
95% Bootstrap-t UCL	5055		
95% Hall's Bootstrap UCL	4537		

Area	5 RSH 6 Z LQJ Hot 6 pot
Medium	Sediment
Chemical	Bird TEQ Mean
Units	µg/kg

HS_BirdTEQMean

Number of Valid Observations	26	95% UCLs (Adjusted for Skewness)	
Number of Distinct Observations	25	95% Adjusted-CLT UCL	7.6
Minimum	0.00722	95% Modified-t UCL	6.748
Maximum	37.28		
Mean	3.886	95% Non-Parametric UCLs	
Median	1.12	95% Bootstrap-t UCL	11.35
Standard Deviation	8.017	95% Hall's Bootstrap UCL	14.8
Variance	64.28		
k star (bias corrected)	0.422	95% Gamma UCLs(Assuming Gamma Distribution)	
Theta Star	9.202	95% Approximate Gamma UCL	6.934
nu star	21.96	95% Adjusted Gamma UCL	7.213
Approximate Chi Square Value (.05)	12.31		
Adjusted Level of Significance	0.0398	**Potential UCL to Use**	
Adjusted Chi Square Value (.05)	11.83	Use Adjusted Gamma UCL	7.213

Anderson-Darling Test Statistic	0.792
Anderson-Darling Critical Value	0.82
Kolmogorov-Smirnov Test Statistic	0.162
Kolmogorov-Smirnov Critical Value	0.182

Data appear Gamma distributed at 5% Significance Level

Area	5 RSH 6 Z LQJ Hot 6 pot
Medium	Sediment
Chemical	Fish TEQ Mean
Units	µg/kg

HS_FishTEQMean

Number of Valid Observations	26	95% UCLs (Adjusted for Skewness)	
Number of Distinct Observations	25	95% Adjusted-CLT UCL	0.0313
Minimum	2.9872E-05	95% Modified-t UCL	0.0278
Maximum	0.154		
Mean	0.0159	95% Non-Parametric UCLs	
Median	0.00352	95% Bootstrap-t UCL	0.0487
Standard Deviation	0.0332	95% Hall's Bootstrap UCL	0.0619
Variance	0.0011		
k star (bias corrected)	0.412	95% Gamma UCLs(Assuming Gamma Distribution)	
Theta Star	0.0386	95% Approximate Gamma UCL	0.0286
nu star	21.43	95% Adjusted Gamma UCL	0.0298
Approximate Chi Square Value (.05)	11.91		
Adjusted Level of Significance	0.0398	**Potential UCL to Use**	
Adjusted Chi Square Value (.05)	11.44	Use Adjusted Gamma UCL	0.0298

Anderson-Darling Test Statistic	0.817
Anderson-Darling Critical Value	0.822
Kolmogorov-Smirnov Test Statistic	0.156
Kolmogorov-Smirnov Critical Value	0.183

Data appear Gamma distributed at 5% Significance Level

Area	5 RSH 6 Z LQJ Hot 6 pot
Medium	Sediment
Chemical	Mammal TEQ Mean
Units	µg/kg

HS_MamTEQMean

Number of Valid Observations	26	95% UCLs (Adjusted for Skewness)	
Number of Distinct Observations	25	95% Adjusted-CLT UCL	0.0323
Minimum	3.0702E-05	95% Modified-t UCL	0.0287
Maximum	0.158		
Mean	0.0165	95% Non-Parametric UCLs	
Median	0.00451	95% Bootstrap-t UCL	0.0473
Standard Deviation	0.0341	95% Hall's Bootstrap UCL	0.0659
Variance	0.00116		
k star (bias corrected)	0.42	95% Gamma UCLs(Assuming Gamma Distribution)	
Theta Star	0.0392	95% Approximate Gamma UCL	0.0295
nu star	21.86	95% Adjusted Gamma UCL	0.0306
Approximate Chi Square Value (.05)	12.23		
Adjusted Level of Significance	0.0398	**Potential UCL to Use**	
Adjusted Chi Square Value (.05)	11.76	Use Adjusted Gamma UCL	0.0306

Anderson-Darling Test Statistic	0.793
Anderson-Darling Critical Value	0.82
Kolmogorov-Smirnov Test Statistic	0.161
Kolmogorov-Smirnov Critical Value	0.182

Data appear Gamma distributed at 5% Significance Level

Area	5 RSH 6 Z LQJ Hot 6 pot
Medium	Sediment
Chemical	Est Congeners
Units	µg/kg

HS_Meas&Estim_TotCong

Number of Valid Observations	26	UCLs (Assuming Lognormal Distribution)	
Number of Distinct Observations	25	95% H-UCL	5594
Minimum of log data	1.629	95% Chebyshev (MVUE) UCL	4917
Maximum of log data	9.306	97.5% Chebyshev (MVUE) UCL	6247
Mean of log data	6.397	99% Chebyshev (MVUE) UCL	8859
SD of log data	1.559		
Variance of log data	2.431	**Potential UCL to Use**	
		Use 95% Chebyshev (MVUE) UCL	4917
Shapiro Wilk Test Statistic	0.927		
Shapiro Wilk 5% Critical Value	0.92		
Data appear Lognormal at 5% Significance Level			

95% UCL (Assuming Normal Distribution)	
95% Student's-t UCL	2625
ML Estimates Assuming Lognormal Distribution	
Mean	2023
SD	6514
Coefficient of Variation	3.22
Skewness	43.03
Median	600.1
80% Quantile	2229
90% Quantile	4426
95% Quantile	7798
99% Quantile	22563
MVU Estimate of Median	572.7
MVU Estimate of Mean	1844
MVU Estimate of SD	4316
MVU Estimate of Standard Error of Mean	705
Non-Parametric UCLs	
95% Adjusted-CLT UCL (Adjusted for Skewness)	2897
95% Modified-t UCL (Adjusted for Skewness)	2673
95% Hall's Bootstrap UCL	3629
95% Bootstrap t UCL	4002
95% BCA Bootstrap UCL	2936
95% Chebyshev (Mean, Sd) UCL	4109
97.5% Chebyshev (Mean, Sd) UCL	5166
99% Chebyshev (Mean, Sd) UCL	7241

Area	Rope Swing/Hot Spot
Medium	Sediment
Chemical	Thallium
Units	Pg/kg

Thallium

General Statistics

Number of Valid Observations 8

Number of Distinct Observations 6

Raw Statistics

Minimum 0.89
Maximum 2.85
Mean 2.499
Median 2.675
SD 0.657
Coefficient of Variation 0.263
Skewness -2.708

Log-transformed Statistics

Minimum of Log Data -0.117
Maximum of Log Data 1.047
Mean of log Data 0.863
SD of log Data 0.397

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.554
Shapiro Wilk Critical Value 0.818
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.501
Shapiro Wilk Critical Value 0.818
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 2.939

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 2.643
95% Modified-t UCL 2.902

Assuming Lognormal Distribution

95% H-UCL 3.566
95% Chebyshev (MVUE) UCL 4.105
97.5% Chebyshev (MVUE) UCL 4.782
99% Chebyshev (MVUE) UCL 6.113

Gamma Distribution Test

k star (bias corrected) 6.128
Theta Star 0.408
nu star 98.05
Approximate Chi Square Value (.05) 76.2
Adjusted Level of Significance 0.0195
Adjusted Chi Square Value 71.35

Anderson-Darling Test Statistic 1.942
Anderson-Darling 5% Critical Value 0.715
Kolmogorov-Smirnov Test Statistic 0.467
Kolmogorov-Smirnov 5% Critical Value 0.294
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 3.215
95% Adjusted Gamma UCL 3.434

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 2.881
95% Jackknife UCL 2.939
95% Standard Bootstrap UCL 2.848
95% Bootstrap-t UCL 2.808
95% Hall's Bootstrap UCL 2.722
95% Percentile Bootstrap UCL 2.763
95% BCA Bootstrap UCL 2.738
95% Chebyshev(Mean, Sd) UCL 3.511
97.5% Chebyshev(Mean, Sd) UCL 3.949
99% Chebyshev(Mean, Sd) UCL 4.81

Potential UCL to Use

Use 95% Student's-t UCL 2.939
or 95% Modified-t UCL 2.902

Recommended UCL exceeds the maximum observation

Area	A/B
Medium	White Sucker
Chemical	Total Congeners
Units	µg/kg

Total_Congeners

Number of Valid Observations	12	95% UCLs (Adjusted for Skewness)	
Number of Distinct Observations	11	95% Adjusted-CLT UCL	17353
Minimum	290	95% Modified-t UCL	16709
Maximum	38000		
Mean	10470	95% Non-Parametric UCLs	
Median	4700	95% Bootstrap-t UCL	18826
Standard Deviation	11624	95% Hall's Bootstrap UCL	17939
Variance	135100000		
k star (bias corrected)	0.62	95% Gamma UCLs(Assuming Gamma Distribution)	
Theta Star	16893	95% Approximate Gamma UCL	21707
nu star	14.87	95% Adjusted Gamma UCL	24430
Approximate Chi Square Value (.05)	7.174		
Adjusted Level of Significance	0.029	**Potential UCL to Use**	
Adjusted Chi Square Value (.05)	6.375	**Use Approximate Gamma UCL**	**21707**

Anderson-Darling Test Statistic	0.326
Anderson-Darling Critical Value	0.766
Kolmogorov-Smirnov Test Statistic	0.178
Kolmogorov-Smirnov Critical Value	0.255

Data appear Gamma distributed at 5% Significance Level

Area	A/B
Medium	White Sucker
Chemical	Bird TEQ
Units	µg/kg

Bird_TEQ

Number of Valid Observations	12	95% UCLs (Adjusted for Skewness)	
Number of Distinct Observations	12	95% Adjusted-CLT UCL	4.825
Minimum	0.145	95% Modified-t UCL	4.564
Maximum	11.08		
Mean	2.824	95% Non-Parametric UCLs	
Median	1.636	95% Bootstrap-t UCL	5.478
Standard Deviation	3.214	95% Hall's Bootstrap UCL	5.906
Variance	10.33		
k star (bias corrected)	0.65	95% Gamma UCLs(Assuming Gamma Distribution)	
Theta Star	4.344	95% Approximate Gamma UCL	5.735
nu star	15.6	95% Adjusted Gamma UCL	6.432
Approximate Chi Square Value (.05)	7.681		
Adjusted Level of Significance	0.029	**Potential UCL to Use**	
Adjusted Chi Square Value (.05)	6.849	**Use Approximate Gamma UCL**	**5.735**

Anderson-Darling Test Statistic	0.343
Anderson-Darling Critical Value	0.764
Kolmogorov-Smirnov Test Statistic	0.151
Kolmogorov-Smirnov Critical Value	0.254

Data appear Gamma distributed at 5% Significance Level

Area	A/B
Medium	White Sucker
Chemical	Fish TEQ
Units	µg/kg

Fish_TEQ

Number of Valid Observations	12	95% UCLs (Adjusted for Skewness)	
Number of Distinct Observations	12	95% Adjusted-CLT UCL	0.0154
Minimum	0.00279	95% Modified-t UCL	0.0149
Maximum	0.0309		
Mean	0.0103	95% Non-Parametric UCLs	
Median	0.00707	95% Bootstrap-t UCL	0.0165
Standard Deviation	0.00855	95% Hall's Bootstrap UCL	0.0167
Variance	0.000073041		
k star (bias corrected)	1.387	95% Gamma UCLs(Assuming Gamma Distribution)	
Theta Star	0.0074	95% Approximate Gamma UCL	0.0162
nu star	33.3	95% Adjusted Gamma UCL	0.0174
Approximate Chi Square Value (.05)	21.11		
Adjusted Level of Significance	0.029	**Potential UCL to Use**	
Adjusted Chi Square Value (.05)	19.63	**Use Approximate Gamma UCL**	**0.0162**

Anderson-Darling Test Statistic	0.453
Anderson-Darling Critical Value	0.743
Kolmogorov-Smirnov Test Statistic	0.182
Kolmogorov-Smirnov Critical Value	0.249

Data appear Gamma distributed at 5% Significance Level

Area	A/B
Medium	White Sucker
Chemical	Total Aroclors
Units	µg/kg

Total_Aroclors

Number of Valid Observations	24	**Non-Parametric UCLs**	
Number of Distinct Observations	24	95% CLT UCL	9035
Minimum	243	95% Jackknife UCL	9170
Maximum	39500	95% Standard Bootstrap UCL	9052
Mean	5810	95% Bootstrap-t UCL	11310
Median	1227	95% Hall's Bootstrap UCL	11038
SD	9606	95% Percentile Bootstrap UCL	9222
Variance	92282171	95% BCA Bootstrap UCL	10157
Coefficient of Variation	1.653	95% Chebyshev(Mean, Sd) UCL	14357
Skewness	2.381	97.5% Chebyshev(Mean, Sd) UCL	18055
Mean of log data	7.45	99% Chebyshev(Mean, Sd) UCL	25320
SD of log data	1.622		
		Potential UCL to Use	
Data do not follow a Discernable Distribution		99% Chebyshev(Mean, Sd) UCL	25320

95% Useful UCLs

Student's-t UCL	9170

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	10053
95% Modified-t UCL	9329

Area	A/B
Medium	White Sucker
Chemical	Mammal TEQ
Units	µg/kg

Mammal_TEQ

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	0.0573
Maximum	0.0942
Mean	0.0723
Median	0.0666
SD	0.0124
Variance	0.0001548
Coefficient of Variation	0.172
Skewness	0.745
Shapiro Wilk Test Statistic	0.891
5% Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	0.0788

Potential UCL to Use

Student's-t UCL	**0.0788**

Data File

Area	A/B
Medium	White Sucker
Chemical	DDx
Units	µg/kg

Variable: **DDx**

Raw Statistics

Number of Valid Observations	12	Shapiro Wilk Test Statistic	0.959
Number of Distinct Observations	12	5% Shapiro Wilk Critical Value	0.859
Minimum	17.79	Data appear Normal at 5% Significance Level	
Maximum	26.86		
Mean	21.35	95% UCL (Assuming Normal Distribution)	
Median	21.02	Student's-t UCL	22.78
SD	2.759		
Variance	7.611		
Coefficient of Variation	0.129		
Skewness	0.578		

Potential UCL to Use

Student's-t UCL	**22.78**

Data File

Area	A/B
Medium	White Sucker
Chemical	Barium
Units	mg/kg

Variable: **Barium**

Raw Statistics

Number of Valid Observations	12	Shapiro Wilk Test Statistic	0.932
Number of Distinct Observations	11	5% Shapiro Wilk Critical Value	0.859
Minimum	1.11	Data appear Normal at 5% Significance Level	
Maximum	2.12		
Mean	1.558	95% UCL (Assuming Normal Distribution)	
Median	1.56	Student's-t UCL	1.702
SD	0.277		
Variance	0.0769		
Coefficient of Variation	0.178		
Skewness	0.61		

Potential UCL to Use

Student's-t UCL	**1.702**

Data File

Area	A/B
Medium	White Sucker
Chemical	Mercury
Units	mg/kg

Variable: **Mercury**

Raw Statistics

Number of Valid Observations	12	Shapiro Wilk Test Statistic	0.899
Number of Distinct Observations	12	5% Shapiro Wilk Critical Value	0.859
Minimum	0.0423	Data appear Normal at 5% Significance Level	
Maximum	0.0863		
Mean	0.0662	95% UCL (Assuming Normal Distribution)	
Median	0.068	Student's-t UCL	0.0737
SD	0.0146		
Variance	0.000214		
Coefficient of Variation	0.221		
Skewness	-0.616		

Potential UCL to Use

Student's-t UCL	**0.0737**

Data File

Area	A/B
Medium	White Sucker
Chemical	Zinc
Units	mg/kg

Variable: **Zinc**

Raw Statistics

Number of Valid Observations	12	Shapiro Wilk Test Statistic	0.958
Number of Distinct Observations	12	5% Shapiro Wilk Critical Value	0.859
Minimum	17.9	Data appear Normal at 5% Significance Level	
Maximum	24.3		
Mean	21.73	95% UCL (Assuming Normal Distribution)	
Median	21.95	Student's-t UCL	22.66
SD	1.805		
Variance	3.257		
Coefficient of Variation	0.0831		
Skewness	-0.6		

Potential UCL to Use

Student's-t UCL	**22.66**

Data File

Area	A/B
Medium	White Sucker
Chemical	Cobalt
Units	mg/kg

Variable: **Cobalt_HalfDL**

Raw Statistics	
Number of Valid Observations	12
Number of Distinct Observations	10
Minimum	0.082
Maximum	0.202
Mean	0.103
Median	0.0895
SD	0.0324
Variance	0.00105
Coefficient of Variation	0.316
Skewness	3.069

Log-transformed Statistics	
Mean of log data	-2.309
SD of log data	0.24

Data do not follow a Discernable Distribution

Potential UCL to Use

Use 95% Student's-t UCL	**0.119**
Or 95% Modified-t UCL	**0.121**

95% Useful UCLs	
Student's-t UCL	0.119

95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	0.127
95% Modified-t UCL	0.121

Non-Parametric UCLs	
95% CLT UCL	0.118
95% Jackknife UCL	0.119
95% Standard Bootstrap UCL	0.117
95% Bootstrap-t UCL	0.154
95% Hall's Bootstrap UCL	0.174
95% Percentile Bootstrap UCL	0.12
95% BCA Bootstrap UCL	0.128
95% Chebyshev(Mean, Sd) UCL	0.143
97.5% Chebyshev(Mean, Sd) UCL	0.161
99% Chebyshev(Mean, Sd) UCL	0.196

Data File

Area	A/B
Medium	White Sucker
Chemical	Nickel
Units	mg/Kg

Variable: **Nickel_HalfDL**

Raw Statistics	
Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	0.206
Maximum	0.552
Mean	0.26
Median	0.224
SD	0.0942
Variance	0.00887
Coefficient of Variation	0.362
Skewness	3.17

Log-transformed Statistics	
Mean of log data	-1.385
SD of log data	0.264

Data do not follow a Discernable Distribution

Potential UCL to Use

Use 95% Student's-t UCL	**0.309**
Or 95% Modified-t UCL	**0.313**

95% Useful UCLs	
Student's-t UCL	0.309
95% UCLs (Adjusted for Skewness)	
95% Adjusted-CLT UCL	0.332
95% Modified-t UCL	0.313
Non-Parametric UCLs	
95% CLT UCL	0.305
95% Jackknife UCL	0.309
95% Standard Bootstrap UCL	0.302
95% Bootstrap-t UCL	0.43
95% Hall's Bootstrap UCL	0.469
95% Percentile Bootstrap UCL	0.313
95% BCA Bootstrap UCL	0.332
95% Chebyshev(Mean, Sd) UCL	0.379
97.5% Chebyshev(Mean, Sd) UCL	0.43
99% Chebyshev(Mean, Sd) UCL	0.531

Data File

Area	A/B
Medium	White Sucker
Chemical	Total PCB Aroclor
Units	µg/Kg

Variable: **Total PCB Aroclor**

Raw Statistics		95% Useful UCLs	
Number of Valid Observations	24	Student's-t UCL	9170
Number of Distinct Observations	24		
Minimum	243	95% UCLs (Adjusted for Skewness)	
Maximum	39500	95% Adjusted-CLT UCL	10053
Mean	5810	95% Modified-t UCL	9329
Median	1227		
SD	9606	Non-Parametric UCLs	
Variance	92282171	95% CLT UCL	9035
Coefficient of Variation	1.653	95% Jackknife UCL	9170
Skewness	2.381	95% Standard Bootstrap UCL	9091
		95% Bootstrap-t UCL	11681
Log-transformed Statistics		95% Hall's Bootstrap UCL	11031
Mean of log data	7.45	95% Percentile Bootstrap UCL	8977
SD of log data	1.622	95% BCA Bootstrap UCL	10302
		95% Chebyshev(Mean, Sd) UCL	14357
Data do not follow a Discernable Distribution		97.5% Chebyshev(Mean, Sd) UCL	18055
Potential UCL to Use		99% Chebyshev(Mean, Sd) UCL	25320
99% Chebyshev(Mean, Sd) UCL	**25320**		

Data File

Area	A/B
Medium	White Sucker
Chemical	Total BHC
Units	µg/kg

Variable: **Total BHC**

Raw Statistics

Total Number of Data	12
Number of Non-Detect Data	7
Number of Detected Data	5
Minimum Detected	0.91
Maximum Detected	2.52
Percent Non-Detects	58.33%
Minimum Non-detect	0
Maximum Non-detect	0
Mean of Detected Data	1.37
SD of Detected Data	0.667

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Potential UCLs to Use

95% KM (t) UCL	**1.361**
95% KM (Percentile Bootstrap) UCL	**1.42**

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.765
5% Shapiro Wilk Critical Value	0.762

Data appear Normal at 5% Significance Level

DL/2 Substitution Method

Mean	0.571
SD	0.812
95% DL/2 (t) UCL	0.992

Note: DL/2 is not a recommended method.

Maximum Likelihood Method

Mean	-0.218
SD	1.591
95% MLE (t) UCL	0.607
95% MLE (Tiku) UCL	0.905

Kaplan Meier(KM) Method

Mean	1.102
SD	0.447
Standard Error of Mean	0.144
95% KM (t) UCL	1.361
95% KM (z) UCL	1.339
95% KM (BCA) UCL	1.429
95% KM (Percentile Bootstrap) UCL	1.42

Data File

Area	A/B
Medium	White Sucker
Chemical	Copper
Units	mg/kg

Variable: **Copper**

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	0.643
Maximum	1.37
Mean	0.867
Median	0.803
Standard Deviation	0.202
Variance	0.0408

Gamma Statistics

k star (bias corrected)	17.38
Theta Star	0.0499
nu star	417
Approximate Chi Square Value (.05)	370.7
Adjusted Level of Significance	0.029
Adjusted Chi Square Value (.05)	364

Potential UCL to Use

Use Approximate Gamma UCL	**0.975**

Gamma Distribution Test

Anderson-Darling Test Statistic	0.557
Anderson-Darling Critical Value	0.732
Kolmogorov-Smirnov Test Statistic	0.257
Kolmogorov-Smirnov Critical Value	0.245

Data follow Appr. Gamma distribution at 5% Significance Level

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	0.991
95% Modified-t UCL	0.976

95% Non-Parametric UCLs

95% Bootstrap-t UCL	1.045
95% Hall's Bootstrap UCL	1.461

95% Gamma UCLs(Assuming Gamma Distribution)

95% Approximate Gamma UCL	0.975
95% Adjusted Gamma UCL	0.993

Data File

Area	A/B
Medium	White Sucker
Chemical	Aluminum
Units	mg/kg

Variable: **Aluminum**

Raw Statistics

Total Number of Data	10
Number of Non-Detect Data	2
Number of Detected Data	8
Minimum Detected	23
Maximum Detected	82.6
Percent Non-Detects	20.00%
Minimum Non-detect	5.54
Maximum Non-detect	11
Mean of Detected Data	38.06
Median of Detected Data	31.25
SD of Detected Data	18.87
k Star of Detected Data	4.224
Theta Star of Detected Data	9.012
Nu Star of Detected Data	67.58

Warning: There are only 8 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Potential UCL to Use

95% KM (BCA) UCL	**46.98**

Gamma Distribution Test with Detected Values Only

A-D Test Statistic	0.751
5% A-D Critical Value	0.718
K-S Test Statistic	0.263
5% K-S Critical Value	0.295

Data follow Appr. Gamma Distribution at 5% Significance Level

Gamma ROS Statistics with Extrapolated Data

Minimum	19.3
Maximum	82.6
Mean	34.31
Median	30.3
SD	18.43
k Star	3.905
Theta Star	8.785
Nu Star	78.11
95% Percentile of Chisquare (2k)	15.24
AppChi2	58.75
95% Gamma Approximate UCL	45.62
95% Gamma Adjusted UCL	47.99

Kaplan Meier(KM) Method

Mean	35.05
SD	16.9
Standard Error of Mean	5.713
95% KM (t) UCL	45.52
95% KM (BCA) UCL	46.98
95% KM (Percentile Bootstrap) UCL	45.23
95% KM (Chebyshev) UCL	59.95

Data File

Area	A/B
Medium	White Sucker
Chemical	Chromium
Units	mg/kg

Variable: **Chromium**

Raw Statistics		Gamma Distribution Test with Detected Values Only	
Total Number of Data	12	A-D Test Statistic	0.646
Number of Non-Detect Data	8	5% A-D Critical Value	0.658
Number of Detected Data	4	K-S Test Statistic	0.398
Minimum Detected	0.475	5% K-S Critical Value	0.395
Maximum Detected	1.08	Data follow Appr. Gamma Distribution at 5% Significance Level	
Percent Non-Detects	66.67%		
Minimum Non-detect	0.44	Gamma ROS Statistics with Extrapolated Data	
Maximum Non-detect	0.535	Minimum	1E-09
Mean of Detected Data	0.659	Maximum	1.08
Median of Detected Data	0.54	Mean	0.22
SD of Detected Data	0.283	Median	1E-09
k Star of Detected Data	2.372	SD	0.356
Theta Star of Detected Data	0.278	k Star	0.107
Nu Star of Detected Data	18.98	Theta Star	2.059
		Nu Star	2.56
Warning: There are only 4 Distinct Detected Values in this data		95% Percentile of Chisquare (2k)	1.233
Note: It should be noted that even though bootstrap may be performed on this data set		AppChi2	0.255
the resulting calculations may not be reliable enough tp draw conclusions		95% Gamma Approximate UCL	2.205
		95% Gamma Adjusted UCL	3.062
It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.			
		Kaplan Meier(KM) Method	
		Mean	0.537
		SD	0.166
		Standard Error of Mean	0.0553
		95% KM (t) UCL	0.636
		95% KM (BCA) UCL	0.74
		95% KM (Percentile Bootstrap) UCL	0.686
		95% KM (Chebyshev) UCL	0.778
Potential UCL to Use			
95% KM (t) UCL	**0.636**		

Data File

Area	A/B
Medium	White Sucker
Chemical	Manganese
Units	mg/kg

Variable: **Manganese**

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	11
Minimum	17
Maximum	42.9
Mean	24.3
Median	24
Standard Deviation	7.173
Variance	51.45

Gamma Statistics

k star (bias corrected)	11.05
Theta Star	2.198
nu star	265.3
Approximate Chi Square Value (.05)	228.6
Adjusted Level of Significance	0.029
Adjusted Chi Square Value (.05)	223.4

Gamma Distribution Test

Anderson-Darling Test Statistic	0.589
Anderson-Darling Critical Value	0.731
Kolmogorov-Smirnov Test Statistic	0.193
Kolmogorov-Smirnov Critical Value	0.245

Data appear Gamma distributed at 5% Significance Level

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	28.73
95% Modified-t UCL	28.18

95% Non-Parametric UCLs

95% Bootstrap-t UCL	29.76
95% Hall's Bootstrap UCL	35.81

95% Gamma UCLs(Assuming Gamma Distribution)

95% Approximate Gamma UCL	28.2
95% Adjusted Gamma UCL	28.86

Potential UCL to Use

Use Approximate Gamma UCL	**28.2**

Area	Area A/B
Medium	Redbreast Sunfish
Chemical	Total PCBs
Units	µg/kg

Total_Congeners

Number of Valid Observations	12	Non-Parametric UCLs	
Number of Distinct Observations	12	95% Adjusted-CLT UCL (Adjusted for Skewness)	1417
Minimum of log data	2.092	95% Modified-t UCL (Adjusted for Skewness)	1217
Maximum of log data	8.294	95% Hall's Bootstrap UCL	3197
Mean of log data	5.126	95% Bootstrap t UCL	3437
SD of log data	1.629	95% BCA Bootstrap UCL	1568
Variance of log data	2.655	95% Chebyshev (Mean, Sd) UCL	2012
		97.5% Chebyshev (Mean, Sd) UCL	2631
Shapiro Wilk Test Statistic	0.946	99% Chebyshev (Mean, Sd) UCL	3847
Shapiro Wilk 5% Critical Value	0.859		
Data appear Lognormal at 5% Significance Level		UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	4917
95% UCL (Assuming Normal Distribution)		95% Chebyshev (MVUE) UCL	1680
95% Student's-t UCL	1171	97.5% Chebyshev (MVUE) UCL	2183
		99% Chebyshev (MVUE) UCL	3171
ML Estimates Assuming Lognormal Distribution			
Mean	635.2	**Potential UCL to Use**	
SD	2310	**Use 99% Chebyshev (MVUE) UCL**	**3171**
Coefficient of Variation	3.636		
Skewness	58.98		
Median	168.4		
80% Quantile	663.7		
90% Quantile	1359		
95% Quantile	2457		
99% Quantile	7457		
MVU Estimate of Median	150.6		
MVU Estimate of Mean	517.4		
MVU Estimate of SD	1049		
MVU Estimate of Standard Error of Mean	266.7		

Area	Area A/B
Medium	Redbreast Sunfish
Chemical	Total Aroclors
Units	µg/kg

Total_Aroclors

Number of Valid Observations	12	UCLs (Assuming Lognormal Distribution)	
Number of Distinct Observations	12	95% H-UCL	3707
Minimum of log data	3.645	95% Chebyshev (MVUE) UCL	2061
Maximum of log data	8.6	97.5% Chebyshev (MVUE) UCL	2645
Mean of log data	5.743	99% Chebyshev (MVUE) UCL	3792
SD of log data	1.381		
Variance of log data	1.908	**Potential UCL to Use**	
		Use 95% Chebyshev (MVUE) UCL	**2061**
Shapiro Wilk Test Statistic	0.923		
Shapiro Wilk 5% Critical Value	0.859		
Data appear Lognormal at 5% Significance Level			

95% UCL (Assuming Normal Distribution)	
95% Student's-t UCL	1648
ML Estimates Assuming Lognormal Distribution	
Mean	810.2
SD	1941
Coefficient of Variation	2.396
Skewness	20.94
Median	312.1
80% Quantile	998
90% Quantile	1833
95% Quantile	3027
99% Quantile	7759
MVU Estimate of Median	288.1
MVU Estimate of Mean	710.9
MVU Estimate of SD	1160
MVU Estimate of Standard Error of Mean	309.7
Non-Parametric UCLs	
95% Adjusted-CLT UCL (Adjusted for Skewness)	1968
95% Modified-t UCL (Adjusted for Skewness)	1708
95% Hall's Bootstrap UCL	4330
95% Bootstrap t UCL	4033
95% BCA Bootstrap UCL	2104
95% Chebyshev (Mean, Sd) UCL	2786
97.5% Chebyshev (Mean, Sd) UCL	3624
99% Chebyshev (Mean, Sd) UCL	5269

Area	A/B
Medium	Redbreast Sunfish
Chemical	Bird TEQ
Units	ug/kg

PCB TEQ Fish

General Statistics

Number of Valid Observations 12

Number of Distinct Observations 12

Raw Statistics

Minimum 6.24E-05
Maximum 0.00372
Mean 0.000539
Median 9.82E-05
SD 0.00105
Coefficient of Variation 1.943
Skewness 2.992

Log-transformed Statistics

Minimum of Log Data -9.683
Maximum of Log Data -5.595
Mean of log Data -8.54
SD of log Data 1.3

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.52
Shapiro Wilk Critical Value 0.859
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.811
Shapiro Wilk Critical Value 0.859
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.00108

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 0.00132
95% Modified-t UCL 0.00113

Assuming Lognormal Distribution

95% H-UCL 0.00179
95% Chebyshev (MVUE) UCL 0.00113
97.5% Chebyshev (MVUE) UCL 0.00145
99% Chebyshev (MVUE) UCL 0.00207

Gamma Distribution Test

k star (bias corrected) 0.512
Theta Star 0.00105
nu star 12.28
Approximate Chi Square Value (.05) 5.409
Adjusted Level of Significance 0.029
Adjusted Chi Square Value 4.732

Anderson-Darling Test Statistic 1.466
Anderson-Darling 5% Critical Value 0.777
Kolmogorov-Smirnov Test Statistic 0.307
Kolmogorov-Smirnov 5% Critical Value 0.257
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.00122
95% Adjusted Gamma UCL 0.0014

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 0.00104
95% Jackknife UCL 0.00108
95% Standard Bootstrap UCL 0.00101
95% Bootstrap-t UCL 0.00336
95% Hall's Bootstrap UCL 0.00289
95% Percentile Bootstrap UCL 0.0011
95% BCA Bootstrap UCL 0.00139
95% Chebyshev(Mean, Sd) UCL 0.00186
97.5% Chebyshev(Mean, Sd) UCL 0.00243
99% Chebyshev(Mean, Sd) UCL 0.00355

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 0.00355

Area	A/B
Medium	Redbreast Sunfish
Chemical	Bird TEQ
Units	ug/kg

PCB TEQ Bird

General Statistics

Number of Valid Observations 12

Number of Distinct Observations 12

Raw Statistics

Minimum 0.0224
Maximum 1.407
Mean 0.199
Median 0.024
SD 0.4
Coefficient of Variation 2.006
Skewness 2.953

Log-transformed Statistics

Minimum of Log Data -3.797
Maximum of Log Data 0.342
Mean of log Data -2.784
SD of log Data 1.423

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.522
Shapiro Wilk Critical Value 0.859
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.755
Shapiro Wilk Critical Value 0.859
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.407

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 0.495
95% Modified-t UCL 0.423

Assuming Lognormal Distribution

95% H-UCL 0.846
95% Chebyshev (MVUE) UCL 0.437
97.5% Chebyshev (MVUE) UCL 0.562
99% Chebyshev (MVUE) UCL 0.808

Gamma Distribution Test

k star (bias corrected) 0.458
Theta Star 0.436
nu star 10.98
Approximate Chi Square Value (.05) 4.565
Adjusted Level of Significance 0.029
Adjusted Chi Square Value 3.953

Anderson-Darling Test Statistic 1.628
Anderson-Darling 5% Critical Value 0.782
Kolmogorov-Smirnov Test Statistic 0.328
Kolmogorov-Smirnov 5% Critical Value 0.258
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.48
95% Adjusted Gamma UCL 0.554

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 0.389
95% Jackknife UCL 0.407
95% Standard Bootstrap UCL 0.385
95% Bootstrap-t UCL 1.264
95% Hall's Bootstrap UCL 1.102
95% Percentile Bootstrap UCL 0.417
95% BCA Bootstrap UCL 0.55
95% Chebyshev(Mean, Sd) UCL 0.703
97.5% Chebyshev(Mean, Sd) UCL 0.921
99% Chebyshev(Mean, Sd) UCL 1.349

Potential UCL to Use

Use 99% Chebyshev (Mean, Sd) UCL 1.349

Area	Area A/B
Medium	Redbreast Sunfish
Chemical	Mammal TEQ
Units	µg/kg

Mammal_TEQ

Number of Valid Observations	12	Non-Parametric UCLs	
Number of Distinct Observations	12	95% Adjusted-CLT UCL (Adjusted for Skewness)	0.00298
Minimum of log data	-8.794	95% Modified-t UCL (Adjusted for Skewness)	0.00255
Maximum of log data	-4.791	95% Hall's Bootstrap UCL	0.00642
Mean of log data	-7.517	95% Bootstrap t UCL	0.00769
SD of log data	1.164	95% BCA Bootstrap UCL	0.00322
Variance of log data	1.355	95% Chebyshev (Mean, Sd) UCL	0.00416
		97.5% Chebyshev (Mean, Sd) UCL	0.00541
Shapiro Wilk Test Statistic	0.865	99% Chebyshev (Mean, Sd) UCL	0.00788
Shapiro Wilk 5% Critical Value	0.859		
Data appear Lognormal at 5% Significance Level		UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	0.00331
95% UCL (Assuming Normal Distribution)		95% Chebyshev (MVUE) UCL	0.00254
95% Student's-t UCL	0.00245	97.5% Chebyshev (MVUE) UCL	0.00322
		99% Chebyshev (MVUE) UCL	0.00454
ML Estimates Assuming Lognormal Distribution			
Mean	0.00107	**Potential UCL to Use**	
SD	0.00181	**Use 95% Chebyshev (MVUE) UCL**	**0.00254**
Coefficient of Variation	1.696		
Skewness	9.964		
Median	0.0005436		
80% Quantile	0.00145		
90% Quantile	0.00242		
95% Quantile	0.00369		
99% Quantile	0.00815		
MVU Estimate of Median	0.0005136		
MVU Estimate of Mean	0.0009847		
MVU Estimate of SD	0.0013		
MVU Estimate of Standard Error of Mean	0.0003578		

Area	A/B
Medium	Redbreast Sunfish
Chemical	PCB Dioxin
Units	ug/kg

PCB Diox

General Statistics

Number of Valid Observations 12

Number of Distinct Observations 12

Raw Statistics

Minimum 4.015
Maximum 211.4
Mean 32.48
Median 10.66
SD 58.36
Coefficient of Variation 1.797
Skewness 3.088

Log-transformed Statistics

Minimum of Log Data 1.39
Maximum of Log Data 5.354
Mean of log Data 2.711
SD of log Data 1.115

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.516
Shapiro Wilk Critical Value 0.859
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.881
Shapiro Wilk Critical Value 0.859
Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 62.74

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 76.24
95% Modified-t UCL 65.24

Assuming Lognormal Distribution

95% H-UCL 80.12
95% Chebyshev (MVUE) UCL 65.32
97.5% Chebyshev (MVUE) UCL 82.33
99% Chebyshev (MVUE) UCL 115.8

Gamma Distribution Test

k star (bias corrected) 0.637
Theta Star 51.02
nu star 15.28
Approximate Chi Square Value (.05) 7.455
Adjusted Level of Significance 0.029
Adjusted Chi Square Value 6.638

Anderson-Darling Test Statistic 1.247
Anderson-Darling 5% Critical Value 0.765
Kolmogorov-Smirnov Test Statistic 0.307
Kolmogorov-Smirnov 5% Critical Value 0.255
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 66.56
95% Adjusted Gamma UCL 74.75

Data Distribution

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 60.19
95% Jackknife UCL 62.74
95% Standard Bootstrap UCL 58.23
95% Bootstrap-t UCL 197.1
95% Hall's Bootstrap UCL 168.5
95% Percentile Bootstrap UCL 62.46
95% BCA Bootstrap UCL 82.19
95% Chebyshev(Mean, Sd) UCL 105.9
97.5% Chebyshev(Mean, Sd) UCL 137.7
99% Chebyshev(Mean, Sd) UCL 200.1

Potential UCL to Use

Use 95% Chebyshev (MVUE) UCL 65.32

Area	Area A/B
Medium	Redbreast Sunfish
Chemical	Congeners - TEQ
Units	µg/kg

RBS_TotCong-TEQ

Number of Valid Observations	12	Non-Parametric UCLs	
Number of Distinct Observations	12	95% Adjusted-CLT UCL (Adjusted for Skewness)	1341
Minimum of log data	1.407	95% Modified-t UCL (Adjusted for Skewness)	1152
Maximum of log data	8.24	95% Hall's Bootstrap UCL	3049
Mean of log data	4.991	95% Bootstrap t UCL	3400
SD of log data	1.756	95% BCA Bootstrap UCL	1420
Variance of log data	3.084	95% Chebyshev (Mean, Sd) UCL	1906
		97.5% Chebyshev (Mean, Sd) UCL	2494
Shapiro Wilk Test Statistic	0.942	99% Chebyshev (Mean, Sd) UCL	3647
Shapiro Wilk 5% Critical Value	0.859		
Data appear Lognormal at 5% Significance Level		UCLs (Assuming Lognormal Distribution)	
		95% H-UCL	7191
95% UCL (Assuming Normal Distribution)		95% Chebyshev (MVUE) UCL	1824
95% Student's-t UCL	1108	97.5% Chebyshev (MVUE) UCL	2382
		99% Chebyshev (MVUE) UCL	3478
ML Estimates Assuming Lognormal Distribution			
Mean	687.2	**Potential UCL to Use**	
SD	3137	**Use 99% Chebyshev (MVUE) UCL**	**3478**
Coefficient of Variation	4.565		
Skewness	108.8		
Median	147.1		
80% Quantile	644.6		
90% Quantile	1396		
95% Quantile	2642		
99% Quantile	8742		
MVU Estimate of Median	129.2		
MVU Estimate of Mean	533.7		
MVU Estimate of SD	1200		
MVU Estimate of Standard Error of Mean	295.9		

Area	A/B
Medium	Redbreast Sunfish
Chemical	Total DDx
Units	ug/kg

Total DDx

General Statistics

Number of Valid Observations	12	Number of Distinct Observations	12

Raw Statistics		**Log-transformed Statistics**	
Minimum	2.53	Minimum of Log Data	0.928
Maximum	13.77	Maximum of Log Data	2.622
Mean	8.541	Mean of log Data	2.04
Median	8.97	SD of log Data	0.543
SD	3.272		
Coefficient of Variation	0.383		
Skewness	-0.766		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.889	Shapiro Wilk Test Statistic	0.741
Shapiro Wilk Critical Value	0.859	Shapiro Wilk Critical Value	0.859
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	10.24	95% H-UCL	12.76
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	14.95
95% Adjusted-CLT UCL	9.871	97.5% Chebyshev (MVUE) UCL	17.62
95% Modified-t UCL	10.2	99% Chebyshev (MVUE) UCL	22.87

Gamma Distribution Test		**Data Distribution**
k star (bias corrected)	3.736	Data appear Normal at 5% Significance Level
Theta Star	2.286	
nu star	89.66	
Approximate Chi Square Value (.05)	68.83	**Nonparametric Statistics**
Adjusted Level of Significance	0.029	95% CLT UCL 10.09
Adjusted Chi Square Value	66.05	95% Jackknife UCL 10.24
		95% Standard Bootstrap UCL 10.03
Anderson-Darling Test Statistic	1.193	95% Bootstrap-t UCL 10.07
Anderson-Darling 5% Critical Value	0.732	95% Hall's Bootstrap UCL 9.931
Kolmogorov-Smirnov Test Statistic	0.314	95% Percentile Bootstrap UCL 9.923
Kolmogorov-Smirnov 5% Critical Value	0.246	95% BCA Bootstrap UCL 9.852
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 12.66
		97.5% Chebyshev(Mean, Sd) UCL 14.44
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 17.94
95% Approximate Gamma UCL	11.13	
95% Adjusted Gamma UCL	11.59	

Potential UCL to Use		Use 95% Student's-t UCL	10.24

Data File

Area	A/B
Medium	Redbreast sunfish
Chemical	44DDE
Units	µg/kg

Variable: **rbDDE**

Number of Valid Observations	10
Number of Distinct Observations	9
Minimum	5.23
Maximum	11.6
Mean	7.215
Median	7.02
SD	1.952
Variance	3.808
Coefficient of Variation	0.27
Skewness	1.384

Shapiro Wilk Test Statistic	0.863
5% Shapiro Wilk Critical Value	0.842

Data appear Normal at 5% Significance Level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	8.346

Potential UCL to Use

Student's-t UCL	8.346

Area	A/B
Medium	Redbreast Sunfish
Chemical	Total BHC
Units	ug/kg

Total BHC

General Statistics

Number of Valid Observations 12

Number of Distinct Observations 6

Raw Statistics

Minimum 5.06
Maximum 5.22
Mean 5.118
Median 5.12
SD 0.0529
Coefficient of Variation 0.0103
Skewness 0.532

Log-transformed Statistics

Minimum of Log Data 1.621
Maximum of Log Data 1.652
Mean of log Data 1.633
SD of log Data 0.0103

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.91
Shapiro Wilk Critical Value 0.859
Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.911
Shapiro Wilk Critical Value 0.859
Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 5.146

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 5.146
95% Modified-t UCL 5.146

Assuming Lognormal Distribution

95% H-UCL N/A
95% Chebyshev (MVUE) UCL 5.185
97.5% Chebyshev (MVUE) UCL 5.213
99% Chebyshev (MVUE) UCL 5.27

Gamma Distribution Test

k star (bias corrected) 7686
Theta Star 0.0007
nu star 184470
Approximate Chi Square Value (.05) 183472
Adjusted Level of Significance 0.029
Adjusted Chi Square Value 183320

Anderson-Darling Test Statistic 0.6
Anderson-Darling 5% Critical Value 0.731
Kolmogorov-Smirnov Test Statistic 0.232
Kolmogorov-Smirnov 5% Critical Value 0.245
Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 5.146
95% Adjusted Gamma UCL 5.15

Data Distribution

Data appear Normal at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 5.143
95% Jackknife UCL 5.146
95% Standard Bootstrap UCL 5.143
95% Bootstrap-t UCL 5.147
95% Hall's Bootstrap UCL 5.145
95% Percentile Bootstrap UCL 5.145
95% BCA Bootstrap UCL 5.145
95% Chebyshev(Mean, Sd) UCL 5.185
97.5% Chebyshev(Mean, Sd) UCL 5.214
99% Chebyshev(Mean, Sd) UCL 5.27

Potential UCL to Use

Use 95% Student's-t UCL 5.146

Area	A/B
Medium	Redbreast Sunfish
Chemical	Aluminum
Units	mg/kg

Aluminum (with NDs)

General Statistics

Number of Valid Data	12	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	3
		Percent Non-Detects	25.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.18	Minimum Detected	0.779
Maximum Detected	7.01	Maximum Detected	1.947
Mean of Detected	5.398	Mean of Detected	1.644
SD of Detected	1.372	SD of Detected	0.343
Minimum Non-Detect	1.71	Minimum Non-Detect	0.536
Maximum Non-Detect	1.76	Maximum Non-Detect	0.565

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	3
Number treated as Detected	9
Single DL Non-Detect Percentage	25.00%

Warning: There are only 9 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.846	Shapiro Wilk Test Statistic	0.712
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.265	Mean	1.197
SD	2.36	SD	0.859
95% DL/2 (t) UCL	5.488	95% H-Stat (DL/2) UCL	9.225
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	4.157	Mean in Log Scale	1.483
SD	2.487	SD in Log Scale	0.412
95% MLE (t) UCL	5.447	Mean in Original Scale	4.73
95% MLE (Tiku) UCL	5.546	SD in Original Scale	1.682
		95% Percentile Bootstrap UCL	5.477
		95% BCA Bootstrap UCL	5.441

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	8.032	Data appear Normal at 5% Significance Level
Theta Star	0.672	
nu star	144.6	
A-D Test Statistic	0.949	
5% A-D Critical Value	0.722	
K-S Test Statistic	0.722	
5% K-S Critical Value	0.279	
Data follow Appr. Gamma Distribution at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	2.18	Mean	4.593
		SD	1.788
		SE of Mean	0.547
		95% KM (t) UCL	5.576
		95% KM (z) UCL	5.494
		95% KM (jackknife) UCL	5.738
		95% KM (bootstrap t) UCL	5.383

Area	A/B
Medium	Redbreast Sunfish
Chemical	Aluminum
Units	mg/kg

Aluminum (half RL)

General Statistics

Number of Valid Observations 12

Number of Distinct Observations 12

Raw Statistics

Minimum 0.855
Maximum 7.01
Mean 4.265
Median 5.32
SD 2.36
Coefficient of Variation 0.553
Skewness -0.677

Log-transformed Statistics

Minimum of Log Data -0.157
Maximum of Log Data 1.947
Mean of log Data 1.197
SD of log Data 0.859

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.82
Shapiro Wilk Critical Value 0.859
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.735
Shapiro Wilk Critical Value 0.859
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 5.488

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 5.243
95% Modified-t UCL 5.466

Assuming Lognormal Distribution

95% H-UCL 9.56
95% Chebyshev (MVUE) UCL 9.867
97.5% Chebyshev (MVUE) UCL 12.14
99% Chebyshev (MVUE) UCL 16.62

Gamma Distribution Test

k star (bias corrected) 1.648
Theta Star 2.588
nu star 39.55
Approximate Chi Square Value (.05) 26.14
Adjusted Level of Significance 0.029
Adjusted Chi Square Value 24.49

Anderson-Darling Test Statistic 1.389
Anderson-Darling 5% Critical Value 0.741
Kolmogorov-Smirnov Test Statistic 0.321
Kolmogorov-Smirnov 5% Critical Value 0.248
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 6.452
95% Adjusted Gamma UCL 6.888

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 5.386
95% Jackknife UCL 5.488
95% Standard Bootstrap UCL 5.385
95% Bootstrap-t UCL 5.332
95% Hall's Bootstrap UCL 5.177
95% Percentile Bootstrap UCL 5.27
95% BCA Bootstrap UCL 5.239
95% Chebyshev(Mean, Sd) UCL 7.234
97.5% Chebyshev(Mean, Sd) UCL 8.519
99% Chebyshev(Mean, Sd) UCL 11.04

Potential UCL to Use

Use 95% Chebyshev (Mean, Sd) UCL 7.234

Recommended UCL exceeds the maximum observation

Area	A/B
Medium	Redbreast Sunfish
Chemical	Copper
Units	mg/kg

Copper (with NDs)

General Statistics

Number of Valid Data	12	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	7
		Percent Non-Detects	58.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.388	Minimum Detected	-0.947
Maximum Detected	0.727	Maximum Detected	-0.319
Mean of Detected	0.534	Mean of Detected	-0.652
SD of Detected	0.136	SD of Detected	0.251
Minimum Non-Detect	0.397	Minimum Non-Detect	-0.924
Maximum Non-Detect	0.527	Maximum Non-Detect	-0.641

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	10
Number treated as Detected	2
Single DL Non-Detect Percentage	83.33%

Warning: There are only 5 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough tp draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.962	Shapiro Wilk Test Statistic	0.977
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.352	Mean	-1.151
SD	0.181	SD	0.471
95% DL/2 (t) UCL	0.446	95% H-Stat (DL/2) UCL	0.413
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.849
		SD in Log Scale	0.232
		Mean in Original Scale	0.44
		SD in Original Scale	0.117
		95% Percentile Bootstrap UCL	0.496
		95% BCA Bootstrap UCL	0.511

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	8.07	Data appear Normal at 5% Significance Level
Theta Star	0.0662	
nu star	80.7	
A-D Test Statistic	0.205	
5% A-D Critical Value	0.679	
K-S Test Statistic	0.679	
5% K-S Critical Value	0.357	
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution		Nonparametric Statistics	
Gamma ROS Statistics using Extrapolated Data		Kaplan-Meier (KM) Method	
Minimum	0.388	Mean	0.452
		SD	0.106
		SE of Mean	0.0345
		95% KM (t) UCL	0.514
		95% KM (z) UCL	0.509
		95% KM (jackknife) UCL	0.507
		95% KM (bootstrap t) UCL	0.519

Area	A/B
Medium	Redbreast Sunfish
Chemical	Copper
Units	mg/kg

Copper (half RL)

General Statistics

Number of Valid Observations 12

Number of Distinct Observations 12

Raw Statistics

Minimum 0.199
Maximum 0.727
Mean 0.352
Median 0.248
SD 0.181
Coefficient of Variation 0.514
Skewness 1.055

Log-transformed Statistics

Minimum of Log Data -1.617
Maximum of Log Data -0.319
Mean of log Data -1.151
SD of log Data 0.471

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.822
Shapiro Wilk Critical Value 0.859
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.855
Shapiro Wilk Critical Value 0.859
Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 0.446

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 0.455
95% Modified-t UCL 0.449

Assuming Lognormal Distribution

95% H-UCL 0.477
95% Chebyshev (MVUE) UCL 0.562
97.5% Chebyshev (MVUE) UCL 0.653
99% Chebyshev (MVUE) UCL 0.834

Gamma Distribution Test

k star (bias corrected) 3.65
Theta Star 0.0965
nu star 87.61
Approximate Chi Square Value (.05) 67.03
Adjusted Level of Significance 0.029
Adjusted Chi Square Value 64.29

Anderson-Darling Test Statistic 0.85
Anderson-Darling 5% Critical Value 0.733
Kolmogorov-Smirnov Test Statistic 0.257
Kolmogorov-Smirnov 5% Critical Value 0.246
Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

95% Approximate Gamma UCL 0.461
95% Adjusted Gamma UCL 0.48

Data Distribution

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

95% CLT UCL 0.438
95% Jackknife UCL 0.446
95% Standard Bootstrap UCL 0.435
95% Bootstrap-t UCL 0.477
95% Hall's Bootstrap UCL 0.447
95% Percentile Bootstrap UCL 0.434
95% BCA Bootstrap UCL 0.457
95% Chebyshev(Mean, Sd) UCL 0.58
97.5% Chebyshev(Mean, Sd) UCL 0.679
99% Chebyshev(Mean, Sd) UCL 0.872

Potential UCL to Use

Use 95% Student's-t UCL 0.446
or 95% Modified-t UCL 0.449

Maximum	0.727
Mean	0.534
Median	0.534
SD	0.0819
k star	35.6
Theta star	0.015
Nu star	854.4
AppChi2	787.5
95% Gamma Approximate UCL	0.58
95% Adjusted Gamma UCL	0.587

Note: DL/2 is not a recommended method.

95% KM (BCA) UCL	0.627
95% KM (Percentile Bootstrap) UCL	0.557
95% KM (Chebyshev) UCL	0.603
97.5% KM (Chebyshev) UCL	0.668
99% KM (Chebyshev) UCL	0.796

Potential UCLs to Use

95% KM (t) UCL	0.514
95% KM (Percentile Bootstrap) UCL	0.557

Maximum	7.01	95% KM (BCA) UCL	5.949
Mean	5.057	95% KM (Percentile Bootstrap) UCL	5.786
Median	5.32	95% KM (Chebyshev) UCL	6.98
SD	1.323	97.5% KM (Chebyshev) UCL	8.012
k star	9.694	99% KM (Chebyshev) UCL	10.04
Theta star	0.522		
Nu star	232.7	**Potential UCLs to Use**	
AppChi2	198.4	95% KM (t) UCL	5.576
95% Gamma Approximate UCL	5.932	95% KM (Percentile Bootstrap) UCL	5.786
95% Adjusted Gamma UCL	6.08		

Note: DL/2 is not a recommended method.

Area	A/B
Medium	Redbreast Sunfish
Chemical	Manganese
Units	mg/kg

Manganese

General Statistics

Number of Valid Observations 12

Number of Distinct Observations 12

Raw Statistics

Minimum 0.362
Maximum 3.31
Mean 1.023
Median 0.679
SD 0.829
Coefficient of Variation 0.811
Skewness 2.127

Log-transformed Statistics

Minimum of Log Data -1.016
Maximum of Log Data 1.197
Mean of log Data -0.204
SD of log Data 0.666

Relevant UCL Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic 0.74
Shapiro Wilk Critical Value 0.859
Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic 0.903
Shapiro Wilk Critical Value 0.859
Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% Student's-t UCL 1.452

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL 1.573
95% Modified-t UCL 1.477

Assuming Lognormal Distribution

95% H-UCL 1.637
95% Chebyshev (MVUE) UCL 1.864
97.5% Chebyshev (MVUE) UCL 2.239
99% Chebyshev (MVUE) UCL 2.976

Gamma Distribution Test

k star (bias corrected) 1.831
Theta Star 0.559
nu star 43.94
Approximate Chi Square Value (.05) 29.74
Adjusted Level of Significance 0.029
Adjusted Chi Square Value 27.96

Anderson-Darling Test Statistic 0.676
Anderson-Darling 5% Critical Value 0.741
Kolmogorov-Smirnov Test Statistic 0.21
Kolmogorov-Smirnov 5% Critical Value 0.248
Data appear Gamma Distributed at 5% Significance Level

Data Distribution

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

95% CLT UCL 1.416
95% Jackknife UCL 1.452
95% Standard Bootstrap UCL 1.39
95% Bootstrap-t UCL 1.827
95% Hall's Bootstrap UCL 2.925
95% Percentile Bootstrap UCL 1.402
95% BCA Bootstrap UCL 1.566
95% Chebyshev(Mean, Sd) UCL 2.066
97.5% Chebyshev(Mean, Sd) UCL 2.517
99% Chebyshev(Mean, Sd) UCL 3.403

Assuming Gamma Distribution

95% Approximate Gamma UCL 1.511
95% Adjusted Gamma UCL 1.607

Potential UCL to Use

Use 95% Approximate Gamma UCL 1.511

Data File

Variable: **rbHg**

Area	A/B
Medium	Redbreast sunfish
Chemical	Mercury
Units	mg/kg

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	0.0845
Maximum	0.175
Mean	0.123
Median	0.12
SD	0.0326
Variance	0.00106
Coefficient of Variation	0.264
Skewness	0.272

Shapiro Wilk Test Statistic	0.911
5% Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

95% UCL (Assuming Normal Distribution)

Student's-t UCL	0.14

Potential UCL to Use

Student's-t UCL	0.14

Area	A/B
Medium	Redbreast Sunfish
Chemical	Zinc
Units	mg/kg

Zinc

General Statistics

Number of Valid Observations	12	Number of Distinct Observations	12

Raw Statistics		Log-transformed Statistics	
Minimum	5.35	Minimum of Log Data	1.677
Maximum	8.14	Maximum of Log Data	2.097
Mean	6.93	Mean of log Data	1.929
Median	7.05	SD of log Data	0.117
SD	0.79		
Coefficient of Variation	0.11		
Skewness	-0.4		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.97	Shapiro Wilk Test Statistic	0.957
Shapiro Wilk Critical Value	0.86	Shapiro Wilk Critical Value	0.859
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	7.34	95% H-UCL	7.386
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	7.955
95% Adjusted-CLT UCL	7.28	97.5% Chebyshev (MVUE) UCL	8.398
95% Modified-t UCL	7.33	99% Chebyshev (MVUE) UCL	9.27

Gamma Distribution Test		Data Distribution
k star (bias corrected)	60.9	Data appear Normal at 5% Significance Level
Theta Star	0.11	
nu star	1461	
Approximate Chi Square Value (.05)	1373	**Nonparametric Statistics**
Adjusted Level of Significance	0.03	95% CLT UCL 7.303
Adjusted Chi Square Value	1360	95% Jackknife UCL 7.337
		95% Standard Bootstrap UCL 7.294
Anderson-Darling Test Statistic	0.23	95% Bootstrap-t UCL 7.315
Anderson-Darling 5% Critical Value	0.73	95% Hall's Bootstrap UCL 7.282
Kolmogorov-Smirnov Test Statistic	0.16	95% Percentile Bootstrap UCL 7.272
Kolmogorov-Smirnov 5% Critical Value	0.25	95% BCA Bootstrap UCL 7.263
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL 7.92
		97.5% Chebyshev(Mean, Sd) UCL 8.349
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL 9.192
95% Approximate Gamma UCL	7.37	
95% Adjusted Gamma UCL	7.44	

Potential UCL to Use	Use 95% Student's-t UCL 7.337

Data File

Area	C
Medium	White Sucker
Chemical	Total Aroclor
Units	µg/kg

Variable: **wsAroclor**

Total PCB Aroclor

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	46.8
Maximum	7090
Mean	1115
Median	554.5
Standard Deviation	1939
Variance	3759767
k star (bias corrected)	0.557
Theta Star	2001
nu star	13.37
Approximate Chi Square Value (.05)	6.146
Adjusted Level of Significance	0.029
Adjusted Chi Square Value (.05)	5.415

Anderson-Darling Test Statistic	0.59
Anderson-Darling Critical Value	0.772
Kolmogorov-Smirnov Test Statistic	0.195
Kolmogorov-Smirnov Critical Value	0.256

Data appear Gamma distributed at 5% Significance Level

95% UCLs (Adjusted for Skewness)

95% Adjusted-CLT UCL	2573
95% Modified-t UCL	2204

95% Non-Parametric UCLs

95% Bootstrap-t UCL	4194
95% Hall's Bootstrap UCL	5541

95% Gamma UCLs(Assuming Gamma Distribution)

95% Approximate Gamma UCL	2427
95% Adjusted Gamma UCL	2754

Potential UCL to Use

Use Approximate Gamma UCL 2427

APPENDIX E

Human Health Exposure Parameters

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TABLE E-1
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Wader
REASONABLE MAXIMUM EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediment (0-6 in bgs)
Exposure Point: Souhegan River Sediments
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child/Adult

Exposure Units Evaluated: Areas A & B combined and Area C

Exposure Route	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation
Ingestion (Cancer)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS_{adj}	Age-adjusted Ingestion Rate of Soil	114	mg-year/kg-day	Calculated	EPC x IRS_{adj} x CF x FI x EF x 1/AT
	FI	Fraction Ingested	0.5	unitless	Professional judgment	
	EF	Exposure Frequency	52	days/year	Professional judgment (1)	Where:
	CF	Conversion Factor	1.00E-06	kg/mg	-----	IRS_{adj} = (IRS_c x ED_c x 1/BW_c)+(IRS_a x ED_a x 1/BW_a)
	IRS_c	Ingestion Rate of Soil - child	200	mg/day	USEPA, 2002a	
	IRS_a	Ingestion Rate of Soil - adult	100	mg/day	USEPA, 2002a	
	ED_c	Exposure Duration - child	6	years	USEPA, 2002a	
	ED_a	Exposure Duration - adult	24	years	USEPA, 2002a	
	BW_c	Body Weight - child	15	kg	USEPA, 2002b	
	BW_a	Body Weight - adult	70	kg	USEPA, 2002a	
	AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
Ingestion (Noncancer Child)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS	Ingestion Rate of Soil	200	mg/day	USEPA, 2002a	EPC x IRS x CF x FI x EF x ED x 1/BW x 1/AT
	FI	Fraction Ingested	0.5	unitless	Professional judgment	
	EF	Exposure Frequency	52	days/year	Professional judgment (1)	
	ED	Exposure Duration	6	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	BW	Body Weight	15	kg	USEPA, 2002b	
	AT_{NC}	Averaging Time (Non-Cancer)	2,190	days	Calculated	
Ingestion (Noncancer Adult)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS	Ingestion Rate of Soil	100	mg/day	USEPA, 2002a	EPC x IRS x CF x FI x EF x ED x 1/BW x 1/AT
	FI	Fraction Ingested	0.5	unitless	Professional judgment	
	EF	Exposure Frequency	52	days/year	Professional judgment (1)	
	ED	Exposure Duration	24	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	BW	Body Weight	70	kg	USEPA, 2002a	
	AT_{NC}	Averaging Time (Non-Cancer)	8,760	days	Calculated	

TABLE E-1
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Wader
REASONABLE MAXIMUM EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediment (0-6 in bgs)
Exposure Point: Souhegan River Sediments
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child/Adult

Exposure Units Evaluated: Areas A & B combined and Area C

Exposure Route	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation
Dermal (Cancer)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SFS_{adj}	Age-adjusted Soil Contact Factor	810	mg-year/kg-day	Calculated	EPC x SFS_{adj} x ABS x EF x CF x 1/AT
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	EF	Exposure Frequency	52	days/year	Professional judgment (1)	Where:
	CF	Conversion Factor	1.00E-06	kg/mg	-----	SFS_{adj} = (SA_c x AF_c x ED_c x 1/BW_c)
	SA_c	Exposed Skin Surface Area - child	2,800	mg/day	USEPA, 2004a	+ (SA_a x AF_a x ED_a x 1/BW_a)
	SA_a	Exposed Skin Surface Area - adult	5,700	mg/day	USEPA, 2004a	
	AF_c	Soil to Skin Adherence Factor - child	0.2	mg/cm^2	USEPA, 2004a (2)	
	AF_a	Soil to Skin Adherence Factor - adult	0.3	mg/cm^2	USEPA, 2004a (3)	
	ED_c	Exposure Duration - child	6	years	USEPA, 2002a	
	ED_a	Exposure Duration - adult	24	years	USEPA, 2002a	
	BW_c	Body Weight - child	15	kg	USEPA, 2002b	
	BW_a	Body Weight - adult	70	kg	USEPA, 2002a	
	AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
Dermal (Noncancer Child)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SA	Exposed Skin Surface Area	2,800	cm^2/day	USEPA, 2004a	EPC x SA x AF x EF x ED x CF x ABS x 1/BW x 1/AT
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2	USEPA, 2004a (2)	
	EF	Exposure Frequency	52	days/year	Professional judgment (1)	
	ED	Exposure Duration	6	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	BW	Body Weight	15	kg	USEPA, 2002b	
	AT_{NC}	Averaging Time (Non-Cancer)	2,190	days	Calculated	
Dermal (Noncancer Adult)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SA	Exposed Skin Surface Area	5,700	cm^2/day	USEPA, 2004a	EPC x SA x AF x EF x ED x CF x ABS x 1/BW x 1/AT
	AF	Soil to Skin Adherence Factor	0.3	mg/cm^2	USEPA, 2004a (3)	
	EF	Exposure Frequency	52	days/year	Professional judgment (1)	
	ED	Exposure Duration	24	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	BW	Body Weight	70	kg	USEPA, 2002a	
	AT_{NC}	Averaging Time (Non-Cancer)	8,760	days	Calculated	

(1) Recreational user exposure is assumed to occur 2 times a week for 6 months (April through September; assume 4.33 weeks per month). The recreational users are not assumed to contact the sediment during October, November, December, January, February, and March.
(2) Assuming geometric mean body-part specific adherance factors for child playing in wet soil (USEPA, 2004a).
(3) Assuming geometric mean body-part specific adherance factors for reed gatherer (USEPA, 2004a).

TABLE E-2
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Wader
CENTRAL TENDENCY EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediment (0-6 in bgs)
Exposure Point: Souhegan River Sediments
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child/Adult

Exposure Units Evaluated: Areas A & B combined and Area C

Exposure Route	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation
Ingestion (Cancer)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS_{adj}	Age-adjusted Ingestion Rate of Soil	46	mg-year/kg-day	Calculated	EPC x IRS_{adj} x CF x FI x EF x 1/AT
	FI	Fraction Ingested	0.25	unitless	Professional judgment	
	EF	Exposure Frequency	26	days/year	Professional judgment (1)	Where:
	CF	Conversion Factor	1.00E-06	kg/mg	-----	IRS_{adj} = (IRS_c x ED_c x 1/BW_c)+(IRS_a x ED_a x 1/BW_a)
	IRS_c	Ingestion Rate of Soil - child	100	mg/day	Half of RME value	
	IRS_a	Ingestion Rate of Soil - adult	50	mg/day	Half of RME value	
	ED_c	Exposure Duration - child	6	years	USEPA, 2002a	
	ED_a	Exposure Duration - adult	9	years	USEPA, 1997	
	BW_c	Body Weight - child	15	kg	USEPA, 2002b	
	BW_a	Body Weight - adult	70	kg	USEPA, 2002a	
	AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
Ingestion (Noncancer Child)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS	Ingestion Rate of Soil	100	mg/day	Half of RME value	EPC x IRS x CF x FI x EF x ED x 1/BW x 1/AT
	FI	Fraction Ingested	0.25	unitless	Professional judgment	
	EF	Exposure Frequency	26	days/year	Half of RME value	
	ED	Exposure Duration	6	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	BW	Body Weight	15	kg	USEPA, 2002b	
	AT_{NC}	Averaging Time (Non-Cancer)	2,190	days	Calculated	
Ingestion (Noncancer Adult)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS	Ingestion Rate of Soil	50	mg/day	Half of RME value	EPC x IRS x CF x FI x EF x ED x 1/BW x 1/AT
	FI	Fraction Ingested	0.25	unitless	Professional judgment	
	EF	Exposure Frequency	26	days/year	Half of RME value	
	ED	Exposure Duration	9	years	USEPA, 1997	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	BW	Body Weight	70	kg	USEPA, 2002a	
	AT_{NC}	Averaging Time (Non-Cancer)	3,285	days	Calculated	

TABLE E-2
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Wader
CENTRAL TENDENCY EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediment (0-6 in bgs)
Exposure Point: Souhegan River Sediments
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child/Adult

Exposure Units Evaluated: Areas A & B combined and Area C

Exposure Route	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation
Dermal (Cancer)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SFS_{adj}	Age-adjusted Soil Contact Factor	275	mg-year/kg-day	Calculated	EPC x SFS_{adj} x ABS x EF x CF x 1/AT
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	EF	Exposure Frequency	26	days/year	Half of RME value	Where:
	CF	Conversion Factor	1.00E-06	kg/mg	-----	SFS_{adj} = (SA_c x AF_c x ED_c x 1/BW_c)
	SA_c	Exposed Skin Surface Area - child	2,800	mg/day	USEPA, 2004a	+ (SA_a x AF_a x ED_a x 1/BW_a)
	SA_a	Exposed Skin Surface Area - adult	5,700	mg/day	USEPA, 2004a	
	AF_c	Soil to Skin Adherence Factor - child	0.2	mg/cm^2	USEPA, 2004a (2)	
	AF_a	Soil to Skin Adherence Factor - adult	0.07	mg/cm^2	USEPA, 2004a (3)	
	ED_c	Exposure Duration - child	6	years	USEPA, 2002a	
	ED_a	Exposure Duration - adult	9	years	USEPA, 1997	
	BW_c	Body Weight - child	15	kg	USEPA, 2002b	
	BW_a	Body Weight - adult	70	kg	USEPA, 2002a	
	AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
Dermal (Noncancer Child)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SA	Exposed Skin Surface Area	2,800	cm^2/day	USEPA, 2004a	EPC x SA x AF x EF x ED x CF x ABS x 1/BW x 1/AT
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2	USEPA, 2004a (2)	
	EF	Exposure Frequency	26	days/year	Half of RME value	
	ED	Exposure Duration	6	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	BW	Body Weight	15	kg	USEPA, 2002b	
	AT_{NC}	Averaging Time (Non-Cancer)	2,190	days	Calculated	
Dermal (Noncancer Adult)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SA	Exposed Skin Surface Area	5,700	cm^2/day	USEPA, 2004a	EPC x SA x AF x EF x ED x CF x ABS x 1/BW x 1/AT
	AF	Soil to Skin Adherence Factor	0.07	mg/cm^2	USEPA, 2004a (3)	
	EF	Exposure Frequency	26	days/year	Half of RME value	
	ED	Exposure Duration	9	years	USEPA, 1997	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	BW	Body Weight	70	kg	USEPA, 2002a	
	AT_{NC}	Averaging Time (Non-Cancer)	3,285	days	Calculated	

(1) Recreational user exposure is assumed to occur 1 time a week for 6 months (April through September; assume 4.33 weeks per month). The recreational users are not assumed to contact the sediment during October, November, December, January, February, and March.
(2) Assuming geometric mean body-part specific adherance factors for child playing in wet soil (USEPA, 2004a).
(3) Assuming geometric mean body-part specific adherance factors for residential gardener (USEPA, 2004a).

TABLE E-3
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Swimmer
REASONABLE MAXIMUM EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediment (0-6 in bgs)
Exposure Point: Souhegan River Sediments
Receptor Population: Recreational - Swimmer
Receptor Age: Child/Adult

Exposure Units Evaluated: Areas A & B combined and Area C

Exposure Route	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation
Ingestion (Cancer)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS_{adj}	Age-adjusted Ingestion Rate of Soil	114	mg-year/kg-day	Calculated	EPC x IRS_{adj} x CF x FI x EF x 1/AT
	FI	Fraction Ingested	0.5	unitless	Professional judgment	
	EF	Exposure Frequency	39	days/year	Professional judgment (1)	Where:
	CF	Conversion Factor	1.00E-06	kg/mg	-----	IRS_{adj} = (IRS_c x ED_c x 1/BW_c)+(IRS_a x ED_a x 1/BW_a)
	IRS_c	Ingestion Rate of Soil - child	200	mg/day	USEPA, 2002a	
	IRS_a	Ingestion Rate of Soil - adult	100	mg/day	USEPA, 2002a	
	ED_c	Exposure Duration - child	6	years	USEPA, 2002a	
	ED_a	Exposure Duration - adult	24	years	USEPA, 2002a	
	BW_c	Body Weight - child	15	kg	USEPA, 2002b	
	BW_a	Body Weight - adult	70	kg	USEPA, 2002a	
	AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
Ingestion (Noncancer Child)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS	Ingestion Rate of Soil	200	mg/day	USEPA, 2002a	EPC x IRS x CF x FI x EF x ED x 1/BW x 1/AT
	FI	Fraction Ingested	0.5	unitless	Professional judgment	
	EF	Exposure Frequency	39	days/year	Professional judgment (1)	
	ED	Exposure Duration	6	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	BW	Body Weight	15	kg	USEPA, 2002b	
	AT_{NC}	Averaging Time (Non-Cancer)	2,190	days	Calculated	
Ingestion (Noncancer Adult)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS	Ingestion Rate of Soil	100	mg/day	USEPA, 2002a	EPC x IRS x CF x FI x EF x ED x 1/BW x 1/AT
	FI	Fraction Ingested	0.5	unitless	Professional judgment	
	EF	Exposure Frequency	39	days/year	Professional judgment (1)	
	ED	Exposure Duration	24	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	BW	Body Weight	70	kg	USEPA, 2002a	
	AT_{NC}	Averaging Time (Non-Cancer)	8,760	days	Calculated	

TABLE E-3
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Swimmer
REASONABLE MAXIMUM EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediment (0-6 in bgs)
Exposure Point: Souhegan River Sediments
Receptor Population: Recreational - Swimmer
Receptor Age: Child/Adult

Exposure Units Evaluated: Areas A & B combined and Area C

Exposure Route	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation
Dermal (Cancer)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SFS_{adj}	Age-adjusted Soil Contact Factor	2379	mg-year/kg-day	Calculated	EPC x SFS_{adj} x ABS x EF x CF x 1/AT
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	EF	Exposure Frequency	39	days/year	Professional judgment (1)	Where:
	CF	Conversion Factor	1.00E-06	kg/mg	-----	SFS_{adj} = (SA_c x AF_c x ED_c x 1/BW_c)
	SA_c	Exposed Skin Surface Area - child	6,600	mg/day	USEPA, 2004a	+ (SA_a x AF_a x ED_a x 1/BW_a)
	SA_a	Exposed Skin Surface Area - adult	18,000	mg/day	USEPA, 2004a	
	AF_c	Soil to Skin Adherence Factor - child	0.2	mg/cm^2	Calculated (2)	
	AF_a	Soil to Skin Adherence Factor - adult	0.3	mg/cm^2	Calculated (3)	
	ED_c	Exposure Duration - child	6	years	USEPA, 2002a	
	ED_a	Exposure Duration - adult	24	years	USEPA, 2002a	
	BW_c	Body Weight - child	15	kg	USEPA, 2002b	
	BW_a	Body Weight - adult	70	kg	USEPA, 2002a	
	AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
Dermal (Noncancer Child)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SA	Exposed Skin Surface Area	6,600	cm^2/day	USEPA, 2004a	EPC x SA x AF x EF x ED x CF x ABS x 1/BW x 1/AT
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2	Calculated (2)	
	EF	Exposure Frequency	39	days/year	Professional judgment (1)	
	ED	Exposure Duration	6	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	BW	Body Weight	15	kg	USEPA, 2002b	
	AT_{NC}	Averaging Time (Non-Cancer)	2,190	days	Calculated	
Dermal (Noncancer Adult)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SA	Exposed Skin Surface Area	18,000	cm^2/day	USEPA, 2004a	EPC x SA x AF x EF x ED x CF x ABS x 1/BW x 1/AT
	AF	Soil to Skin Adherence Factor	0.3	mg/cm^2	Calculated (3)	
	EF	Exposure Frequency	39	days/year	Professional judgment (1)	
	ED	Exposure Duration	24	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	BW	Body Weight	70	kg	USEPA, 2002a	
	AT_{NC}	Averaging Time (Non-Cancer)	8,760	days	Calculated	

(1) Swimming is assumed to occur 3 times a week from June through August (assume 4.33 weeks per month). The swimmer is not assumed to contact the sediment during September, October, November, December, January, February, March, April, and May.
(2) Calculated using Exhibits C-1 and C-2 in USEPA, 2004a assuming geometric mean body-part specific adherance factors for child playing in wet soil. See Table D-4.
(3) Calculated using Exhibit C-2 in USEPA, 2004a assuming geometric mean body-part specific adherance factors for reed gatherer and Tables 6-2 and 6-3 in USEPA, 1997. See Table D-5.

Table E-4
Calculation of Sediment Adherence Factors - Child Swimmer - RME and CTE Scenarios

Age	Total Body SA[a] (m^2; 50th percentile)		
	Males	Females	Average
<1	0.603	0.579	0.591
1<2	0.603	0.579	0.591
2<3	0.603	0.579	0.591
3<4	0.664	0.649	0.657
4<5	0.731	0.706	0.719
5<6	0.793	0.799	0.796

Age	Fraction of Total SA[a] (unitless)					
	Head	Arms	Hands	Legs	Feet	Trunk
<1	0.182	0.137	0.053	0.206	0.0654	0.3566
1<2	0.165	0.13	0.0568	0.231	0.0627	0.3545
2<3	0.142	0.118	0.053	0.232	0.0707	0.3843
3<4	0.136	0.144	0.0607	0.268	0.0721	0.3192
4<5	0.138	0.14	0.057	0.278	0.0729	0.3141
5<6	0.131	0.131	0.0471	0.271	0.069	0.3509

Age	Body Part-Specific SA[b] (cm^2)						
	Head	Arms	Hands	Legs	Feet	Trunk	Total
<1	1075.62	809.67	313.23	1217.46	386.51	2107.51	5910
1<2	975.15	768.3	335.69	1365.21	370.56	2095.10	5910
2<3	839.22	697.38	313.23	1371.12	417.84	2271.21	5910
3<4	892.84	945.36	398.50	1759.42	473.34	2095.55	6565
4<5	991.53	1005.9	409.55	1997.43	523.79	2256.81	7185
5<6	1042.76	1042.76	374.92	2157.16	549.24	2793.16	7960

Geometric Mean of Post-Activity Loading[c] (mg/cm^2)					
Head[d]	Arms	Hands	Legs	Feet[d]	Trunk[d]
0.2	0.015	0.656	0.026	0.2	0.2

Age	Body Part-Specific Loading[e] (mg)						Weighted AF[f]
	Head	Arms	Hands	Legs	Feet	Trunk	
<1	215.12	12.15	205.48	31.65	77.30	421.50	0.16298
1<2	195.03	11.52	220.21	35.50	74.11	419.02	0.16166
2<3	167.84	10.46	205.48	35.65	83.57	454.24	0.16197
3<4	178.57	14.18	261.41	45.74	94.67	419.11	0.15441
4<5	198.31	15.09	268.66	51.93	104.76	451.36	0.15172
5<6	208.55	15.64	245.94	56.09	109.85	558.63	0.15009
						Average:	**0.2**

AF = Adherence Factor
SA = Surface Area

[a]USEPA, 2004a, Exhibit C-1.
[b]Calculated:
average of male and female total body surface area x body part-specific fraction of total body surface area x 10,000 cm^2/m^2
[c]Activity is children playing (wet soil); USEPA, 2004a, Exhibit C-2.
[d]Defaulted to weighted AF.
[e]Calculated:
body part-specific SA x geometric mean of post-activitiy loading.
[f]Calculated:
sum of body part-specific loadings divided by total body surface area exposed

Table E-5
Calculation of Sediment Adherence Factors - Adult Swimmer - RME and CTE Scenarios

Sex	Body Part-Specific SA[a] (m^2; 50th percentile)						
	Head	Arms	Hands	Legs	Feet	Trunk	Total
Male	0.13	0.291	0.099	0.64	0.131	0.739	2.03
Female	0.111	0.23	0.0817	0.546	0.114	0.579	1.6617
Average	0.1205	0.2605	0.09035	0.593	0.1225	0.659	1.84585
Average (cm^2)	1205	2605	903.5	5930	1225	6590	18458.5

Scenario	Geometric Mean of Post-Activity Loading[b] (mg/cm^2)					
	Head[c]	Arms	Hands	Legs	Feet	Trunk[c]
RME	0.3	0.036	0.658	0.159	0.633	0.3
CTE	0.07	0.052	0.19	0.033	0.197	0.07

Scenario	Body Part-Specific Loading[d] (mg)						Weighted AF[e]
	Head	Arms	Hands	Legs	Feet	Trunk	
RME	361.5	93.78	594.503	942.87	775.425	1977	**0.3**
CTE	84.35	135.46	171.665	195.69	241.325	461.3	**0.07**

AF = Adherence Factor
SA = Surface Area

[a]USEPA, 1997, Tables 6-2 and 6-3.
[b]RME activity is based on reed gatherers and CTE activity is based on gardners; USEPA, 2004a, Exhibit C-2.
[c]Defaulted to weighted AF.
[d]Calculated:
body part-specific SA x geometric mean of post-activitiy loading.
[e]Calculated:
sum of body part-specific loadings divided by total body surface area exposed

TABLE E-6
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Swimmer
CENTRAL TENDENCY EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediment (0-6 in bgs)
Exposure Point: Souhegan River Sediments
Receptor Population: Recreational - Swimmer
Receptor Age: Child/Adult

Exposure Units Evaluated: Areas A & B combined and Area C

Exposure Route	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation
Ingestion (Cancer)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS_{adj}	Age-adjusted Ingestion Rate of Soil	46	mg-year/kg-day	Calculated	EPC x IRS_{adj} x CF x FI x EF x 1/AT
	FI	Fraction Ingested	0.25	unitless	Professional judgment	
	EF	Exposure Frequency	13	days/year	Professional judgment (1)	Where:
	CF	Conversion Factor	1.00E-06	kg/mg	-----	IRS_{adj} = (IRS_c x ED_c x 1/BW_c)+(IRS_a x ED_a x 1/BW_a)
	IRS_c	Ingestion Rate of Soil - child	100	mg/day	Half of RME value	
	IRS_a	Ingestion Rate of Soil - adult	50	mg/day	Half of RME value	
	ED_c	Exposure Duration - child	6	years	USEPA, 2002a	
	ED_a	Exposure Duration - adult	9	years	USEPA, 1997	
	BW_c	Body Weight - child	15	kg	USEPA, 2002b	
	BW_a	Body Weight - adult	70	kg	USEPA, 2002a	
	AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
Ingestion (Noncancer Child)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS	Ingestion Rate of Soil	100	mg/day	Half of RME value	EPC x IRS x CF x FI x EF x ED x 1/BW x 1/AT
	FI	Fraction Ingested	0.25	unitless	Professional judgment	
	EF	Exposure Frequency	13	days/year	Professional judgment (1)	
	ED	Exposure Duration	6	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	BW	Body Weight	15	kg	USEPA, 2002b	
	AT_{NC}	Averaging Time (Non-Cancer)	2,190	days	Calculated	
Ingestion (Noncancer Adult)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
	IRS	Ingestion Rate of Soil	50	mg/day	Half of RME value	EPC x IRS x CF x FI x EF x ED x 1/BW x 1/AT
	FI	Fraction Ingested	0.25	unitless	Professional judgment	
	EF	Exposure Frequency	13	days/year	Professional judgment (1)	
	ED	Exposure Duration	9	years	USEPA, 1997	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	BW	Body Weight	70	kg	USEPA, 2002a	
	AT_{NC}	Averaging Time (Non-Cancer)	3,285	days	Calculated	

TABLE E-6
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Swimmer
CENTRAL TENDENCY EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediment (0-6 in bgs)
Exposure Point: Souhegan River Sediments
Receptor Population: Recreational - Swimmer
Receptor Age: Child/Adult

Exposure Units Evaluated: Areas A & B combined and Area C

Exposure Route	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation
Dermal (Cancer)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SFS_{adj}	Age-adjusted Soil Contact Factor	690	mg-year/kg-day	Calculated	EPC x SFS_{adj} x ABS x EF x CF x 1/AT
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	EF	Exposure Frequency	13	days/year	Professional judgment (1)	Where:
	CF	Conversion Factor	1.00E-06	kg/mg	-----	SFS_{adj} = (SA_c x AF_c x ED_c x 1/BW_c)
	SA_c	Exposed Skin Surface Area - child	6,600	mg/day	USEPA, 2004a	+ (SA_a x AF_a x ED_a x 1/BW_a)
	SA_a	Exposed Skin Surface Area - adult	18,000	mg/day	USEPA, 2004a	
	AF_c	Soil to Skin Adherence Factor - child	0.2	mg/cm^2	Calculated (2)	
	AF_a	Soil to Skin Adherence Factor - adult	0.07	mg/cm^2	Calculated (3)	
	ED_c	Exposure Duration - child	6	years	USEPA, 2002a	
	ED_a	Exposure Duration - adult	9	years	USEPA, 1997	
	BW_c	Body Weight - child	15	kg	USEPA, 2002b	
	BW_a	Body Weight - adult	70	kg	USEPA, 2002a	
	AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
Dermal (Noncancer Child)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SA	Exposed Skin Surface Area	6,600	cm^2/day	USEPA, 2004a	EPC x SA x AF x EF x ED x CF x ABS x 1/BW x 1/AT
	AF	Soil to Skin Adherence Factor	0.2	mg/cm^2	Calculated (2)	
	EF	Exposure Frequency	13	days/year	Professional judgment (1)	
	ED	Exposure Duration	6	years	USEPA, 2002a	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	BW	Body Weight	15	kg	USEPA, 2002b	
	AT_{NC}	Averaging Time (Non-Cancer)	2,190	days	Calculated	
Dermal (Noncancer Adult)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
	SA	Exposed Skin Surface Area	18,000	cm^2/day	USEPA, 2004a	EPC x SA x AF x EF x ED x CF x ABS x 1/BW x 1/AT
	AF	Soil to Skin Adherence Factor	0.07	mg/cm^2	Calculated (3)	
	EF	Exposure Frequency	13	days/year	Professional judgment (1)	
	ED	Exposure Duration	9	years	USEPA, 1997	
	CF	Conversion Factor	1.00E-06	kg/mg	-----	
	ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
	BW	Body Weight	70	kg	USEPA, 2002a	
	AT_{NC}	Averaging Time (Non-Cancer)	3,285	days	Calculated	

(1) Swimming is assumed to occur once a week from June through August (assume 4.33 weeks per month). The swimmer is not assumed to contact the sediment during September, October, November, December, January, February, March, April, and May.
(2) Calculated using Exhibits C-1 and C-2 in USEPA, 2004a assuming geometric mean body-part specific adherance factors for child playing in wet soil. See Table D-4.
(3) Calculated using Exhibit C-2 in USEPA, 2004a assuming geometric mean body-part specific adherance factors for residential gardener and Tables 6-2 and 6-3 in USEPA, 1997. See Table D-5.

TABLE E-7
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Rope Swinger
REASONABLE MAXIMUM EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediment (0-6 in bgs)
Receptor Population: Recreational - Rope Swing
Receptor Age: Adolescent (10-18 years)

Exposure Units Evaluated: Rope Swing Area

Exposure Route	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation
Ingestion	Sediment	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
		IRSED	Ingestion Rate of Sediment	100	mg/day	USEPA, 2002a	EPC x IRS x CF x FI x EF x ED x 1/BW x 1/AT
		FI	Fraction Ingested	0.5	unitless	Professional judgment	
		EF	Exposure Frequency	39	days/year	Professional judgment (1)	
		ED	Exposure Duration	8	years	Calculated	
		CF	Conversion Factor	1.00E-06	kg/mg	-----	
		BW	Body Weight	52	kg	USEPA, 1997	
		AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
		AT_{NC}	Averaging Time (Non-Cancer)	2,920	days	Calculated	
Dermal	Sediment	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
		SA	Exposed Skin Surface Area	15,000	cm^2/day	Professional judgment (2)	EPC x SA x AF x EF x ED x CF x ABS x 1/BW x 1/AT
		AF	Soil to Skin Adherence Factor	0.3	mg/cm^2	Calculated (3)	
		EF	Exposure Frequency	39	days/year	Professional judgment (1)	
		ED	Exposure Duration	8	years	Calculated	
		CF	Conversion Factor	1.00E-06	kg/mg	-----	
		ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
		BW	Body Weight	52	kg	USEPA, 1997	
		AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
		AT_{NC}	Averaging Time (Non-Cancer)	2,920	days	Calculated	

(1) The rope swinger/swimmer is assumed to be exposed 3 times a week from June through August (assume 4.33 weeks per month). The rope swinger/swimmer is not assumed to contact the sediment during September, October, November, December, January, February, March, April, and May.
(2) Assumes that the head, hands, arms, legs, feet, and trunk are exposed. Calculated using data from Exhibit C-1, USEPA, 2004a. See Table D-8.
(3) Calculated using Exhibit C-2 in USEPA, 2004a assuming geometric mean body-part specific adherance factors for reed gatherer. See Table D-8.

Table E-8
Calculation of Sediment Adherence Factors - Rope Swinger - RME and CTE Scenarios

Age	Total Body SA[a] (m^2; 50th percentile)		
	Males	Females	Average
10<11	1.18	1.17	1.175
11<12	1.23	1.3	1.265
12<13	1.34	1.4	1.37
13<14	1.47	1.48	1.475
14<15	1.61	1.55	1.58
15<16	1.7	1.57	1.635
16<17	1.76	1.6	1.68
17<18	1.8	1.63	1.715

Age	Fraction of Total SA[a] (unitless)					
	Head	Arms	Hands	Legs	Feet	Trunk
10<11	0.0874	0.137	0.0539	0.305	0.0703	0.3464
11<12	0.0874	0.137	0.0539	0.305	0.0703	0.3464
12<13	0.0874	0.137	0.0539	0.305	0.0703	0.3464
13<14	0.0997	0.121	0.0511	0.32	0.0802	0.328
14<15	0.0796	0.131	0.0568	0.336	0.0693	0.3273
15<16	0.0796	0.131	0.0568	0.336	0.0693	0.3273
16<17	0.0796	0.131	0.0568	0.336	0.0693	0.3273
17<18	0.0758	0.175	0.0513	0.308	0.0728	0.3171

Age	Body Part-Specific SA[b] (cm^2)						
	Head	Arms	Hands	Legs	Feet	Trunk	Total
10<11	1026.95	1609.75	633.325	3583.75	826.025	4070.2	11750
11<12	1105.61	1733.05	681.835	3858.25	889.295	4381.96	12650
12<13	1197.38	1876.9	738.43	4178.5	963.11	4745.68	13700
13<14	1470.575	1784.75	753.725	4720	1182.95	4838	14750
14<15	1257.68	2069.8	897.44	5308.8	1094.94	5171.34	15800
15<16	1301.46	2141.85	928.68	5493.6	1133.055	5351.355	16350
16<17	1337.28	2200.8	954.24	5644.8	1164.24	5498.64	16800
17<18	1299.97	3001.25	879.795	5282.2	1248.52	5438.265	17150

Scenario	Geometric Mean of Post-Activity Loading[c] (mg/cm^2)					
	Head[d]	Arms	Hands	Legs	Feet	Trunk[d]
RME	0.3	0.036	0.658	0.159	0.633	0.3
CTE	0.07	0.052	0.19	0.033	0.197	0.07

Age	RME Body Part-Specific Loading[e] (mg/cm^2)						Weighted AF[f]
	Head	Arms	Hands	Legs	Feet	Trunk	
10<11	308.085	57.951	416.72785	569.81625	522.87383	1221.06	0.2635331
11<12	331.683	62.3898	448.64743	613.46175	562.92374	1314.588	0.2635331
12<13	359.214	67.5684	485.88694	664.3815	609.64863	1423.704	0.2635331
13<14	441.1725	64.251	495.95105	750.48	748.80735	1451.4	0.2679364
14<15	377.304	74.5128	590.51552	844.0992	693.09702	1551.402	0.2614513
15<16	390.438	77.1066	611.07144	873.4824	717.22382	1605.4065	0.2614513
16<17	401.184	79.2288	627.88992	897.5232	736.96392	1649.592	0.2614513
17<18	389.991	108.045	578.90511	839.8698	790.31316	1631.4795	0.2529798
						Average	**0.3**

Age	CTE Body Part-Specific Loading[e] (mg/cm^2)						Weighted AF[f]
	Head	Arms	Hands	Legs	Feet	Trunk	
10<11	71.8865	83.707	120.33175	118.26375	162.72693	284.914	0.0716451
11<12	77.3927	90.1186	129.54865	127.32225	175.19112	306.7372	0.0716451
12<13	83.8166	97.5988	140.3017	137.8905	189.73267	332.1976	0.0716451
13<14	102.94025	92.807	143.20775	155.76	233.04115	338.66	0.0722994
14<15	88.0376	107.6296	170.5136	175.1904	215.70318	361.9938	0.0708271
15<16	91.1022	111.3762	176.4492	181.2888	223.21184	374.59485	0.0708271
16<17	93.6096	114.4416	181.3056	186.2784	229.35528	384.9048	0.0708271
17<18	90.9979	156.065	167.16105	174.3126	245.95844	380.67855	0.0708556
						Average	**0.07**

AF = Adherence Factor
SA = Surface Area

[a]USEPA, 2004a, Exhibit C-1.
[b]Calculated: average of male and female total body surface area x body part-specific fraction of total body surface area x 10,000 cm^2/m^2
[c]RME activity is based on reed gatherers and CTE activity is based on gardners; USEPA, 2004a, Exhibit C-2.
[d]Defaulted to weighted AF.
[e]Calculated: body part-specific SA x geometric mean of post-activitiy loading
[f]Calculated: sum of body part-specific loadings divided by total body surface area exposed

TABLE E-9
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Rope Swinger
CENTRAL TENDENCY EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Surface Sediment (0-6 in bgs)
Receptor Population: Recreational - Rope Swing
Receptor Age: Adolescent (10-18 years)

Exposure Units Evaluated: Rope Swing Area

Exposure Route	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation
Ingestion	Sediment	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (mg/kg-day) =
		IRSED	Ingestion Rate of Sediment	50	mg/day	USEPA, 2002a	EPC x IRS x CF x FI x EF x ED x 1/BW x 1/AT
		FI	Fraction Ingested	0.25	unitless	Professional judgment	
		EF	Exposure Frequency	13	days/year	Professional judgment (1)	
		ED	Exposure Duration	8	years	Calculated	
		CF	Conversion Factor	1.00E-06	kg/mg	-----	
		BW	Body Weight	52	kg	USEPA, 1997	
		AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
		AT_{NC}	Averaging Time (Non-Cancer)	2,920	days	Calculated	
Dermal	Sediment	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Dermally Absorbed Dose (mg/kg-day) =
		SA	Exposed Skin Surface Area	15,000	cm^2/day	Professional judgment (2)	EPC x SA x AF x EF x ED x CF x ABS x 1/BW x 1/AT
		AF	Soil to Skin Adherence Factor	0.07	mg/cm^2	Calculated (3)	
		EF	Exposure Frequency	13	days/year	Professional judgment (1)	
		ED	Exposure Duration	8	years	Calculated	
		CF	Conversion Factor	1.00E-06	kg/mg	-----	
		ABS	Dermal Absorption Factor	COPC-specific	unitless	USEPA, 2004a	
		BW	Body Weight	52	kg	USEPA, 1997	
		AT_C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
		AT_{NC}	Averaging Time (Non-Cancer)	2,920	days	Calculated	

(1) The rope swinger/swimmer is assumed to be exposed occur once a week from June through August (assume 4.33 weeks per month). The rope swinger/swimmer is not assumed to contact the sediment during September, October, November, December, January, February, March, April, and May.
(2) Assumes that the head, hands, forearms, lower legs and feet are exposed. Calculated using data from Exhibit C-1, USEPA, 2004a. See Table D-8.
(3) Calculated using Exhibit C-2 in USEPA, 2004a assuming geometric mean body-part specific adherance factors for residential gardener. See Table D-8.

TABLE E-10
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Fisher
REASONABLE MAXIMUM EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Fish Fillet
Exposure Medium: Fish Fillet
Receptor Population: Recreational fisherman
Receptor Age: Child/Adult

Exposure Units Evaluated: Areas A & B combined and Area C

Exposure Route	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion (Cancer)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (CDI)(mg/kg-day) =
	IFF_{adj}	Age-adjusted fish ingestion factor	7	g-year/day-kg	Calculated	EPC x IFF_{adj} x CF x FI x EF x 1/AT
	FI	Fraction of Fish Ingested from Contaminated Source	0.5	unitless	Professional judgment (1)	Where
	EF	Exposure Frequency	350	days/year	USEPA, 1991	IFF_{adj} = (IRF_c x ED_c x 1/BW_c) + (IRF_a x ED_a x 1/BW_a)
	CF	Conversion Factor	1E-03	kg/g	-----	
	IRF_c	Ingestion Rate of Fish - Child	6.1	g/day	Ebert et al., 1993	
	IRF_a	Ingestion Rate of Fish - Adult	14	g/day	Ebert et al., 1993	
	ED_c	Exposure Duration - Child	6	years	USEPA, 2002a	
	ED_a	Exposure Duration - Adult	24	years	USEPA, 2002a	
	BW_c	Body Weight - Child	15	kg	USEPA, 2002b	
	BW_a	Body Weight - Adult	70	kg	USEPA, 2002a	
	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
Ingestion (Noncancer Child)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (CDI) (mg/kg-day) =
	IRF	Ingestion Rate of Fish	6.1	g/day	Ebert et al., 1993	EPC x IRF x FI x EF x ED x CF x 1/BW x 1/AT
	FI	Fraction of Fish Ingested from Contaminated Source	0.5	unitless	Professional judgment (1)	
	EF	Exposure Frequency	350	days/year	USEPA, 1991	
	ED	Exposure Duration	6	years	USEPA, 2002a	
	CF	Conversion Factor	1E-03	kg/g	-----	
	BW	Body Weight	15	kg	USEPA, 2002b	
	AT-NC	Averaging Time (Non-Cancer)	2,190	days	Calculated	
Ingestion (Noncancer Adult)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (CDI) (mg/kg-day) =
	IRF	Ingestion Rate of Fish	14	g/day	Ebert et al., 1993	EPC x IRF x FI x EF x ED x CF x 1/BW x 1/AT
	FI	Fraction of Fish Ingested from Contaminated Source	0.5	unitless	Professional judgment (1)	
	EF	Exposure Frequency	350	days/year	USEPA, 1991	
	ED	Exposure Duration	24	years	USEPA, 2002a	
	CF	Conversion Factor	1E-03	kg/g	-----	
	BW	Body Weight	70	kg	USEPA, 2002a	
	AT-NC	Averaging Time (Non-Cancer)	8,760	days	Calculated	

(1) Indicates that 50% of the total amount of recreationally-caught fish ingested is obtained from the indicated reach of the Souhegan River. This is a conservative estimate given the abundance of angling opportunities in the vicinity of the Fletcher's Paint Site, the size of the areas being evaluated and the apparent biomass of the river.

TABLE E-11
VALUES PROPOSED TO BE USED FOR DAILY INTAKE CALCULATIONS-Fisher
CENTRAL TENDENCY EXPOSURE
Fletcher's Paint - Souhegan River

Scenario Timeframe: Current/Future
Medium: Fish Fillet
Exposure Medium: Fish Fillet
Receptor Population: Recreational fisherman
Receptor Age: Child/Adult

Exposure Units Evaluated: Areas A & B combined and Area C

Exposure Route	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion (Cancer)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (CDI)(mg/kg-day) =
	IFF_{adj}	Age-adjusted fish ingestion factor	3	g-year/day-kg	Calculated	EPC x IFF_{adj} x CF x FI x EF x 1/AT
	FI	Fraction of Fish Ingested from Contaminated Source	0.25	unitless	Professional judgment (1)	Where
	EF	Exposure Frequency	350	days/year	USEPA, 1991	IFF_{adj} = (IRF_c x ED_c x 1/BW_c) + (IRF_a x ED_a x 1/BW_a)
	CF	Conversion Factor	1E-03	kg/g	-----	
	IRF_c	Ingestion Rate of Fish - Child	3.7	g/day	Ebert et al., 1993	
	IRF_a	Ingestion Rate of Fish - Adult	8.9	g/day	Ebert et al., 1993	
	ED_c	Exposure Duration - Child	6	years	USEPA, 2002a	
	ED_a	Exposure Duration - Adult	9	years	USEPA, 1997	
	BW_c	Body Weight - Child	15	kg	USEPA, 2002b	
	BW_a	Body Weight - Adult	70	kg	USEPA, 2002a	
	AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
Ingestion (Noncancer Child)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (CDI) (mg/kg-day) =
	IRF	Ingestion Rate of Fish	3.7	g/day	Ebert et al., 1993	EPC x IRF x FI x EF x ED x CF x 1/BW x 1/AT
	FI	Fraction of Fish Ingested from Contaminated Source	0.25	unitless	Professional judgment (1)	
	EF	Exposure Frequency	350	days/year	USEPA, 1991	
	ED	Exposure Duration	6	years	USEPA, 2002a	
	CF	Conversion Factor	1E-03	kg/g	-----	
	BW	Body Weight	15	kg	USEPA, 2002b	
	AT-NC	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Ingestion (Noncancer Adult)	EPC	Exposure Point Concentration	COPC-specific	mg/kg	Calculated	Chronic daily intake (CDI) (mg/kg-day) =
	IRF	Ingestion Rate of Fish	8.9	g/day	Ebert et al., 1993	EPC x IRF x FI x EF x ED x CF x 1/BW x 1/AT
	FI	Fraction of Fish Ingested from Contaminated Source	0.25	unitless	Professional judgment (1)	
	EF	Exposure Frequency	350	days/year	USEPA, 1991	
	ED	Exposure Duration	9	years	USEPA, 1997	
	CF	Conversion Factor	1E-03	kg/g	-----	
	BW	Body Weight	70	kg	USEPA, 2002a	
	AT-NC	Averaging Time (Non-Cancer)	3,285	days	USEPA,1989	

(1) Indicates that 25% of the total amount of recreationally-caught fish ingested is obtained from the indicated reach of the Souhegan River.

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APPENDIX F

Calculation of Human Health Risks

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Table F-1

RAGS Part D TABLE 7.1

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	1.86E-08	mg/kg/day	7.30E+00	1/mg/kg/day	1.36E-07	---	---	---	---	---
				Benzo[b]fluoranthene	2.17E-01	mg/kg	2.52E-08	mg/kg/day	7.30E-01	1/mg/kg/day	1.84E-08	---	---	---	---	---
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	3.14E-09	mg/kg/day	7.30E+00	1/mg/kg/day	2.29E-08	---	---	---	---	---
				Total PCB Aroclors	3.37E+00	mg/kg	3.92E-07	mg/kg/day	2.00E+00	1/mg/kg/day	7.83E-07	---	---	---	---	---
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	6.26E-07	mg/kg/day	2.00E+00	1/mg/kg/day	1.25E-06	---	---	---	---	---
				Mammal TEQ (Measured)	4.91E-06	mg/kg	5.71E-13	mg/kg/day	1.50E+05	1/mg/kg/day	8.57E-08	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	4.78E+00	mg/kg	5.56E-07	mg/kg/day	2.00E+00	1/mg/kg/day	1.11E-06	---	---	---	---	---
				Arsenic	7.96E+00	mg/kg	9.26E-07	mg/kg/day	1.50E+00	1/mg/kg/day	1.39E-06	---	---	---	---	---
				Beryllium	1.60E+00	mg/kg	1.85E-07	mg/kg/day	NA	NA	NA	---	---	---	---	---
				Thallium	3.51E+00	mg/kg	4.09E-07	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								2.35E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								2.82E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								1.65E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)								2.76E-06					---
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	3.43E-08	mg/kg/day	7.30E+00	1/mg/kg/day	2.51E-07	---	---	---	---	---
				Benzo[b]fluoranthene	2.17E-01	mg/kg	4.65E-08	mg/kg/day	7.30E-01	1/mg/kg/day	3.39E-08	---	---	---	---	---
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	5.78E-09	mg/kg/day	7.30E+00	1/mg/kg/day	4.22E-08	---	---	---	---	---
				Total PCB Aroclors	3.37E+00	mg/kg	7.78E-07	mg/kg/day	2.00E+00	1/mg/kg/day	1.56E-06	---	---	---	---	---
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	1.24E-06	mg/kg/day	2.00E+00	1/mg/kg/day	2.49E-06	---	---	---	---	---
				Mammal TEQ (Measured)	4.91E-06	mg/kg	2.43E-13	mg/kg/day	1.50E+05	1/mg/kg/day	3.64E-08	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	4.78E+00	mg/kg	1.10E-06	mg/kg/day	2.00E+00	1/mg/kg/day	2.21E-06	---	---	---	---	---
				Arsenic	7.96E+00	mg/kg	3.94E-07	mg/kg/day	1.50E+00	1/mg/kg/day	5.91E-07	---	---	---	---	---
				Beryllium	1.60E+00	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---
				Thallium	3.51E+00	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---

Table F-1

RAGS Part D TABLE 7.1

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment (cont'd)	Surface Sediment (cont'd)	Surface Sediment at Areas A & B (cont'd)	Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								2.47E-06					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								3.40E-06					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								9.54E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)								3.16E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											4.82E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											6.22E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)											2.61E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)											5.92E-06					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

Table F-2

RAGS Part D TABLE 7.2

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	1.52E-07	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	2.06E-07	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	2.56E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	3.20E-06	mg/kg/day	2.00E-05	mg/kg/day	1.60E-01
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	5.11E-06	mg/kg/day	2.00E-05	mg/kg/day	2.56E-01
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	4.66E-12	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	7.56E-06	mg/kg/day	3.00E-04	mg/kg/day	2.52E-02
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	1.51E-06	mg/kg/day	2.00E-03	mg/kg/day	7.57E-04
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	3.34E-06	mg/kg/day	6.50E-05	mg/kg/day	5.13E-02
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					2.37E-01
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					3.33E-01
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	1.11E-07	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	1.50E-07	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	1.86E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	2.51E-06	mg/kg/day	2.00E-05	mg/kg/day	1.25E-01
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	4.01E-06	mg/kg/day	2.00E-05	mg/kg/day	2.00E-01
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	7.83E-13	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	1.27E-06	mg/kg/day	3.00E-04	mg/kg/day	4.23E-03
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	6.50E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					1.30E-01
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.05E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					3.67E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					5.38E-01

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

Table F-3

RAGS Part D TABLE 7.3

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	1.63E-08	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	2.21E-08	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	2.74E-09	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	3.43E-07	mg/kg/day	2.00E-05	mg/kg/day	1.71E-02
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	5.48E-07	mg/kg/day	2.00E-05	mg/kg/day	2.74E-02
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	5.00E-13	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	8.10E-07	mg/kg/day	3.00E-04	mg/kg/day	2.70E-03
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	1.62E-07	mg/kg/day	2.00E-03	mg/kg/day	8.12E-05
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	3.58E-07	mg/kg/day	6.50E-05	mg/kg/day	5.50E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					2.54E-02
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					3.57E-02
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	7.25E-08	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	9.80E-08	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	1.22E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	1.64E-06	mg/kg/day	2.00E-05	mg/kg/day	8.21E-02
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	2.62E-06	mg/kg/day	2.00E-05	mg/kg/day	1.31E-01
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	5.13E-13	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	8.31E-07	mg/kg/day	3.00E-04	mg/kg/day	2.77E-03
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	6.50E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					8.48E-02
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					1.34E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					1.10E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					1.70E-01

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

Table F-4

RAGS Part D TABLE 7.4

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	2.60E-01	mg/kg	3.02E-08	mg/kg/day	7.30E+00	1/mg/kg/day	2.21E-07	---	---	---	---	---
				Total PCB Aroclors	3.01E-02	mg/kg	3.50E-09	mg/kg/day	2.00E+00	1/mg/kg/day	7.00E-09	---	---	---	---	---
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	9.30E-10	mg/kg/day	2.00E+00	1/mg/kg/day	1.86E-09	---	---	---	---	---
				Mammal TEQ (Measured)	2.22E-08	mg/kg	2.58E-15	mg/kg/day	1.50E+05	1/mg/kg/day	3.87E-10	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	7.26E-03	mg/kg	8.44E-10	mg/kg/day	2.00E+00	1/mg/kg/day	1.69E-09	---	---	---	---	---
				Arsenic	9.20E+00	mg/kg	1.07E-06	mg/kg/day	1.50E+00	1/mg/kg/day	1.60E-06	---	---	---	---	---
				Beryllium	6.70E-01	mg/kg	7.79E-08	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.83E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								1.83E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)								1.83E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)								1.83E-06					---
			Dermal	Benzo[a]pyrene	2.60E-01	mg/kg	5.57E-08	mg/kg/day	7.30E+00	1/mg/kg/day	4.07E-07	---	---	---	---	---
				Total PCB Aroclors	3.01E-02	mg/kg	6.95E-09	mg/kg/day	2.00E+00	1/mg/kg/day	1.39E-08	---	---	---	---	---
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	1.85E-09	mg/kg/day	2.00E+00	1/mg/kg/day	3.69E-09	---	---	---	---	---
				Mammal TEQ (Measured)	2.22E-08	mg/kg	1.10E-15	mg/kg/day	1.50E+05	1/mg/kg/day	1.65E-10	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	7.26E-03	mg/kg	1.68E-09	mg/kg/day	2.00E+00	1/mg/kg/day	3.35E-09	---	---	---	---	---
				Arsenic	9.20E+00	mg/kg	4.55E-07	mg/kg/day	1.50E+00	1/mg/kg/day	6.83E-07	---	---	---	---	---
				Beryllium	6.70E-01	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.10E-06					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								1.09E-06					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)								1.09E-06					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)								1.09E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											2.94E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											2.92E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)											2.92E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)											2.92E-06					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-5

RAGS Part D TABLE 7.5

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	2.60E-01	mg/kg	---	---	---	---	---	2.47E-07	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.01E-02	mg/kg	---	---	---	---	---	2.86E-08	mg/kg/day	2.00E-05	mg/kg/day	1.43E-03
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	7.60E-09	mg/kg/day	2.00E-05	mg/kg/day	3.80E-04
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	2.11E-14	mg/kg/day	NA	NA	NA
				Arsenic	9.20E+00	mg/kg	---	---	---	---	---	8.74E-06	mg/kg/day	3.00E-04	mg/kg/day	2.91E-02
				Beryllium	6.70E-01	mg/kg	---	---	---	---	---	6.36E-07	mg/kg/day	2.00E-03	mg/kg/day	3.18E-04
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					3.09E-02
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.98E-02
			Dermal	Benzo[a]pyrene	2.60E-01	mg/kg	---	---	---	---	---	1.80E-07	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.01E-02	mg/kg	---	---	---	---	---	2.24E-08	mg/kg/day	2.00E-05	mg/kg/day	1.12E-03
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	5.96E-09	mg/kg/day	2.00E-05	mg/kg/day	2.98E-04
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	3.54E-15	mg/kg/day	NA	NA	NA
				Arsenic	9.20E+00	mg/kg	---	---	---	---	---	1.47E-06	mg/kg/day	3.00E-04	mg/kg/day	4.89E-03
				Beryllium	6.70E-01	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					6.01E-03
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					5.19E-03
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					3.69E-02
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					3.50E-02

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-6

RAGS Part D TABLE 7.6

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	2.60E-01	mg/kg	---	---	---	---	---	2.65E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.01E-02	mg/kg	---	---	---	---	---	3.06E-09	mg/kg/day	2.00E-05	mg/kg/day	1.53E-04
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	8.14E-10	mg/kg/day	2.00E-05	mg/kg/day	4.07E-05
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	2.26E-15	mg/kg/day	NA	NA	NA
				Arsenic	9.20E+00	mg/kg	---	---	---	---	---	9.36E-07	mg/kg/day	3.00E-04	mg/kg/day	3.12E-03
				Beryllium	6.70E-01	mg/kg	---	---	---	---	---	6.82E-08	mg/kg/day	2.00E-03	mg/kg/day	3.41E-05
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					3.31E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					3.20E-03
			Dermal	Benzo[a]pyrene	2.60E-01	mg/kg	---	---	---	---	---	1.18E-07	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.01E-02	mg/kg	---	---	---	---	---	1.47E-08	mg/kg/day	2.00E-05	mg/kg/day	7.33E-04
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	3.90E-09	mg/kg/day	2.00E-05	mg/kg/day	1.95E-04
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	2.32E-15	mg/kg/day	NA	NA	NA
				Arsenic	9.20E+00	mg/kg	---	---	---	---	---	9.61E-07	mg/kg/day	3.00E-04	mg/kg/day	3.20E-03
				Beryllium	6.70E-01	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					3.94E-03
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					3.40E-03
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					7.24E-03
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					6.59E-03

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-7

RAGS Part D TABLE 7.7

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	1.89E-09	mg/kg/day	7.30E+00	1/mg/kg/day	1.38E-08	---	---	---	---	---
				Benzo[b]fluoranthene	2.17E-01	mg/kg	2.56E-09	mg/kg/day	7.30E-01	1/mg/kg/day	1.87E-09	---	---	---	---	---
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	3.19E-10	mg/kg/day	7.30E+00	1/mg/kg/day	2.33E-09	---	---	---	---	---
				Total PCB Aroclors	3.37E+00	mg/kg	3.98E-08	mg/kg/day	2.00E+00	1/mg/kg/day	7.96E-08	---	---	---	---	---
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	6.36E-08	mg/kg/day	2.00E+00	1/mg/kg/day	1.27E-07	---	---	---	---	---
				Mammal TEQ (Measured)	4.91E-06	mg/kg	5.80E-14	mg/kg/day	1.50E+05	1/mg/kg/day	8.70E-09	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	4.78E+00	mg/kg	5.64E-08	mg/kg/day	2.00E+00	1/mg/kg/day	1.13E-07	---	---	---	---	---
				Arsenic	7.96E+00	mg/kg	9.40E-08	mg/kg/day	1.50E+00	1/mg/kg/day	1.41E-07	---	---	---	---	---
				Beryllium	1.60E+00	mg/kg	1.88E-08	mg/kg/day	NA	NA	NA	---	---	---	---	---
				Thallium	3.51E+00	mg/kg	4.15E-08	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								2.39E-07					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								2.86E-07					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								1.68E-07					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)								2.81E-07					---
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	5.83E-09	mg/kg/day	7.30E+00	1/mg/kg/day	4.26E-08	---	---	---	---	---
				Benzo[b]fluoranthene	2.17E-01	mg/kg	7.89E-09	mg/kg/day	7.30E-01	1/mg/kg/day	5.76E-09	---	---	---	---	---
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	9.82E-10	mg/kg/day	7.30E+00	1/mg/kg/day	7.17E-09	---	---	---	---	---
				Total PCB Aroclors	3.37E+00	mg/kg	1.32E-07	mg/kg/day	2.00E+00	1/mg/kg/day	2.64E-07	---	---	---	---	---
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	2.11E-07	mg/kg/day	2.00E+00	1/mg/kg/day	4.22E-07	---	---	---	---	---
				Mammal TEQ (Measured)	4.91E-06	mg/kg	4.13E-14	mg/kg/day	1.50E+05	1/mg/kg/day	6.19E-09	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	4.78E+00	mg/kg	1.87E-07	mg/kg/day	2.00E+00	1/mg/kg/day	3.75E-07	---	---	---	---	---
				Arsenic	7.96E+00	mg/kg	6.69E-08	mg/kg/day	1.50E+00	1/mg/kg/day	1.00E-07	---	---	---	---	---
				Beryllium	1.60E+00	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---
				Thallium	3.51E+00	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---

Table F-7

RAGS Part D TABLE 7.7

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment (cont'd)	Surface Sediment (cont'd)	Surface Sediment at Areas A & B (cont'd)	Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								4.20E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								5.78E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								1.62E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)								5.37E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											6.59E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											8.64E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)											3.30E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)											8.17E-07					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

Table F-8

RAGS Part D TABLE 7.8

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	1.90E-08	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	2.57E-08	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	3.20E-09	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	4.00E-07	mg/kg/day	2.00E-05	mg/kg/day	2.00E-02
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	6.39E-07	mg/kg/day	2.00E-05	mg/kg/day	3.19E-02
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	5.83E-13	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	9.45E-07	mg/kg/day	3.00E-04	mg/kg/day	3.15E-03
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	1.89E-07	mg/kg/day	2.00E-03	mg/kg/day	9.47E-05
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	4.17E-07	mg/kg/day	6.50E-05	mg/kg/day	6.42E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					2.97E-02
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					4.16E-02
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	5.54E-08	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	7.49E-08	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	9.32E-09	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	1.25E-06	mg/kg/day	2.00E-05	mg/kg/day	6.27E-02
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	2.00E-06	mg/kg/day	2.00E-05	mg/kg/day	1.00E-01
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	3.92E-13	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	6.35E-07	mg/kg/day	3.00E-04	mg/kg/day	2.12E-03
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	6.50E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					6.48E-02
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					1.02E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					9.45E-02
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					1.44E-01

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

Table F-9

RAGS Part D TABLE 7.9

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	2.04E-09	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	2.76E-09	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	3.43E-10	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	4.28E-08	mg/kg/day	2.00E-05	mg/kg/day	2.14E-03
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	6.85E-08	mg/kg/day	2.00E-05	mg/kg/day	3.42E-03
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	6.25E-14	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	1.01E-07	mg/kg/day	3.00E-04	mg/kg/day	3.38E-04
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	2.03E-08	mg/kg/day	2.00E-03	mg/kg/day	1.01E-05
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	4.47E-08	mg/kg/day	6.50E-05	mg/kg/day	6.88E-04
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					3.18E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					4.46E-03
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	8.46E-09	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	1.14E-08	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	1.42E-09	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	1.91E-07	mg/kg/day	2.00E-05	mg/kg/day	9.57E-03
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	3.06E-07	mg/kg/day	2.00E-05	mg/kg/day	1.53E-02
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	5.98E-14	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	9.70E-08	mg/kg/day	3.00E-04	mg/kg/day	3.23E-04
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	6.50E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					9.90E-03
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					1.56E-02
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					1.31E-02
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					2.01E-02

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

Table F-10

RAGS Part D TABLE 7.10

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	1.45E-01	mg/kg	1.71E-09	mg/kg/day	7.30E+00	1/mg/kg/day	1.25E-08	---	---	---	---	---
				Total PCB Aroclors	1.73E-02	mg/kg	2.04E-10	mg/kg/day	2.00E+00	1/mg/kg/day	4.09E-10	---	---	---	---	---
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	9.45E-11	mg/kg/day	2.00E+00	1/mg/kg/day	1.89E-10	---	---	---	---	---
				Mammal TEQ (Measured)	2.22E-08	mg/kg	2.62E-16	mg/kg/day	1.50E+05	1/mg/kg/day	3.93E-11	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	7.26E-03	mg/kg	8.58E-11	mg/kg/day	2.00E+00	1/mg/kg/day	1.72E-10	---	---	---	---	---
				Arsenic	6.30E+00	mg/kg	7.44E-08	mg/kg/day	1.50E+00	1/mg/kg/day	1.12E-07	---	---	---	---	---
				Beryllium	4.02E-01	mg/kg	4.75E-09	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.24E-07					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								1.24E-07					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)								1.24E-07					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)								1.24E-07					---
			Dermal	Benzo[a]pyrene	1.45E-01	mg/kg	5.27E-09	mg/kg/day	7.30E+00	1/mg/kg/day	3.84E-08	---	---	---	---	---
				Total PCB Aroclors	1.73E-02	mg/kg	6.79E-10	mg/kg/day	2.00E+00	1/mg/kg/day	1.36E-09	---	---	---	---	---
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	3.14E-10	mg/kg/day	2.00E+00	1/mg/kg/day	6.28E-10	---	---	---	---	---
				Mammal TEQ (Measured)	2.22E-08	mg/kg	1.87E-16	mg/kg/day	1.50E+05	1/mg/kg/day	2.80E-11	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	7.26E-03	mg/kg	2.85E-10	mg/kg/day	2.00E+00	1/mg/kg/day	5.69E-10	---	---	---	---	---
				Arsenic	6.30E+00	mg/kg	5.29E-08	mg/kg/day	1.50E+00	1/mg/kg/day	7.94E-08	---	---	---	---	---
				Beryllium	4.02E-01	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.19E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								1.18E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)								1.18E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)								1.18E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											2.44E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											2.43E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)											2.42E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus TEQ Congeners, and TEQ Measured)											2.43E-07					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-11

RAGS Part D TABLE 7.11

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	1.45E-01	mg/kg	---	---	---	---	---	1.72E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	1.73E-02	mg/kg	---	---	---	---	---	2.05E-09	mg/kg/day	2.00E-05	mg/kg/day	1.03E-04
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	9.50E-10	mg/kg/day	2.00E-05	mg/kg/day	4.75E-05
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	2.64E-15	mg/kg/day	NA	NA	NA
				Arsenic	6.30E+00	mg/kg	---	---	---	---	---	7.48E-07	mg/kg/day	3.00E-04	mg/kg/day	2.49E-03
				Beryllium	4.02E-01	mg/kg	---	---	---	---	---	4.77E-08	mg/kg/day	2.00E-03	mg/kg/day	2.39E-05
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					2.62E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.56E-03
			Dermal	Benzo[a]pyrene	1.45E-01	mg/kg	---	---	---	---	---	5.00E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	1.73E-02	mg/kg	---	---	---	---	---	6.44E-09	mg/kg/day	2.00E-05	mg/kg/day	3.22E-04
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	2.98E-09	mg/kg/day	2.00E-05	mg/kg/day	1.49E-04
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	1.77E-15	mg/kg/day	NA	NA	NA
				Arsenic	6.30E+00	mg/kg	---	---	---	---	---	5.03E-07	mg/kg/day	3.00E-04	mg/kg/day	1.68E-03
				Beryllium	4.02E-01	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					2.00E-03
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					1.82E-03
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					4.62E-03
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					4.39E-03

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-12

RAGS Part D TABLE 7.12

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	1.45E-01	mg/kg	---	---	---	---	---	1.84E-09	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	1.73E-02	mg/kg	---	---	---	---	---	2.20E-10	mg/kg/day	2.00E-05	mg/kg/day	1.10E-05
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	1.02E-10	mg/kg/day	2.00E-05	mg/kg/day	5.09E-06
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	2.82E-16	mg/kg/day	NA	NA	NA
				Arsenic	6.30E+00	mg/kg	---	---	---	---	---	8.01E-08	mg/kg/day	3.00E-04	mg/kg/day	2.67E-04
				Beryllium	4.02E-01	mg/kg	---	---	---	---	---	5.11E-09	mg/kg/day	2.00E-03	mg/kg/day	2.56E-06
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					2.81E-04
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.75E-04
			Dermal	Benzo[a]pyrene	1.45E-01	mg/kg	---	---	---	---	---	7.63E-09	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	1.73E-02	mg/kg	---	---	---	---	---	9.83E-10	mg/kg/day	2.00E-05	mg/kg/day	4.92E-05
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	4.55E-10	mg/kg/day	2.00E-05	mg/kg/day	2.27E-05
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	2.70E-16	mg/kg/day	NA	NA	NA
				Arsenic	6.30E+00	mg/kg	---	---	---	---	---	7.67E-08	mg/kg/day	3.00E-04	mg/kg/day	2.56E-04
				Beryllium	4.02E-01	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					3.05E-04
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.79E-04
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					5.86E-04
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					5.53E-04

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-13

RAGS Part D TABLE 7.13

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	1.40E-08	mg/kg/day	7.30E+00	1/mg/kg/day	1.02E-07	---	---	---	---	---
				Benzo[b]fluoranthene	2.17E-01	mg/kg	1.89E-08	mg/kg/day	7.30E-01	1/mg/kg/day	1.38E-08	---	---	---	---	---
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	2.35E-09	mg/kg/day	7.30E+00	1/mg/kg/day	1.72E-08	---	---	---	---	---
				Total PCB Aroclors	3.37E+00	mg/kg	2.94E-07	mg/kg/day	2.00E+00	1/mg/kg/day	5.88E-07	---	---	---	---	---
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	4.69E-07	mg/kg/day	2.00E+00	1/mg/kg/day	9.39E-07	---	---	---	---	---
				Mammal TEQ (Measured)	4.91E-06	mg/kg	4.28E-13	mg/kg/day	1.50E+05	1/mg/kg/day	6.42E-08	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	4.78E+00	mg/kg	4.17E-07	mg/kg/day	2.00E+00	1/mg/kg/day	8.33E-07	---	---	---	---	---
				Arsenic	7.96E+00	mg/kg	6.94E-07	mg/kg/day	1.50E+00	1/mg/kg/day	1.04E-06	---	---	---	---	---
				Beryllium	1.60E+00	mg/kg	1.39E-07	mg/kg/day	NA	NA	NA	---	---	---	---	---
				Thallium	3.51E+00	mg/kg	3.07E-07	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.76E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								2.11E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								1.24E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								2.07E-06					---
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	7.56E-08	mg/kg/day	7.30E+00	1/mg/kg/day	5.52E-07	---	---	---	---	---
				Benzo[b]fluoranthene	2.17E-01	mg/kg	1.02E-07	mg/kg/day	7.30E-01	1/mg/kg/day	7.47E-08	---	---	---	---	---
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	1.27E-08	mg/kg/day	7.30E+00	1/mg/kg/day	9.30E-08	---	---	---	---	---
				Total PCB Aroclors	3.37E+00	mg/kg	1.71E-06	mg/kg/day	2.00E+00	1/mg/kg/day	3.43E-06	---	---	---	---	---
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	2.74E-06	mg/kg/day	2.00E+00	1/mg/kg/day	5.47E-06	---	---	---	---	---
				Mammal TEQ (Measured)	4.91E-06	mg/kg	5.35E-13	mg/kg/day	1.50E+05	1/mg/kg/day	8.02E-08	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	4.78E+00	mg/kg	2.43E-06	mg/kg/day	2.00E+00	1/mg/kg/day	4.86E-06	---	---	---	---	---
				Arsenic	7.96E+00	mg/kg	8.67E-07	mg/kg/day	1.50E+00	1/mg/kg/day	1.30E-06	---	---	---	---	---
				Beryllium	1.60E+00	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---
				Thallium	3.51E+00	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---

Table F-13

RAGS Part D TABLE 7.13

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment (cont'd)	Surface Sediment (cont'd)	Surface Sediment at Areas A & B (cont'd)	Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								5.45E-06					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								7.49E-06					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								2.10E-06					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								6.96E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											7.21E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											9.61E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)											3.34E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)											9.03E-06					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

Table F-14

RAGS Part D TABLE 7.14

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	1.14E-07	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	1.54E-07	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	1.92E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	2.40E-06	mg/kg/day	2.00E-05	mg/kg/day	1.20E-01
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	3.83E-06	mg/kg/day	2.00E-05	mg/kg/day	1.92E-01
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	3.50E-12	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	5.67E-06	mg/kg/day	3.00E-04	mg/kg/day	1.89E-02
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	1.14E-06	mg/kg/day	2.00E-03	mg/kg/day	5.68E-04
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	2.50E-06	mg/kg/day	6.50E-05	mg/kg/day	3.85E-02
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					1.78E-01
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.50E-01
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	1.96E-07	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	2.65E-07	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	3.30E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	4.43E-06	mg/kg/day	2.00E-05	mg/kg/day	2.22E-01
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	7.08E-06	mg/kg/day	2.00E-05	mg/kg/day	3.54E-01
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	1.39E-12	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	2.25E-06	mg/kg/day	3.00E-04	mg/kg/day	7.49E-03
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	6.50E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					2.29E-01
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					3.62E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					4.07E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					6.11E-01

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

Table F-15

RAGS Part D TABLE 7.15

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	1.22E-08	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	1.65E-08	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	2.06E-09	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	2.57E-07	mg/kg/day	2.00E-05	mg/kg/day	1.29E-02
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	4.11E-07	mg/kg/day	2.00E-05	mg/kg/day	2.05E-02
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	3.75E-13	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	6.08E-07	mg/kg/day	3.00E-04	mg/kg/day	2.03E-03
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	1.22E-07	mg/kg/day	2.00E-03	mg/kg/day	6.09E-05
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	2.68E-07	mg/kg/day	6.50E-05	mg/kg/day	4.13E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					1.91E-02
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.68E-02
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	1.72E-07	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	2.32E-07	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	2.89E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	3.89E-06	mg/kg/day	2.00E-05	mg/kg/day	1.94E-01
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	6.21E-06	mg/kg/day	2.00E-05	mg/kg/day	3.11E-01
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	1.21E-12	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	1.97E-06	mg/kg/day	3.00E-04	mg/kg/day	6.56E-03
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	6.50E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					2.01E-01
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					3.17E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					2.20E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					3.44E-01

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, and beryllium.

Table F-16

RAGS Part D TABLE 7.16

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	2.60E-01	mg/kg	2.27E-08	mg/kg/day	7.30E+00	1/mg/kg/day	1.66E-07	---	---	---	---	---
				Total PCB Aroclors	3.01E-02	mg/kg	2.63E-09	mg/kg/day	2.00E+00	1/mg/kg/day	5.25E-09	---	---	---	---	---
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	6.98E-10	mg/kg/day	2.00E+00	1/mg/kg/day	1.40E-09	---	---	---	---	---
				Mammal TEQ (Measured)	2.22E-08	mg/kg	1.94E-15	mg/kg/day	1.50E+05	1/mg/kg/day	2.90E-10	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	7.26E-03	mg/kg	6.33E-10	mg/kg/day	2.00E+00	1/mg/kg/day	1.27E-09	---	---	---	---	---
				Arsenic	9.20E+00	mg/kg	8.02E-07	mg/kg/day	1.50E+00	1/mg/kg/day	1.20E-06	---	---	---	---	---
				Beryllium	6.70E-01	mg/kg	5.84E-08	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.37E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								1.37E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)								1.37E-06					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								1.37E-06					---
			Dermal	Benzo[a]pyrene	2.60E-01	mg/kg	1.23E-07	mg/kg/day	7.30E+00	1/mg/kg/day	8.96E-07	---	---	---	---	---
				Total PCB Aroclors	3.01E-02	mg/kg	1.53E-08	mg/kg/day	2.00E+00	1/mg/kg/day	3.06E-08	---	---	---	---	---
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	4.07E-09	mg/kg/day	2.00E+00	1/mg/kg/day	8.14E-09	---	---	---	---	---
				Mammal TEQ (Measured)	2.22E-08	mg/kg	2.42E-15	mg/kg/day	1.50E+05	1/mg/kg/day	3.63E-10	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	7.26E-03	mg/kg	3.69E-09	mg/kg/day	2.00E+00	1/mg/kg/day	7.38E-09	---	---	---	---	---
				Arsenic	9.20E+00	mg/kg	1.00E-06	mg/kg/day	1.50E+00	1/mg/kg/day	1.50E-06	---	---	---	---	---
				Beryllium	6.70E-01	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								2.43E-06					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								2.41E-06					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)								2.40E-06					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								2.41E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											3.80E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											3.78E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)											3.77E-06					---
Sediment Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)											3.78E-06					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-17

RAGS Part D TABLE 7.17

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	2.60E-01	mg/kg	---	---	---	---	---	1.85E-07	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.01E-02	mg/kg	---	---	---	---	---	2.14E-08	mg/kg/day	2.00E-05	mg/kg/day	1.07E-03
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	5.70E-09	mg/kg/day	2.00E-05	mg/kg/day	2.85E-04
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	1.58E-14	mg/kg/day	NA	NA	NA
				Arsenic	9.20E+00	mg/kg	---	---	---	---	---	6.55E-06	mg/kg/day	3.00E-04	mg/kg/day	2.18E-02
				Beryllium	6.70E-01	mg/kg	---	---	---	---	---	4.77E-07	mg/kg/day	2.00E-03	mg/kg/day	2.39E-04
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					2.32E-02
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.24E-02
			Dermal	Benzo[a]pyrene	2.60E-01	mg/kg	---	---	---	---	---	3.18E-07	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.01E-02	mg/kg	---	---	---	---	---	3.96E-08	mg/kg/day	2.00E-05	mg/kg/day	1.98E-03
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	1.05E-08	mg/kg/day	2.00E-05	mg/kg/day	5.27E-04
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	6.26E-15	mg/kg/day	NA	NA	NA
				Arsenic	9.20E+00	mg/kg	---	---	---	---	---	2.60E-06	mg/kg/day	3.00E-04	mg/kg/day	8.65E-03
				Beryllium	6.70E-01	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					1.06E-02
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					9.18E-03
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					3.38E-02
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					3.15E-02

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-18

RAGS Part D TABLE 7.18

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	2.60E-01	mg/kg	---	---	---	---	---	1.98E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.01E-02	mg/kg	---	---	---	---	---	2.30E-09	mg/kg/day	2.00E-05	mg/kg/day	1.15E-04
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	6.11E-10	mg/kg/day	2.00E-05	mg/kg/day	3.05E-05
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	1.69E-15	mg/kg/day	NA	NA	NA
				Arsenic	9.20E+00	mg/kg	---	---	---	---	---	7.02E-07	mg/kg/day	3.00E-04	mg/kg/day	2.34E-03
				Beryllium	6.70E-01	mg/kg	---	---	---	---	---	5.11E-08	mg/kg/day	2.00E-03	mg/kg/day	2.56E-05
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					2.48E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.40E-03
			Dermal	Benzo[a]pyrene	2.60E-01	mg/kg	---	---	---	---	---	2.79E-07	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.01E-02	mg/kg	---	---	---	---	---	3.47E-08	mg/kg/day	2.00E-05	mg/kg/day	1.74E-03
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	9.23E-09	mg/kg/day	2.00E-05	mg/kg/day	4.62E-04
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	5.49E-15	mg/kg/day	NA	NA	NA
				Arsenic	9.20E+00	mg/kg	---	---	---	---	---	2.27E-06	mg/kg/day	3.00E-04	mg/kg/day	7.58E-03
				Beryllium	6.70E-01	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					9.32E-03
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					8.04E-03
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					1.18E-02
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					1.04E-02

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-19

RAGS Part D TABLE 7.19

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	9.46E-10	mg/kg/day	7.30E+00	1/mg/kg/day	6.91E-09	---	---	---	---	---
				Benzo[b]fluoranthene	2.17E-01	mg/kg	1.28E-09	mg/kg/day	7.30E-01	1/mg/kg/day	9.34E-10	---	---	---	---	---
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	1.59E-10	mg/kg/day	7.30E+00	1/mg/kg/day	1.16E-09	---	---	---	---	---
				Total PCB Aroclors	3.37E+00	mg/kg	1.99E-08	mg/kg/day	2.00E+00	1/mg/kg/day	3.98E-08	---	---	---	---	---
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	3.18E-08	mg/kg/day	2.00E+00	1/mg/kg/day	6.36E-08	---	---	---	---	---
				Mammal TEQ (Measured)	4.91E-06	mg/kg	2.90E-14	mg/kg/day	1.50E+05	1/mg/kg/day	4.35E-09	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	4.78E+00	mg/kg	2.82E-08	mg/kg/day	2.00E+00	1/mg/kg/day	5.64E-08	---	---	---	---	---
				Arsenic	7.96E+00	mg/kg	4.70E-08	mg/kg/day	1.50E+00	1/mg/kg/day	7.05E-08	---	---	---	---	---
				Beryllium	1.60E+00	mg/kg	9.42E-09	mg/kg/day	NA	NA	NA	---	---	---	---	---
				Thallium	3.51E+00	mg/kg	2.08E-08	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.19E-07					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								1.43E-07					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								8.39E-08					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								1.40E-07					---
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	7.31E-09	mg/kg/day	7.30E+00	1/mg/kg/day	5.34E-08	---	---	---	---	---
				Benzo[b]fluoranthene	2.17E-01	mg/kg	9.89E-09	mg/kg/day	7.30E-01	1/mg/kg/day	7.22E-09	---	---	---	---	---
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	1.23E-09	mg/kg/day	7.30E+00	1/mg/kg/day	8.99E-09	---	---	---	---	---
				Total PCB Aroclors	3.37E+00	mg/kg	1.66E-07	mg/kg/day	2.00E+00	1/mg/kg/day	3.31E-07	---	---	---	---	---
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	2.65E-07	mg/kg/day	2.00E+00	1/mg/kg/day	5.29E-07	---	---	---	---	---
				Mammal TEQ (Measured)	4.91E-06	mg/kg	5.17E-14	mg/kg/day	1.50E+05	1/mg/kg/day	7.76E-09	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	4.78E+00	mg/kg	2.35E-07	mg/kg/day	2.00E+00	1/mg/kg/day	4.70E-07	---	---	---	---	---
				Arsenic	7.96E+00	mg/kg	8.38E-08	mg/kg/day	1.50E+00	1/mg/kg/day	1.26E-07	---	---	---	---	---
				Beryllium	1.60E+00	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---
				Thallium	3.51E+00	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---

Table F-19

RAGS Part D TABLE 7.19

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment (cont'd)	Surface Sediment (cont'd)	Surface Sediment at Areas A & B (cont'd)	Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								5.26E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								7.24E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								2.03E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								6.73E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											6.46E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											8.68E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)											2.87E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)											8.13E-07					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

Table F-20

RAGS Part D TABLE 7.20

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	9.51E-09	mg/kg/day	NA	NA	NA
		at Areas A & B		Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	1.29E-08	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	1.60E-09	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	2.00E-07	mg/kg/day	2.00E-05	mg/kg/day	1.00E-02
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	3.19E-07	mg/kg/day	2.00E-05	mg/kg/day	1.60E-02
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	2.91E-13	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	4.73E-07	mg/kg/day	3.00E-04	mg/kg/day	1.58E-03
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	9.47E-08	mg/kg/day	2.00E-03	mg/kg/day	4.73E-05
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	2.09E-07	mg/kg/day	6.50E-05	mg/kg/day	3.21E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					1.48E-02
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.08E-02
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	6.53E-08	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	8.83E-08	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	1.10E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	1.48E-06	mg/kg/day	2.00E-05	mg/kg/day	7.39E-02
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	2.36E-06	mg/kg/day	2.00E-05	mg/kg/day	1.18E-01
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	4.62E-13	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	7.49E-07	mg/kg/day	3.00E-04	mg/kg/day	2.50E-03
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	6.50E-05	mg/kg/day	NA
Sediment	Surface Sediment	Surface Sediment	Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					7.64E-02
(cont'd)	(cont'd)	at Areas A & B	Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					1.21E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					9.12E-02
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					1.41E-01

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

Table F-21

RAGS Part D TABLE 7.21

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment	Ingestion	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	1.02E-09	mg/kg/day	NA	NA	NA
		at Areas A & B		Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	1.38E-09	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	1.72E-10	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	2.14E-08	mg/kg/day	2.00E-05	mg/kg/day	1.07E-03
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	3.42E-08	mg/kg/day	2.00E-05	mg/kg/day	1.71E-03
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	3.12E-14	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	5.06E-08	mg/kg/day	3.00E-04	mg/kg/day	1.69E-04
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	1.01E-08	mg/kg/day	2.00E-03	mg/kg/day	5.07E-06
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	2.23E-08	mg/kg/day	6.50E-05	mg/kg/day	3.44E-04
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					1.59E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.23E-03
			Dermal	Benzo[a]pyrene	1.60E-01	mg/kg	---	---	---	---	---	1.34E-08	mg/kg/day	NA	NA	NA
				Benzo[b]fluoranthene	2.17E-01	mg/kg	---	---	---	---	---	1.81E-08	mg/kg/day	NA	NA	NA
				Dibenz[a,h]anthracene	2.70E-02	mg/kg	---	---	---	---	---	2.25E-09	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.37E+00	mg/kg	---	---	---	---	---	3.02E-07	mg/kg/day	2.00E-05	mg/kg/day	1.51E-02
				Total PCB Congeners (Measured)	5.38E+00	mg/kg	---	---	---	---	---	4.83E-07	mg/kg/day	2.00E-05	mg/kg/day	2.42E-02
				Mammal TEQ (Measured)	4.91E-06	mg/kg	---	---	---	---	---	9.44E-14	mg/kg/day	NA	NA	NA
				Arsenic	7.96E+00	mg/kg	---	---	---	---	---	1.53E-07	mg/kg/day	3.00E-04	mg/kg/day	5.10E-04
				Beryllium	1.60E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
				Thallium	3.51E+00	mg/kg	---	---	---	---	---	NA	mg/kg/day	6.50E-05	mg/kg/day	NA
Sediment	Surface Sediment	Surface Sediment	Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					1.56E-02
(cont'd)	(cont'd)	at Areas A & B	Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.47E-02
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					1.72E-02
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					2.69E-02

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, arsenic, beryllium, and thallium.

Table F-22

RAGS Part D TABLE 7.22

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	1.45E-01	mg/kg	8.54E-10	mg/kg/day	7.30E+00	1/mg/kg/day	6.23E-09	---	---	---	---	---
				Total PCB Aroclors	1.73E-02	mg/kg	1.02E-10	mg/kg/day	2.00E+00	1/mg/kg/day	2.04E-10	---	---	---	---	---
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	4.72E-11	mg/kg/day	2.00E+00	1/mg/kg/day	9.45E-11	---	---	---	---	---
				Mammal TEQ (Measured)	2.22E-08	mg/kg	1.31E-16	mg/kg/day	1.50E+05	1/mg/kg/day	1.97E-11	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	7.26E-03	mg/kg	4.29E-11	mg/kg/day	2.00E+00	1/mg/kg/day	8.58E-11	---	---	---	---	---
				Arsenic	6.30E+00	mg/kg	3.72E-08	mg/kg/day	1.50E+00	1/mg/kg/day	5.58E-08	---	---	---	---	---
				Beryllium	4.02E-01	mg/kg	2.37E-09	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								6.22E-08					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								6.21E-08					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)								6.21E-08					---
			Ingestion Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								6.21E-08					---
			Dermal	Benzo[a]pyrene	1.45E-01	mg/kg	6.60E-09	mg/kg/day	7.30E+00	1/mg/kg/day	4.82E-08	---	---	---	---	---
				Total PCB Aroclors	1.73E-02	mg/kg	8.50E-10	mg/kg/day	2.00E+00	1/mg/kg/day	1.70E-09	---	---	---	---	---
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	3.93E-10	mg/kg/day	2.00E+00	1/mg/kg/day	7.86E-10	---	---	---	---	---
				Mammal TEQ (Measured)	2.22E-08	mg/kg	2.34E-16	mg/kg/day	1.50E+05	1/mg/kg/day	3.51E-11	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	7.26E-03	mg/kg	3.57E-10	mg/kg/day	2.00E+00	1/mg/kg/day	7.14E-10	---	---	---	---	---
				Arsenic	6.30E+00	mg/kg	6.64E-08	mg/kg/day	1.50E+00	1/mg/kg/day	9.95E-08	---	---	---	---	---
				Beryllium	4.02E-01	mg/kg	NA	mg/kg/day	NA	NA	NA	---	---	---	---	---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.49E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								1.48E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)								1.48E-07					---
			Dermal Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								1.48E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											2.12E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											2.11E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)											2.10E-07					---
Sediment Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)											2.11E-07					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-23

RAGS Part D TABLE 7.23

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	1.45E-01	mg/kg	---	---	---	---	---	8.58E-09	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	1.73E-02	mg/kg	---	---	---	---	---	1.03E-09	mg/kg/day	2.00E-05	mg/kg/day	5.13E-05
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	4.75E-10	mg/kg/day	2.00E-05	mg/kg/day	2.37E-05
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	1.32E-15	mg/kg/day	NA	NA	NA
				Arsenic	6.30E+00	mg/kg	---	---	---	---	---	3.74E-07	mg/kg/day	3.00E-04	mg/kg/day	1.25E-03
				Beryllium	4.02E-01	mg/kg	---	---	---	---	---	2.39E-08	mg/kg/day	2.00E-03	mg/kg/day	1.19E-05
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					1.31E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					1.28E-03
			Dermal	Benzo[a]pyrene	1.45E-01	mg/kg	---	---	---	---	---	5.89E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	1.73E-02	mg/kg	---	---	---	---	---	7.59E-09	mg/kg/day	2.00E-05	mg/kg/day	3.80E-04
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	3.51E-09	mg/kg/day	2.00E-05	mg/kg/day	1.76E-04
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	2.09E-15	mg/kg/day	NA	NA	NA
				Arsenic	6.30E+00	mg/kg	---	---	---	---	---	5.92E-07	mg/kg/day	3.00E-04	mg/kg/day	1.97E-03
				Beryllium	4.02E-01	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					2.35E-03
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					2.15E-03
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					3.66E-03
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					3.43E-03

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-24

RAGS Part D TABLE 7.24

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Area C	Ingestion	Benzo[a]pyrene	1.45E-01	mg/kg	---	---	---	---	---	9.20E-10	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	1.73E-02	mg/kg	---	---	---	---	---	1.10E-10	mg/kg/day	2.00E-05	mg/kg/day	5.50E-06
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	5.09E-11	mg/kg/day	2.00E-05	mg/kg/day	2.54E-06
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	1.41E-16	mg/kg/day	NA	NA	NA
				Arsenic	6.30E+00	mg/kg	---	---	---	---	---	4.01E-08	mg/kg/day	3.00E-04	mg/kg/day	1.34E-04
				Beryllium	4.02E-01	mg/kg	---	---	---	---	---	2.56E-09	mg/kg/day	2.00E-03	mg/kg/day	1.28E-06
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					1.40E-04
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					1.37E-04
			Dermal	Benzo[a]pyrene	1.45E-01	mg/kg	---	---	---	---	---	1.21E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	1.73E-02	mg/kg	---	---	---	---	---	1.55E-09	mg/kg/day	2.00E-05	mg/kg/day	7.76E-05
				Total PCB Congeners (Measured)	8.00E-03	mg/kg	---	---	---	---	---	7.18E-10	mg/kg/day	2.00E-05	mg/kg/day	3.59E-05
				Mammal TEQ (Measured)	2.22E-08	mg/kg	---	---	---	---	---	4.27E-16	mg/kg/day	NA	NA	NA
				Arsenic	6.30E+00	mg/kg	---	---	---	---	---	1.21E-07	mg/kg/day	3.00E-04	mg/kg/day	4.04E-04
				Beryllium	4.02E-01	mg/kg	---	---	---	---	---	NA	mg/kg/day	1.40E-05	mg/kg/day	NA
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					4.82E-04
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					4.40E-04
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					6.22E-04
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					5.77E-04

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-25

RAGS Part D TABLE 7.25

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Rope Swing
Receptor Age: Adolescent (10-18 yrs)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Subarea A	Ingestion	Benzo[a]pyrene	1.28E-01	mg/kg	1.51E-09	mg/kg/day	7.30E+00	1/mg/kg/day	1.10E-08	1.32E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.82E+00	mg/kg	4.49E-08	mg/kg/day	2.00E+00	1/mg/kg/day	8.97E-08	3.92E-07	mg/kg/day	2.00E-05	mg/kg/day	1.96E-02
				Total PCB Congeners (Measured)	1.10E+01	mg/kg	1.29E-07	mg/kg/day	2.00E+00	1/mg/kg/day	2.58E-07	1.13E-06	mg/kg/day	2.00E-05	mg/kg/day	5.65E-02
				Mammal TEQ (Measured)	4.86E-04	mg/kg	5.71E-12	mg/kg/day	1.50E+05	1/mg/kg/day	8.56E-07	4.99E-11	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	1.09E+01	mg/kg	1.28E-07	mg/kg/day	2.00E+00	1/mg/kg/day	2.56E-07	NA	NA	NA	NA	NA
				Arsenic	4.78E+00	mg/kg	5.61E-08	mg/kg/day	1.50E+00	1/mg/kg/day	8.41E-08	4.91E-07	mg/kg/day	3.00E-04	mg/kg/day	1.64E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.85E-07					2.13E-02
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								3.53E-07					5.81E-02
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								9.51E-07					1.64E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								1.21E-06					NA
			Dermal	Benzo[a]pyrene	1.28E-01	mg/kg	1.76E-08	mg/kg/day	7.30E+00	1/mg/kg/day	1.29E-07	1.54E-07	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.82E+00	mg/kg	5.65E-07	mg/kg/day	2.00E+00	1/mg/kg/day	1.13E-06	4.95E-06	mg/kg/day	2.00E-05	mg/kg/day	2.47E-01
				Total PCB Congeners (Measured)	1.10E+01	mg/kg	1.63E-06	mg/kg/day	2.00E+00	1/mg/kg/day	3.25E-06	1.42E-05	mg/kg/day	2.00E-05	mg/kg/day	7.12E-01
				Mammal TEQ (Measured)	4.86E-04	mg/kg	1.54E-11	mg/kg/day	1.50E+05	1/mg/kg/day	2.31E-06	1.35E-10	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	1.09E+01	mg/kg	1.61E-06	mg/kg/day	2.00E+00	1/mg/kg/day	3.22E-06	NA	NA	NA	NA	NA
				Arsenic	4.78E+00	mg/kg	1.51E-07	mg/kg/day	1.50E+00	1/mg/kg/day	2.27E-07	1.33E-06	mg/kg/day	3.00E-04	mg/kg/day	4.42E-03
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.49E-06					2.52E-01
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								3.61E-06					7.16E-01
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								2.67E-06					4.42E-03
			Dermal Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								5.89E-06					NA
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											1.67E-06					2.73E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											3.96E-06					7.75E-01
Sediment Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)											3.62E-06					6.05E-03
Sediment Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)											7.10E-06					NA

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene and arsenic.

Table F-26

RAGS Part D TABLE 7.26

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Rope Swing
Receptor Age: Adolescent (10-18 yrs)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Sediment	Surface Sediment	Surface Sediment at Subarea A	Ingestion	Benzo[a]pyrene	1.28E-01	mg/kg	1.26E-10	mg/kg/day	7.30E+00	1/mg/kg/day	9.16E-10	1.10E-09	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.82E+00	mg/kg	3.74E-09	mg/kg/day	2.00E+00	1/mg/kg/day	7.48E-09	3.27E-08	mg/kg/day	2.00E-05	mg/kg/day	1.64E-03
				Total PCB Congeners (Measured)	1.10E+01	mg/kg	1.08E-08	mg/kg/day	2.00E+00	1/mg/kg/day	2.15E-08	9.42E-08	mg/kg/day	2.00E-05	mg/kg/day	4.71E-03
				Mammal TEQ (Measured)	4.91E-06	mg/kg	4.80E-15	mg/kg/day	1.50E+05	1/mg/kg/day	7.21E-10	4.20E-14	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	1.09E+01	mg/kg	1.07E-08	mg/kg/day	2.00E+00	1/mg/kg/day	2.13E-08	NA	NA	NA	NA	NA
				Arsenic	4.78E+00	mg/kg	4.67E-09	mg/kg/day	1.50E+00	1/mg/kg/day	7.01E-09	4.09E-08	mg/kg/day	3.00E-04	mg/kg/day	1.36E-04
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.54E-08					1.77E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								2.95E-08					4.85E-03
			Ingestion Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								8.65E-09					1.36E-04
			Ingestion Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								3.00E-08					NA
			Dermal	Benzo[a]pyrene	1.28E-01	mg/kg	1.37E-09	mg/kg/day	7.30E+00	1/mg/kg/day	1.00E-08	1.20E-08	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	3.82E+00	mg/kg	4.40E-08	mg/kg/day	2.00E+00	1/mg/kg/day	8.79E-08	3.85E-07	mg/kg/day	2.00E-05	mg/kg/day	1.92E-02
				Total PCB Congeners (Measured)	1.10E+01	mg/kg	1.27E-07	mg/kg/day	2.00E+00	1/mg/kg/day	2.53E-07	1.11E-06	mg/kg/day	2.00E-05	mg/kg/day	5.54E-02
				Mammal TEQ (Measured)	4.91E-06	mg/kg	1.21E-14	mg/kg/day	1.50E+05	1/mg/kg/day	1.82E-09	1.06E-13	mg/kg/day	NA	NA	NA
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	1.09E+01	mg/kg	1.25E-07	mg/kg/day	2.00E+00	1/mg/kg/day	2.51E-07	NA	NA	NA	NA	NA
				Arsenic	4.78E+00	mg/kg	1.18E-08	mg/kg/day	1.50E+00	1/mg/kg/day	1.77E-08	1.03E-07	mg/kg/day	3.00E-04	mg/kg/day	3.44E-04
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.16E-07					1.96E-02
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								2.81E-07					5.57E-02
			Dermal Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								2.95E-08					3.44E-04
			Dermal Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								2.80E-07					NA
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											1.31E-07					2.13E-02
Sediment Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											3.10E-07					6.06E-02
Sediment Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)											3.81E-08					4.80E-04
Sediment Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)											3.10E-07					NA

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene and arsenic.

Table F-27

RAGS Part D TABLE 7.27

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	Ingestion	4,4'-DDE	8.35E-03	mg/kg	4.14E-07	mg/kg/day	3.40E-01	1/mg/kg/day	1.41E-07	---	---	---	---	---
				Total PCB Aroclors	2.06E+00	mg/kg	1.02E-04	mg/kg/day	2.00E+00	1/mg/kg/day	2.04E-04	---	---	---	---	---
				Total PCB Congeners (Measured)	3.17E+00	mg/kg	1.57E-04	mg/kg/day	2.00E+00	1/mg/kg/day	3.14E-04	---	---	---	---	---
				Mammal TEQ (Measured)	2.54E-06	mg/kg	1.26E-10	mg/kg/day	1.50E+05	1/mg/kg/day	1.89E-05	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	3.48E+00	mg/kg	1.72E-04	mg/kg/day	2.00E+00	1/mg/kg/day	3.45E-04	---	---	---	---	---
				Mercury	1.40E-01	mg/kg	6.94E-06	mg/kg/day	NA	NA	NA	---	---	---	---	---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											2.05E-04					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											3.15E-04					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)											1.90E-05					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)											3.64E-04					---

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

Table F-28

RAGS Part D TABLE 7.28

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish	Ingestion	4,4'-DDE	8.35E-03	mg/kg	---	---	---	---	---	1.63E-06	mg/kg/day	NA	NA	NA
		at Areas A & B		Total PCB Aroclors	2.06E+00	mg/kg	---	---	---	---	---	4.02E-04	mg/kg/day	2.00E-05	mg/kg/day	2.01E+01
				Total PCB Congeners (Measured)	3.17E+00	mg/kg	---	---	---	---	---	6.18E-04	mg/kg/day	2.00E-05	mg/kg/day	3.09E+01
				Mammal TEQ (Measured)	2.54E-06	mg/kg	---	---	---	---	---	4.95E-10	mg/kg/day	NA	NA	NA
				Mercury	1.40E-01	mg/kg	---	---	---	---	---	2.73E-05	mg/kg/day	3.00E-04	mg/kg/day	9.10E-02
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					2.02E+01
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					3.10E+01

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

Table F-29

RAGS Part D TABLE 7.29

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	Ingestion	4,4'-DDE	8.35E-03	mg/kg	---	---	---	---	---	8.00E-07	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	2.06E+00	mg/kg	---	---	---	---	---	1.98E-04	mg/kg/day	2.00E-05	mg/kg/day	9.88E+00
				Total PCB Congeners (Measured)	3.17E+00	mg/kg	---	---	---	---	---	3.04E-04	mg/kg/day	2.00E-05	mg/kg/day	1.52E+01
				Mammal TEQ (Measured)	2.54E-06	mg/kg	---	---	---	---	---	2.44E-10	mg/kg/day	NA	NA	NA
				Mercury	1.40E-01	mg/kg	---	---	---	---	---	1.34E-05	mg/kg/day	3.00E-04	mg/kg/day	4.47E-02
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					9.93E+00
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					1.52E+01

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

Table F-30

RAGS Part D TABLE 7.30

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Ingestion	Total PCB Aroclors	6.36E-02	mg/kg	3.15E-06	mg/kg/day	2.00E+00	1/mg/kg/day	6.31E-06	---	---	---	---	---
				Total PCB Congeners (Measured)	2.50E-02	mg/kg	1.24E-06	mg/kg/day	2.00E+00	1/mg/kg/day	2.48E-06	---	---	---	---	---
				Mammal TEQ (Measured)	5.70E-08	mg/kg	2.83E-12	mg/kg/day	1.50E+05	1/mg/kg/day	4.24E-07	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	2.31E-02	mg/kg	1.15E-06	mg/kg/day	2.00E+00	1/mg/kg/day	2.29E-06	---	---	---	---	---
				Mercury	2.76E-01	mg/kg	1.37E-05	mg/kg/day	NA	NA	NA	---	---	---	---	---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											6.31E-06					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											2.48E-06					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)											4.24E-07					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)											2.72E-06					---

Note: The non-PCB/TEQ COPC refers to mercury.

Table F-31

RAGS Part D TABLE 7.31

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Ingestion	Total PCB Aroclors	6.36E-02	mg/kg	---	---	---	---	---	1.24E-05	mg/kg/day	2.00E-05	mg/kg/day	6.20E-01
				Total PCB Congeners (Measured)	2.50E-02	mg/kg	---	---	---	---	---	4.87E-06	mg/kg/day	2.00E-05	mg/kg/day	2.44E-01
				Mammal TEQ (Measured)	5.70E-08	mg/kg	---	---	---	---	---	1.11E-11	mg/kg/day	NA	NA	NA
				Mercury	2.76E-01	mg/kg	---	---	---	---	---	5.38E-05	mg/kg/day	3.00E-04	mg/kg/day	1.79E-01
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					7.99E-01
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					4.23E-01

Note: The non-PCB/TEQ COPC refers to mercury.

Table F-32

RAGS Part D TABLE 7.32

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Ingestion	Total PCB Aroclors	6.36E-02	mg/kg	---	---	---	---	---	6.10E-06	mg/kg/day	2.00E-05	mg/kg/day	3.05E-01
				Total PCB Congeners (Measured)	2.50E-02	mg/kg	---	---	---	---	---	2.40E-06	mg/kg/day	2.00E-05	mg/kg/day	1.20E-01
				Mammal TEQ (Measured)	5.70E-08	mg/kg	---	---	---	---	---	5.47E-12	mg/kg/day	NA	NA	NA
				Mercury	2.76E-01	mg/kg	---	---	---	---	---	2.65E-05	mg/kg/day	3.00E-04	mg/kg/day	8.82E-02
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					3.93E-01
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					2.08E-01

Note: The non-PCB/TEQ COPC refers to mercury.

Table F-33

RAGS Part D TABLE 7.33

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	Ingestion	4,4'-DDE	8.35E-03	mg/kg	7.50E-08	mg/kg/day	3.40E-01	1/mg/kg/day	2.55E-08	---	---	---	---	---
				Total PCB Aroclors	2.06E+00	mg/kg	1.85E-05	mg/kg/day	2.00E+00	1/mg/kg/day	3.70E-05	---	---	---	---	---
				Total PCB Congeners (Measured)	3.17E+00	mg/kg	2.85E-05	mg/kg/day	2.00E+00	1/mg/kg/day	5.70E-05	---	---	---	---	---
				Mammal TEQ (Measured)	2.54E-06	mg/kg	2.28E-11	mg/kg/day	1.50E+05	1/mg/kg/day	3.42E-06	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	3.48E+00	mg/kg	3.13E-05	mg/kg/day	2.00E+00	1/mg/kg/day	6.25E-05	---	---	---	---	---
				Mercury	1.40E-01	mg/kg	1.26E-06	mg/kg/day	NA	NA	NA	---	---	---	---	---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											3.71E-05					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											5.70E-05					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)											3.45E-06					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)											6.60E-05					---

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

Table F-34

RAGS Part D TABLE 7.34

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	Ingestion	4,4'-DDE	8.35E-03	mg/kg	---	---	---	---	---	4.94E-07	mg/kg/day	NA	NA	NA
				Total PCB Aroclors	2.06E+00	mg/kg	---	---	---	---	---	1.22E-04	mg/kg/day	2.00E-05	mg/kg/day	6.09E+00
				Total PCB Congeners (Measured)	3.17E+00	mg/kg	---	---	---	---	---	1.88E-04	mg/kg/day	2.00E-05	mg/kg/day	9.38E+00
				Mammal TEQ (Measured)	2.54E-06	mg/kg	---	---	---	---	---	1.50E-10	mg/kg/day	NA	NA	NA
				Mercury	1.40E-01	mg/kg	---	---	---	---	---	8.28E-06	mg/kg/day	3.00E-04	mg/kg/day	2.76E-02
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					6.12E+00
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					9.40E+00

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

Table F-35

RAGS Part D TABLE 7.35

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish	Ingestion	4,4'-DDE	8.35E-03	mg/kg	---	---	---	---	---	2.54E-07	mg/kg/day	NA	NA	NA
		at Areas A & B		Total PCB Aroclors	2.06E+00	mg/kg	---	---	---	---	---	6.28E-05	mg/kg/day	2.00E-05	mg/kg/day	3.14E+00
				Total PCB Congeners (Measured)	3.17E+00	mg/kg	---	---	---	---	---	9.67E-05	mg/kg/day	2.00E-05	mg/kg/day	4.83E+00
				Mammal TEQ (Measured)	2.54E-06	mg/kg	---	---	---	---	---	7.74E-11	mg/kg/day	NA	NA	NA
				Mercury	1.40E-01	mg/kg	---	---	---	---	---	4.27E-06	mg/kg/day	3.00E-04	mg/kg/day	1.42E-02
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					3.16E+00
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					4.85E+00

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

Table F-36

RAGS Part D TABLE 7.36

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Ingestion	Total PCB Aroclors	2.66E-02	mg/kg	2.39E-07	mg/kg/day	2.00E+00	1/mg/kg/day	4.78E-07	---	---	---	---	---
				Total PCB Congeners (Measured)	1.35E-02	mg/kg	1.21E-07	mg/kg/day	2.00E+00	1/mg/kg/day	2.43E-07	---	---	---	---	---
				Mammal TEQ (Measured)	4.03E-08	mg/kg	3.62E-13	mg/kg/day	1.50E+05	1/mg/kg/day	5.43E-08	---	---	---	---	---
				Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	1.22E-02	mg/kg	1.09E-07	mg/kg/day	2.00E+00	1/mg/kg/day	2.19E-07	---	---	---	---	---
				Mercury	1.48E-01	mg/kg	1.33E-06	mg/kg/day	NA	NA	NA	---	---	---	---	---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											4.78E-07					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											2.43E-07					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ Measured)											5.43E-08					---
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs , Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)											2.73E-07					---

Note: The non-PCB/TEQ COPC refers to mercury.

Table F-37

RAGS Part D TABLE 7.37

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Ingestion	Total PCB Aroclors	2.66E-02	mg/kg	---	---	---	---	---	1.57E-06	mg/kg/day	2.00E-05	mg/kg/day	7.87E-02
				Total PCB Congeners (Measured)	1.35E-02	mg/kg	---	---	---	---	---	7.99E-07	mg/kg/day	2.00E-05	mg/kg/day	4.00E-02
				Mammal TEQ (Measured)	4.03E-08	mg/kg	---	---	---	---	---	2.38E-12	mg/kg/day	NA	NA	NA
				Mercury	1.48E-01	mg/kg	---	---	---	---	---	8.75E-06	mg/kg/day	3.00E-04	mg/kg/day	2.92E-02
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					1.08E-01
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					6.91E-02

Note: The non-PCB/TEQ COPC refers to mercury.

Table F-38

RAGS Part D TABLE 7.38

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational fisherman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Contaminant 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
							Value	Units	Value	Units		Value	Units	Value	Units	
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Ingestion	Total PCB Aroclors	2.66E-02	mg/kg	---	---	---	---	---	8.11E-07	mg/kg/day	2.00E-05	mg/kg/day	4.06E-02
				Total PCB Congeners (Measured)	1.35E-02	mg/kg	---	---	---	---	---	4.12E-07	mg/kg/day	2.00E-05	mg/kg/day	2.06E-02
				Mammal TEQ (Measured)	4.03E-08	mg/kg	---	---	---	---	---	1.23E-12	mg/kg/day	NA	NA	NA
				Mercury	1.48E-01	mg/kg	---	---	---	---	---	4.51E-06	mg/kg/day	3.00E-04	mg/kg/day	1.50E-02
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)											---					5.56E-02
Fish Fillet Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)											---					3.56E-02

Note: The non-PCB/TEQ COPC refers to mercury.

Table F-39

RAGS Part D TABLE 9.1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	1.4E-07	---	2.5E-07	---	3.9E-07	---	---	---	---	---
			Benzo[b]fluoranthene	1.8E-08	---	3.4E-08	---	5.2E-08	---	---	---	---	---
			Dibenz[a,h]anthracene	2.3E-08	---	4.2E-08	---	6.5E-08	---	---	---	---	---
			Total PCB Aroclors	7.8E-07	---	1.6E-06	---	2.3E-06	---	---	---	---	---
			Total PCB Congeners (Measured)	1.3E-06	---	2.5E-06	---	3.7E-06	---	---	---	---	---
			Mammal TEQ (Measured)	8.6E-08	---	3.6E-08	---	1.2E-07	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	1.1E-06	---	2.2E-06	---	3.3E-06	---	---	---	---	---
			Arsenic	1.4E-06	---	5.9E-07	---	2.0E-06	---	---	---	---	---
			Beryllium	---	---	---	---	---	---	---	---	---	---
			Thallium	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								4.8E-06					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								6.2E-06					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								2.6E-06					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								5.9E-06					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Table F-40

RAGS Part D TABLE 9.2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Benzo[b]fluoranthene	---	---	---	---	---	---	---	---	---	---
			Dibenz[a,h]anthracene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.16	---	0.125	0.29
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.26	---	0.20	0.46
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.025	---	0.0042	0.029
			Beryllium	---	---	---	---	---	Small Intestine	0.00076	---	---	0.00076
			Thallium	---	---	---	---	---	None observed	0.051	---	---	0.051
Child Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.37
Child Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.54

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.29
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.46
Total Immune System HI Across All Media (Total PCB Aroclors)	0.29
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.46
Total Skin HI Across All Media	0.029
Total Small Intestine HI Across All Media	0.00076

Table F-41

RAGS Part D TABLE 9.3

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Benzo[b]fluoranthene	---	---	---	---	---	---	---	---	---	---
			Dibenz[a,h]anthracene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.017	---	0.082	0.099
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.027	---	0.13	0.16
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.0027	---	0.0028	0.0055
			Beryllium	---	---	---	---	---	Small Intestine	0.000081	---	---	0.000081
			Thallium	---	---	---	---	---	None observed	0.0055	---	---	0.0055
Adult Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.11
Adult Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.17

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.099
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.16
Total Immune System HI Across All Media (Total PCB Aroclors)	0.099
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.16
Total Skin HI Across All Media	0.0055
Total Small Intestine HI Across All Media	0.000081

Table F-42

RAGS Part D TABLE 9.13

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	1.0E-07	---	5.5E-07	---	6.5E-07	---	---	---	---	---
			Benzo[b]fluoranthene	1.4E-08	---	7.5E-08	---	8.8E-08	---	---	---	---	---
			Dibenz[a,h]anthracene	1.7E-08	---	9.3E-08	---	1.1E-07	---	---	---	---	---
			Total PCB Aroclors	5.9E-07	---	3.4E-06	---	4.0E-06	---	---	---	---	---
			Total PCB Congeners (Measured)	9.4E-07	---	5.5E-06	---	6.4E-06	---	---	---	---	---
			Mammal TEQ (Measured)	6.4E-08	---	8.0E-08	---	1.4E-07	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	8.3E-07	---	4.9E-06	---	5.7E-06	---	---	---	---	---
			Arsenic	1.0E-06	---	1.3E-06	---	2.3E-06	---	---	---	---	---
			Beryllium	---	---	---	---	---	---	---	---	---	---
			Thallium	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								7.2E-06					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								9.6E-06					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								3.3E-06					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								9.0E-06					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Table F-43
RAGS Part D TABLE 9.14
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Benzo[b]fluoranthene	---	---	---	---	---	---	---	---	---	---
			Dibenz[a,h]anthracene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.12	---	0.22	0.34
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.19	---	0.35	0.55
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.019	---	0.0075	0.026
			Beryllium	---	---	---	---	---	Small Intestine	0.00057	---	---	0.00057
			Thallium	---	---	---	---	---	None observed	0.0385	---	---	0.0385
Child Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.41
Child Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.61

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.34
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.55
Total Immune System HI Across All Media (Total PCB Aroclors)	0.34
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.55
Total Skin HI Across All Media	0.026
Total Small Intestine HI Across All Media	0.00057

Table F-44

RAGS Part D TABLE 9.15

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Benzo[b]fluoranthene	---	---	---	---	---	---	---	---	---	---
			Dibenz[a,h]anthracene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.013	---	0.19	0.21
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.021	---	0.31	0.33
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.0020	---	0.0066	0.0086
			Beryllium	---	---	---	---	---	Small Intestine	0.000061	---	---	0.000061
			Thallium	---	---	---	---	---	None observed	0.0041	---	---	0.0041
Adult Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.22
Adult Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.34

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.21
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.33
Total Immune System HI Across All Media (Total PCB Aroclors)	0.21
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.33
Total Skin HI Across All Media	0.0086
Total Small Intestine HI Across All Media	0.000061

Table F-45

RAGS Part D TABLE 9.25

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Rope Swing
Receptor Age: Adolescent (10-18 yrs)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Subarea A	Benzo[a]pyrene	1.1E-08	---	1.3E-07	---	1.4E-07	---	---	---	---	---
			Total PCB Aroclors	9.0E-08	---	1.1E-06	---	1.2E-06	Eyes, Immune system	0.020	---	0.25	0.27
			Total PCB Congeners (Measured)	2.6E-07	---	3.3E-06	---	3.5E-06	Eyes, Immune system	0.057	---	0.71	0.77
			Mammal TEQ (Measured)	8.6E-09	---	2.3E-08	---	3.2E-08	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	2.6E-07	---	3.2E-06	---	3.5E-06	NA	NA	NA	NA	---
			Arsenic	8.4E-08	---	2.3E-07	---	3.1E-07	Skin	0.0016	---	0.0044	0.0061
Adolescent Recreational Rope Swing Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.7E-06					0.27
Adolescent Recreational Rope Swing Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								4.0E-06					0.77
Adolescent Recreational Rope Swing Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								4.8E-07					0.0061
Adolescent Recreational Rope Swing Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								4.0E-06					0.0061

Note: Non-PCB/TEQ COPCs include benzo(a)pyrene and arsenic.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.27
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.77
Total Immune System HI Across All Media (Total PCB Aroclors)	0.27
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.77
Total Skin HI Across All Media	0.0061

Table F-46

RAGS Part D TABLE 9.4

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	2.2E-07	---	4.1E-07	---	6.3E-07	---	---	---	---	---
			Total PCB Aroclors	7.0E-09	---	1.4E-08	---	2.1E-08	---	---	---	---	---
			Total PCB Congeners (Measured)	1.9E-09	---	3.7E-09	---	5.6E-09	---	---	---	---	---
			Mammal TEQ (Measured)	3.9E-10	---	1.6E-10	---	5.5E-10	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	1.7E-09	---	3.4E-09	---	5.0E-09	---	---	---	---	---
			Arsenic	1.6E-06	---	6.8E-07	---	2.3E-06	---	---	---	---	---
			Beryllium	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								2.9E-06					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								2.9E-06					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								2.9E-06					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								2.9E-06					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-47

RAGS Part D TABLE 9.5

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.0014	---	0.0011	0.0026
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.00038	---	0.00030	0.00068
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.029	---	0.0049	0.034
			Beryllium	---	---	---	---	---	Small Intestine	0.00032	---	---	0.00032
Child Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.037
Child Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.035

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.0026
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.00068
Total Immune System HI Across All Media (Total PCB Aroclors)	0.0026
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.00068
Total Skin HI Across All Media	0.034
Total Small Intestine HI Across All Media	0.00032

Table F-48

RAGS Part D TABLE 9.6

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.00015	---	0.00073	0.00089
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.000041	---	0.00019	0.00024
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.0031	---	0.0032	0.0063
			Beryllium	---	---	---	---	---	Small Intestine	0.000034	---	---	0.000034
Adult Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.0072
Adult Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.0066

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.00089
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.00024
Total Immune System HI Across All Media (Total PCB Aroclors)	0.00089
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.00024
Total Skin HI Across All Media	0.0063
Total Small Intestine HI Across All Media	0.000034

Table F-49

RAGS Part D TABLE 9.16

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	1.7E-07	---	9.0E-07	---	1.1E-06	---	---	---	---	---
			Total PCB Aroclors	5.3E-09	---	3.1E-08	---	3.6E-08	---	---	---	---	---
			Total PCB Congeners (Measured)	1.4E-09	---	8.1E-09	---	9.5E-09	---	---	---	---	---
			Mammal TEQ (Measured)	2.9E-10	---	3.6E-10	---	6.5E-10	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	1.3E-09	---	7.4E-09	---	8.6E-09	---	---	---	---	---
			Arsenic	1.2E-06	---	1.5E-06	---	2.7E-06	---	---	---	---	---
			Beryllium	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								3.8E-06					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								3.8E-06					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								3.8E-06					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								3.8E-06					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-50

RAGS Part D TABLE 9.17

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.0011	---	0.0020	0.0031
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.00028	---	0.00053	0.00081
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.022	---	0.0087	0.030
			Beryllium	---	---	---	---	---	Small Intestine	0.00024	---	---	0.00024
Child Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.034
Child Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.032

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.0031
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.00081
Total Immune System HI Across All Media (Total PCB Aroclors)	0.0031
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.00081
Total Skin HI Across All Media	0.030
Total Small Intestine HI Across All Media	0.00024

Table F-51

RAGS Part D TABLE 9.18

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.00011	---	0.0017	0.0019
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.000031	---	0.00046	0.00049
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.0023	---	0.0076	0.0099
			Beryllium	---	---	---	---	---	Small Intestine	0.000026	---	---	0.000026
Adult Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.012
Adult Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.010

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.0019
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.00049
Total Immune System HI Across All Media (Total PCB Aroclors)	0.0019
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.00049
Total Skin HI Across All Media	0.0099
Total Small Intestine HI Across All Media	0.000026

Table F-52

RAGS Part D TABLE 9.27

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Age-Adjusted (Child/Adult)

3.64E-04

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	4,4'-DDE	1.4E-07	---	---	---	1.4E-07	---	---	---	---	---
			Total PCB Aroclors	2.0E-04	---	---	---	2.0E-04	---	---	---	---	---
			Total PCB Congeners (Measured)	3.1E-04	---	---	---	3.1E-04	---	---	---	---	---
			Mammal TEQ (Measured)	1.9E-05	---	---	---	1.9E-05	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	3.4E-04	---	---	---	3.4E-04	---	---	---	---	---
			Mercury	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								2.0E-04					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								3.1E-04					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								1.9E-05					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								3.6E-04					---

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

Table F-53

RAGS Part D TABLE 9.28

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	4,4'-DDE	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	20	---	---	20
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	31	---	---	31
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Mercury	---	---	---	---	---	Immune System	0.091	---	---	0.09
Child Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					20
Child Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					31

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

Total Eyes HI Across All Media (Total PCB Aroclors)	20
Total Eyes HI Across All Media (Total PCB Congeners Measured)	31
Total Immune System HI Across All Media (Total PCB Aroclors)	20
Total Immune System HI Across All Media (Total PCB Congeners Measured)	31

Table F-54

RAGS Part D TABLE 9.29

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	4,4'-DDE	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	10	---	---	10
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	15	---	---	15
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Mercury	---	---	---	---	---	Immune System	0.045	---	---	0.045
Adult Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					10
Adult Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					15

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

Total Eyes HI Across All Media (Total PCB Aroclors)	10
Total Eyes HI Across All Media (Total PCB Congeners Measured)	15
Total Immune System HI Across All Media (Total PCB Aroclors)	10
Total Immune System HI Across All Media (Total PCB Congeners Measured)	15

Table F-55

RAGS Part D TABLE 9.30

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Age-Adjusted (Child/Adult)

2.72E-06

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Total PCB Aroclors	6.3E-06	---	---	---	6.3E-06	---	---	---	---	---
			Total PCB Congeners (Measured)	2.5E-06	---	---	---	2.5E-06	---	---	---	---	---
			Mammal TEQ (Measured)	4.2E-07	---	---	---	4.2E-07	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	2.3E-06	---	---	---	2.3E-06	---	---	---	---	---
			Mercury	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								6.3E-06					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								2.5E-06					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								4.2E-07					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								2.7E-06					---

Note: The non-PCB/TEQ COPC refers to mercury.

Table F-56

RAGS Part D TABLE 9.31

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.62	---	---	0.62
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.24	---	---	0.24
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Mercury	---	---	---	---	---	Immune System	0.18	---	---	0.18
Child Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.80
Child Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.42

Note: The non-PCB/TEQ COPC refers to mercury.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.62
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.24
Total Immune System HI Across All Media (Total PCB Aroclors)	0.80
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.42

Table F-57

RAGS Part D TABLE 9.32

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.30	---	---	0.30
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.12	---	---	0.12
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Mercury	---	---	---	---	---	Immune System	0.088	---	---	0.088
Adult Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.39
Adult Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.21

Note: The non-PCB/TEQ COPC refers to mercury.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.30
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.12
Total Immune System HI Across All Media (Total PCB Aroclors)	0.39
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.21

Table F-58

RAGS Part D TABLE 9.7

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	1.4E-08	---	4.3E-08	---	5.6E-08	---	---	---	---	---
			Benzo[b]fluoranthene	1.9E-09	---	5.8E-09	---	7.6E-09	---	---	---	---	---
			Dibenz[a,h]anthracene	2.3E-09	---	7.2E-09	---	9.5E-09	---	---	---	---	---
			Total PCB Aroclors	8.0E-08	---	2.6E-07	---	3.4E-07	---	---	---	---	---
			Total PCB Congeners (Measured)	1.3E-07	---	4.2E-07	---	5.5E-07	---	---	---	---	---
			Mammal TEQ (Measured)	8.7E-09	---	6.2E-09	---	1.5E-08	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	1.1E-07	---	3.7E-07	---	4.9E-07	---	---	---	---	---
			Arsenic	1.4E-07	---	1.0E-07	---	2.4E-07	---	---	---	---	---
			Beryllium	---	---	---	---	---	---	---	---	---	---
			Thallium	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								6.6E-07					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								8.6E-07					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								3.3E-07					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								8.2E-07					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Table F-59

RAGS Part D TABLE 9.8

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Benzo[b]fluoranthene	---	---	---	---	---	---	---	---	---	---
			Dibenz[a,h]anthracene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.020	---	0.063	0.08
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.032	---	0.10	0.13
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.0032	---	0.0021	0.0053
			Beryllium	---	---	---	---	---	Small Intestine	0.000095	---	---	0.000095
			Thallium	---	---	---	---	---	None observed	0.0064	---	---	0.0064
Child Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.094
Child Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.14

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.083
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.13
Total Immune System HI Across All Media (Total PCB Aroclors)	0.083
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.13
Total Skin HI Across All Media	0.0053
Total Small Intestine HI Across All Media	0.000095

Table F-60
RAGS Part D TABLE 9.9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Benzo[b]fluoranthene	---	---	---	---	---	---	---	---	---	---
			Dibenz[a,h]anthracene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.0021	---	0.0096	0.0117
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.0034	---	0.015	0.019
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.00034	---	0.00032	0.00066
			Beryllium	---	---	---	---	---	Small Intestine	0.000010	---	---	0.000010
			Thallium	---	---	---	---	---	None observed	0.00069	---	---	0.00069
Adult Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.013
Adult Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.020

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.012
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.019
Total Immune System HI Across All Media (Total PCB Aroclors)	0.012
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.019
Total Skin HI Across All Media	0.00066
Total Small Intestine HI Across All Media	0.000010

Table F-61

RAGS Part D TABLE 9.19

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	6.9E-09	---	5.3E-08	---	6.0E-08	---	---	---	---	---
			Benzo[b]fluoranthene	9.3E-10	---	7.2E-09	---	8.2E-09	---	---	---	---	---
			Dibenz[a,h]anthracene	1.2E-09	---	9.0E-09	---	1.0E-08	---	---	---	---	---
			Total PCB Aroclors	4.0E-08	---	3.3E-07	---	3.7E-07	---	---	---	---	---
			Total PCB Congeners (Measured)	6.4E-08	---	5.3E-07	---	5.9E-07	---	---	---	---	---
			Mammal TEQ (Measured)	4.3E-09	---	7.8E-09	---	1.2E-08	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	5.6E-08	---	4.7E-07	---	5.3E-07	---	---	---	---	---
			Arsenic	7.1E-08	---	1.3E-07	---	2.0E-07	---	---	---	---	---
			Beryllium	---	---	---	---	---	---	---	---	---	---
			Thallium	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								6.5E-07					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								8.7E-07					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								2.9E-07					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								8.1E-07					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Table F-62
RAGS Part D TABLE 9.20
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Benzo[b]fluoranthene	---	---	---	---	---	---	---	---	---	---
			Dibenz[a,h]anthracene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.010	---	0.074	0.084
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.016	---	0.12	0.13
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.0016	---	0.0025	0.0041
			Beryllium	---	---	---	---	---	Small Intestine	0.000047	---	---	0.000047
			Thallium	---	---	---	---	---	None observed	0.00321	---	---	0.00321
Child Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.091
Child Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.14

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.084
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.13
Total Immune System HI Across All Media (Total PCB Aroclors)	0.084
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.13
Total Skin HI Across All Media	0.0041
Total Small Intestine HI Across All Media	0.000047

Table F-63

RAGS Part D TABLE 9.21

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Benzo[b]fluoranthene	---	---	---	---	---	---	---	---	---	---
			Dibenz[a,h]anthracene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.0011	---	0.015	0.016
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.0017	---	0.024	0.026
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.00017	---	0.00051	0.00068
			Beryllium	---	---	---	---	---	Small Intestine	0.0000051	---	---	0.0000051
			Thallium	---	---	---	---	---	None observed	0.000344	---	---	0.000344
Adult Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.017
Adult Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.027

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, delta-BHC, arsenic, beryllium, and thallium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.016
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.026
Total Immune System HI Across All Media (Total PCB Aroclors)	0.016
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.026
Total Skin HI Across All Media	0.00068
Total Small Intestine HI Across All Media	0.0000051

Table F-64
RAGS Part D TABLE 9.26
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Rope Swing
Receptor Age: Adolescent (10-18 yrs)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Subarea A	Benzo[a]pyrene	9.2E-10	---	1.0E-08	---	1.1E-08	---	---	---	---	---
			Total PCB Aroclors	7.5E-09	---	8.8E-08	---	9.5E-08	Eyes, Immune system	0.0016	---	0.019	0.021
			Total PCB Congeners (Measured)	2.2E-08	---	2.5E-07	---	2.7E-07	Eyes, Immune system	0.0047	---	0.055	0.060
			Mammal TEQ (Measured)	7.2E-10	---	1.8E-09	---	2.5E-09	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	2.1E-08	---	2.5E-07	---	2.7E-07	NA	NA	NA	NA	---
			Arsenic	7.0E-09	---	1.8E-08	---	2.5E-08	Skin	0.00014	---	0.00034	0.00048
Adolescent Recreational Rope Swing Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								1.3E-07					0.021
Adolescent Recreational Rope Swing Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								3.1E-07					0.061
Adolescent Recreational Rope Swing Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								3.8E-08					0.00048
Adolescent Recreational Rope Swing Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								3.1E-07					0.00048

Note: Non-PCB/TEQ COPCs include benzo(a)pyrene and arsenic.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.021
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.060
Total Immune System HI Across All Media (Total PCB Aroclors)	0.021
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.060
Total Skin HI Across All Media	0.00048

Table F-65

RAGS Part D TABLE 9.10

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	1.2E-08	---	3.8E-08	---	5.1E-08	---	---	---	---	---
			Total PCB Aroclors	4.1E-10	---	1.4E-09	---	1.8E-09	---	---	---	---	---
			Total PCB Congeners (Measured)	1.9E-10	---	6.3E-10	---	8.2E-10	---	---	---	---	---
			Mammal TEQ (Measured)	3.9E-11	---	2.8E-11	---	6.7E-11	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	1.7E-10	---	5.7E-10	---	7.4E-10	---	---	---	---	---
			Arsenic	1.1E-07	---	7.9E-08	---	1.9E-07	---	---	---	---	---
			Beryllium	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								2.4E-07					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								2.4E-07					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								2.4E-07					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								2.4E-07					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Table F-66

RAGS Part D TABLE 9.11

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.00010	---	0.00032	0.00042
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.000047	---	0.00015	0.00020
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.0025	---	0.0017	0.0042
			Beryllium	---	---	---	---	---	Small Intestine	0.000024	---	---	0.000024
Child Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.0046
Child Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.0044

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.00042
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.00020
Total Immune System HI Across All Media (Total PCB Aroclors)	0.00042
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.00020
Total Skin HI Across All Media	0.0042
Total Small Intestine HI Across All Media	0.000024

Table F-67

RAGS Part D TABLE 9.12

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.000011	---	0.000049	0.000060
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.0000051	---	0.000023	0.000028
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.00027	---	0.00026	0.00052
			Beryllium	---	---	---	---	---	Small Intestine	0.0000026	---	---	0.0000026
Adult Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.00059
Adult Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.00055

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.000060
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.000028
Total Immune System HI Across All Media (Total PCB Aroclors)	0.000060
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.000028
Total Skin HI Across All Media	0.00052
Total Small Intestine HI Across All Media	0.0000026

Table F-68

RAGS Part D TABLE 9.22

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	6.2E-09	---	4.8E-08	---	5.4E-08	---	---	---	---	---
			Total PCB Aroclors	2.0E-10	---	1.7E-09	---	1.9E-09	---	---	---	---	---
			Total PCB Congeners (Measured)	9.4E-11	---	7.9E-10	---	8.8E-10	---	---	---	---	---
			Mammal TEQ (Measured)	2.0E-11	---	3.5E-11	---	5.5E-11	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	8.6E-11	---	7.1E-10	---	8.0E-10	---	---	---	---	---
			Arsenic	5.6E-08	---	1.0E-07	---	1.6E-07	---	---	---	---	---
			Beryllium	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								2.1E-07					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								2.1E-07					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								2.1E-07					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								2.1E-07					---

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

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RAGS Part D TABLE 9.23

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.000051	---	0.00038	0.00043
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.000024	---	0.00018	0.00020
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.0012	---	0.0020	0.0032
			Beryllium	---	---	---	---	---	Small Intestine	0.000012	---	---	0.000012
Child Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.0037
Child Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.0034

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.00043
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.00020
Total Immune System HI Across All Media (Total PCB Aroclors)	0.00043
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.00020
Total Skin HI Across All Media	0.0032
Total Small Intestine HI Across All Media	0.000012

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RAGS Part D TABLE 9.24

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Benzo[a]pyrene	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.0000055	---	0.000078	0.000083
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.0000025	---	0.000036	0.000038
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Arsenic	---	---	---	---	---	Skin	0.00013	---	0.00040	0.00054
			Beryllium	---	---	---	---	---	Small Intestine	0.0000013	---	---	0.0000013
Adult Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.00062
Adult Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.00058

Note: Non-PCB/TEQ COPCs include the following: benzo(a)pyrene, arsenic, and beryllium.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.000083
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.000038
Total Immune System HI Across All Media (Total PCB Aroclors)	0.000083
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.000038
Total Skin HI Across All Media	0.00054
Total Small Intestine HI Across All Media	0.0000013

Table F-71

RAGS Part D TABLE 9.33

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Age-Adjusted (Child/Adult)

6.59E-05

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	4,4'-DDE	2.6E-08	---	---	---	2.6E-08	---	---	---	---	---
			Total PCB Aroclors	3.7E-05	---	---	---	3.7E-05	---	---	---	---	---
			Total PCB Congeners (Measured)	5.7E-05	---	---	---	5.7E-05	---	---	---	---	---
			Mammal TEQ (Measured)	3.4E-06	---	---	---	3.4E-06	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	6.3E-05	---	---	---	6.3E-05	---	---	---	---	---
			Mercury	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								3.7E-05					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								5.7E-05					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								3.4E-06					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								6.6E-05					---

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

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RAGS Part D TABLE 9.34

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	4,4'-DDE	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	6.1	---	---	6.1
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	9.4	---	---	9.4
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Mercury	---	---	---	---	---	Immune System	0.028	---	---	0.028
Child Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					6.1
Child Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					9.4

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

Total Eyes HI Across All Media (Total PCB Aroclors)	6.1
Total Eyes HI Across All Media (Total PCB Congeners Measured)	9.4
Total Immune System HI Across All Media (Total PCB Aroclors)	6.1
Total Immune System HI Across All Media (Total PCB Congeners Measured)	9.4

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RAGS Part D TABLE 9.35

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	4,4'-DDE	---	---	---	---	---	---	---	---	---	---
			Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	3.1	---	---	3.1
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	4.8	---	---	4.8
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Mercury	---	---	---	---	---	Immune System	0.014	---	---	0.014
Adult Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					3.2
Adult Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					4.8

Note: Non-PCB/TEQ COPCs include 4,4-DDE and mercury.

Total Eyes HI Across All Media (Total PCB Aroclors)	3.1
Total Eyes HI Across All Media (Total PCB Congeners Measured)	4.8
Total Immune System HI Across All Media (Total PCB Aroclors)	3.2
Total Immune System HI Across All Media (Total PCB Congeners Measured)	4.8

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RAGS Part D TABLE 9.36

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Total PCB Aroclors	4.8E-07	---	---	---	4.8E-07	---	---	---	---	---
			Total PCB Congeners (Measured)	2.4E-07	---	---	---	2.4E-07	---	---	---	---	---
			Mammal TEQ (Measured)	5.4E-08	---	---	---	5.4E-08	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	2.2E-07	---	---	---	2.2E-07	---	---	---	---	---
			Mercury	---	---	---	---	---	---	---	---	---	---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								4.8E-07					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								2.4E-07					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Mammal TEQ measured)								5.4E-08					---
Age-adjusted Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs, Total PCB Congeners Minus Mammal TEQ Congeners, and TEQ Measured)								2.7E-07					---

Note: The non-PCB/TEQ COPC refers to mercury.

Table F-75

RAGS Part D TABLE 9.37

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.079	---	---	0.079
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.040	---	---	0.040
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Mercury	---	---	---	---	---	Immune System	0.029	---	---	0.029
Child Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.11
Child Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.069

Note: The non-PCB/TEQ COPC refers to mercury.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.079
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.040
Total Immune System HI Across All Media (Total PCB Aroclors)	0.11
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.069

Table F-76

RAGS Part D TABLE 9.38

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	0.041	---	---	0.041
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	0.021	---	---	0.021
			Mammal TEQ (Measured)	---	---	---	---	---	---	---	---	---	---
			Mercury	---	---	---	---	---	Immune System	0.015	---	---	0.015
Adult Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								---					0.056
Adult Recreational Fisherman Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								---					0.036

Note: The non-PCB/TEQ COPC refers to mercury.

Total Eyes HI Across All Media (Total PCB Aroclors)	0.041
Total Eyes HI Across All Media (Total PCB Congeners Measured)	0.021
Total Immune System HI Across All Media (Total PCB Aroclors)	0.056
Total Immune System HI Across All Media (Total PCB Congeners Measured)	0.036

Table F-77

Cancer Risk Summary Table - Areas A and B Combined

non-PCB/TEQ COPCs plus	RME Cancer Risk					
	Sediment Contact		Fish Ingestion	Totals for Fish Ingestion Plus*		
	Angler/Wader	Swimmer		Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	5E-06	7E-06	2E-04	2E-04 (0.98)	2E-04 (0.97)	2E-04 (0.94)
Total PCB Congeners Measured	6E-06	1E-05	3E-04	3E-04 (0.98)	3E-04 (0.97)	3E-04 (0.95)
Mammal TEQ Measured	3E-06	3E-06	2E-05	2E-05 (0.88)	2E-05 (0.85)	2E-05 (0.76)
Total PCB Congeners Minus Mammal TEQ Congeners and TEQ Measured	6E-06	9E-06	4E-04	4E-04 (0.98)	4E-04 (0.98)	4E-04 (0.96)

*Parenthetical values indicate the contribution of fish ingestion to total cancer risk.

non-PCB/TEQ COPCs plus	CTE Cancer Risk					
	Sediment Contact		Fish Ingestion	Totals for Fish Ingestion Plus*		
	Angler/Wader	Swimmer		Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	7E-07	6E-07	4E-05	4E-05 (0.98)	4E-05 (0.98)	4E-05 (0.97)
Total PCB Congeners Measured	9E-07	9E-07	6E-05	6E-05 (0.99)	6E-05 (0.99)	6E-05 (0.97)
Mammal TEQ Measured	3E-07	3E-07	3E-06	4E-06 (0.91)	4E-06 (0.92)	4E-06 (0.85)
Total PCB Congeners Minus Mammal TEQ Congeners and TEQ Measured	8E-07	8E-07	7E-05	7E-05 (0.99)	7E-05 (0.99)	7E-05 (0.98)

*Parenthetical values indicate the contribution of fish ingestion to total cancer risk.

Table F-78

Noncancer Hazard Summary Table - Areas A and B Combined - Child

	RME Hazard Index					
	Sediment Contact		Fish	Totals for Fish Ingestion Plus*		
non-PCB/TEQ COPCs plus	Angler/Wader	Swimmer	Ingestion	Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	0.37	0.41	20	21 (0.98)	21 (0.98)	21 (0.96)
Total PCB Congeners Measured	0.54	0.61	31	32 (0.98)	32 (0.98)	32 (0.96)

*Parenthetical values indicate the contribution of fish ingestion to Hazard Index.

	CTE Hazard Index					
	Sediment Contact		Fish	Totals for Fish Ingestion Plus*		
non-PCB/TEQ COPCs plus	Angler/Wader	Swimmer	Ingestion	Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	0.094	0.091	6	6 (0.98)	6 (0.99)	6 (0.97)
Total PCB Congeners Measured	0.14	0.14	9	10 (0.98)	10 (0.99)	10 (0.97)

*Parenthetical values indicate the contribution of fish ingestion to Hazard Index.

Table F-79

Noncancer Hazard Summary Table - Areas A and B Combined - Adult

	RME Hazard Index					
	Sediment Contact		Fish	Totals for Fish Ingestion Plus*		
non-PCB/TEQ COPCs plus	Angler/Wader	Swimmer	Ingestion	Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	0.11	0.22	10	10 (0.99)	10 (0.98)	10 (0.97)
Total PCB Congeners Measured	0.17	0.34	15	15 (0.99)	16 (0.98)	16 (0.97)

*Parenthetical values indicate the contribution of fish ingestion to Hazard Index.

	CTE Hazard Index					
	Sediment Contact		Fish	Totals for Fish Ingestion Plus*		
non-PCB/TEQ COPCs plus	Angler/Wader	Swimmer	Ingestion	Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	0.013	0.017	3	3 (1)	3 (0.99)	3 (0.99)
Total PCB Congeners Measured	0.02	0.03	5	5 (1)	5 (0.99)	5 (0.99)

*Parenthetical values indicate the contribution of fish ingestion to Hazard Index.

Table F-80

Cancer Risk Summary Table - Area C

non-PCB/TEQ COPCs plus	RME Cancer Risk					
	Sediment Contact		Fish Ingestion	Totals for Fish Ingestion Plus*		
	Angler/Wader	Swimmer		Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	3E-06	4E-06	6E-06	9E-06 (0.68)	1E-05 (0.62)	1E-05 (0.48)
Total PCB Congeners Measured	3E-06	4E-06	2E-06	5E-06 (0.46)	6E-06 (0.4)	9E-06 (0.27)
Mammal TEQ Measured	3E-06	4E-06	4E-07	3E-06 (0.13)	4E-06 (0.1)	7E-06 (0.06)
Total PCB Congeners Minus Mammal TEQ Congeners and TEQ Measured	3E-06	4E-06	3E-06	6E-06 (0.48)	6E-06 (0.42)	9E-06 (0.29)

*Parenthetical values indicate the contribution of fish ingestion to total cancer risk.

non-PCB/TEQ COPCs plus	CTE Cancer Risk					
	Sediment Contact		Fish Ingestion	Totals for Fish Ingestion Plus*		
	Angler/Wader	Swimmer		Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	2E-07	2E-07	5E-07	7E-07 (0.66)	7E-07 (0.69)	9E-07 (0.51)
Total PCB Congeners Measured	2E-07	2E-07	2E-07	5E-07 (0.5)	5E-07 (0.54)	7E-07 (0.35)
Mammal TEQ Measured	2E-07	2E-07	5E-08	3E-07 (0.18)	3E-07 (0.21)	5E-07 (0.11)
Total PCB Congeners Minus Mammal TEQ Congeners and TEQ Measured	2E-07	2E-07	3E-07	5E-07 (0.53)	5E-07 (0.56)	7E-07 (0.38)

*Parenthetical values indicate the contribution of fish ingestion to total cancer risk.

Table F-81

Noncancer Hazard Summary Table - Area C - Adult

	RME Hazard Index					
	Sediment Contact		Fish	Totals for Fish Ingestion Plus*		
non-PCB/TEQ COPCs plus	Angler/Wader	Swimmer	Ingestion	Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	0.007	0.012	0.39	0.40 (0.98)	0.40 (0.97)	0.41 (0.95)
Total PCB Congeners Measured	0.007	0.010	0.21	0.21 (0.97)	0.22 (0.95)	0.23 (0.92)

*Parenthetical values indicate the contribution of fish ingestion to Hazard Index.

	CTE Hazard Index					
	Sediment Contact		Fish	Totals for Fish Ingestion Plus*		
non-PCB/TEQ COPCs plus	Angler/Wader	Swimmer	Ingestion	Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	0.00059	0.00062	0.056	0.056 (0.99)	0.056 (0.99)	0.057 (0.98)
Total PCB Congeners Measured	0.00055	0.00058	0.036	0.036 (0.98)	0.036 (0.98)	0.037 (0.97)

*Parenthetical values indicate the contribution of fish ingestion to Hazard Index.

Table F-82

Noncancer Hazard Summary Table - Area C - Child

	RME Hazard Index					
	Sediment Contact		Fish	Totals for Fish Ingestion Plus*		
non-PCB/TEQ COPCs plus	Angler/Wader	Swimmer	Ingestion	Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	0.037	0.034	0.80	0.84 (0.96)	0.83 (0.96)	0.87 (0.92)
Total PCB Congeners Measured	0.035	0.032	0.42	0.46 (0.92)	0.45 (0.93)	0.49 (0.86)

*Parenthetical values indicate the contribution of fish ingestion to Hazard Index.

	CTE Hazard Index					
	Sediment Contact		Fish	Totals for Fish Ingestion Plus*		
non-PCB/TEQ COPCs plus	Angler/Wader	Swimmer	Ingestion	Angler/Wader	Swimmer	Angler/Wader plus Swimmer
Total PCB Aroclors	0.0046	0.0037	0.11	0.11 (0.96)	0.11 (0.97)	0.12 (0.93)
Total PCB Congeners Measured	0.0044	0.0034	0.069	0.074 (0.94)	0.073 (0.95)	0.077 (0.9)

*Parenthetical values indicate the contribution of fish ingestion to Hazard Index.

Table F-83
Comparison of EPCs at Differing Sediment Depths - Areas A & B Combined

COPC	Depth (inches bgs)	FOD	EPC (mg/kg)	EPC Ratio depth:surface
Total PCB (Aroclor)	0-6	30/37	3.37E+00	---
	6-14	26/34	1.90E+02	56
	12-27	17/28	3.35E+01	10
	24-39	8/11	1.28E+01	4
	36-56	2/4	6.81E+01	20
Total PCB (Congeners)	0-6	12/13	5.38E+00	---
	6-14	9/11	1.80E+02	33
	12-27	5/5	2.70E+01	5
	24-39	4/4	1.20E+01	2
	36-56	1/1	4.50E+01	8
TEQ	0-6	8/13	4.91E-06	---
	6-14	8/11	4.25E-04	87
	12-27	5/5	4.88E-04	99
	24-39	3/4	1.72E-05	4
	36-56	1/1	2.63E-04	54
PCB minus Congeners	0-6	9/13	4.78E+00	---
	6-14	8/11	1.79E+02	38
	12-27	5/5	2.57E+01	5
	24-39	4/4	1.17E+01	2
	36-56	1/1	4.43E+01	9

EPC for 0-6 inches is 95%UCL. EPC for all other depths is the maximum concentration.

Table F-84
Comparison of EPCs at Differing Sediment Depths - Rope Swing/ Hot Spot Area

COPC	Depth (inches bgs)	FOD	EPC (mg/kg)	EPC Ratio depth:surface
Total PCB (Aroclor)	0-6	26/26	3.82E+00	---
	6-14	6/6	1.67E+02	44
	12-27	4/4	3.35E+01	9
	24-39	4/4	1.28E+01	3
	36-56	2/2	6.81E+01	18
Total PCB (Congeners)	0-6	4/4	1.10E+01	---
	6-14	4/4	1.70E+02	15
	12-27	2/2	2.70E+01	2
	24-39	2/2	1.20E+01	1
	36-56	1/1	4.50E+01	4
TEQ	0-6	3/4	4.91E-06	---
	6-14	3/4	8.45E-05	17
	12-27	2/2	4.88E-04	99
	24-39	2/2	1.72E-05	4
	36-56	1/1	2.63E-04	54
PCB minus Congeners	0-6	4/4	1.09E+01	---
	6-14	3/4	1.69E+02	15
	12-27	2/2	2.57E+01	2
	24-39	2/2	1.17E+01	1
	36-56	1/1	4.43E+01	4

EPC for 0-6 inches is 95%UCL. EPC for all other depths is the maximum concentration.

Table F-85
Comparison of Sandbar Soil and Sediment EPCs

COPC/Area	Depth (inches bgs)	FOD	EPC (mg/kg)	EPC Ratio sandbar:A/B
Total PCB (Congeners)				
Areas A & B Combined Sediment	0-6	12/13	5.38E+00	---
Sandbar	0-12	2/2	1.65E-03	0.0003
Sandbar	12-24	1/2	5.20E-04	0.0001
TEQ				
Areas A & B Combined Sediment	0-6	8/13	4.91E-06	---
Sandbar	12-24	1/2	8.70E-09	0.002
PCB minus Congeners				
Areas A & B Combined Sediment	0-6	9/13	4.78E+00	---
Sandbar	12-24	1/2	2.30E-04	0.00005

Notes:
tPCB Aroclor and TEQ congeners were not detected in the 0-12 inch sandbar sediments.
tPCB Aroclor was not detected in the 12-24 inch sandbar sediments.
EPC for 0-6 inches is 95%UCL. EPC for all other depths is the maximum concentration.

Table F-86
Comparison of EPCs for Various Fish Species - Areas A & B Combined

COPC	Species	FOD	EPC (mg/kg)	EPC Ratio Bullhead:Redbreast
Total PCB (Aroclors)	Redbreast Sunfish	12/12	2.06E+00	---
	Yellow Bullhead	10/12	2.79E+00	1
Total PCB (Congeners)	Redbreast Sunfish	12/12	3.17E+00	---
	Yellow Bullhead	12/12	1.80E+00	0.6
TEQ	Redbreast Sunfish	11/12	2.54E-06	---
	Yellow Bullhead	11/12	2.45E-06	1
PCB minus Congeners	Redbreast Sunfish	12/12	3.48E+00	---
	Yellow Bullhead	12/12	1.73E+00	0.5

EPC for Redbreast Sunfish is 95%UCL. EPC for all other species is the maximum concentration.

Table F-87
Comparison of EPCs for Various Fish Species from Various Sampling Events
Site Impacted Areas Only

Species	Assessment Source	COPC	FOD	EPC (mg/kg)	EPC Ratio Bullhead:Redbreast
Redbreast Sunfish	Current	total PCB Aroclor	12/12	2.06E+00	---
Brown Bullhead	1997 ERA	Aroclor 1248	6/6	3.70E-01	0.2
		Aroclor 1260	4/6	4.70E-02	0.02
Yellow Bullhead	1997 ERA	Aroclor 1248	4/4	6.60E-01	0.3
		Aroclor 1260	3/4	9.20E-02	0.04

EPC for Redbreast Sunfish is 95%UCL. EPC for all other species is the maximum concentration.

TABLE F-88

RAGS Part D TABLE 10.1

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Total PCB Aroclors	---	---	1.6E-06	---	1.6E-06	---	---	---	---	---
			Total PCB Congeners (Measured)	1.3E-06	---	2.5E-06	---	3.7E-06	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	1.1E-06	---	2.2E-06	---	3.3E-06	---	---	---	---	---
			Arsenic	1.4E-06	---	---	---	1.4E-06	---	---	---	---	---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								2.9E-06					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								5.1E-06					---
Age-adjusted Recreational Angler/Wader Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured Minus Mammal TEQ Measured)								4.7E-06					---

Note: The non-PCB/TEQ COPC refers to arsenic.

TABLE F-89

RAGS Part D TABLE 10.2

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Angler/Wader
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Arsenic	1.6E-06	---	---	---	1.6E-06	---	---	---	---	---
Age-adjusted Recreational Angler/Wader Total								1.6E-06					---

TABLE F-90

RAGS Part D TABLE 10.3

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Total PCB Aroclors	---	---	3.4E-06	---	3.4E-06	---	---	---	---	---
			Total PCB Congeners (Measured)	---	---	5.5E-06	---	5.5E-06	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	---	---	4.9E-06	---	4.9E-06	---	---	---	---	---
			Arsenic	1.0E-06	---	1.3E-06	---	2.3E-06	---	---	---	---	---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Aroclors)								5.8E-06					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured)								7.8E-06					---
Age-adjusted Recreational Swimmer Total (Sum of Non-PCB/TEQ COPCs and Total PCB Congeners Measured Minus Mammal TEQ Measured)								7.2E-06					---

Note: The non-PCB/TEQ COPC refers to arsenic.

TABLE F-91

RAGS Part D TABLE 10.4

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Swimmer
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Area C	Arsenic	1.2E-06	---	1.5E-06	---	2.7E-06	---	---	---	---	---
Age-adjusted Recreational Swimmer Total								2.7E-06					---

TABLE F-92

RAGS Part D TABLE 10.5

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational - Rope Swing
Receptor Age: Adolescent (10-18 yrs)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Surface Sediment	Surface Sediment at Areas A & B	Total PCB Aroclors	---	---	1.1E-06	---	1.1E-06	---	---	---	---	---
			Total PCB Congeners (Measured)	---	---	3.3E-06	---	3.3E-06	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	---	---	3.2E-06	---	3.2E-06	---	---	---	---	---
Adolescent Recreational Rope Swing Total (Total PCB Aroclors)								1.1E-06					---
Adolescent Recreational Rope Swing Total (Total PCB Congeners Measured)								3.3E-06					---
Adolescent Recreational Rope Swing Total (Total PCB Congeners Measured Minus Mammal TEQ Measured)								3.2E-06					---

TABLE F-93

RAGS Part D TABLE 10.6

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	Total PCB Aroclors	2.0E-04	---	---	---	2.0E-04	---	---	---	---	---
			Total PCB Congeners (Measured)	3.1E-04	---	---	---	3.1E-04	---	---	---	---	---
			Mammal TEQ (Measured)	1.9E-05	---	---	---	1.9E-05	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	3.4E-04	---	---	---	3.4E-04	---	---	---	---	---
Age-adjusted Recreational Fisherman Total (Total PCB Aroclors)								2.0E-04					---
Age-adjusted Recreational Swimmer Total (Total PCB Congeners Measured)								3.1E-04					---
Age-adjusted Recreational Swimmer Total (Mammal TEQ Measured)								1.9E-05					---
Age-adjusted Recreational Swimmer Total (Total PCB Congeners Measured Minus Mammal TEQ Measured and Mammal TEQ Measured)								3.6E-04					---

TABLE F-94

RAGS Part D TABLE 10.7

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish	Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	20	---	---	20
		at Areas A & B	Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	31	---	---	31
Age-adjusted Recreational Fisherman Total (Total PCB Aroclors)								---					20
Age-adjusted Recreational Swimmer Total (Total PCB Congeners Measured)								---					31

TABLE F-95

RAGS Part D TABLE 10.8

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	10	---	---	10
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	15	---	---	15
Age-adjusted Recreational Fisherman Total (Total PCB Aroclors)								---					10
Age-adjusted Recreational Swimmer Total (Total PCB Congeners Measured)								---					15

TABLE F-96

RAGS Part D TABLE 10.9

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Area C	Total PCB Aroclors	6.3E-06	---	---	---	6.3E-06	---	---	---	---	---
			Total PCB Congeners (Measured)	2.5E-06	---	---	---	2.5E-06	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	2.3E-06	---	---	---	2.3E-06	---	---	---	---	---
Age-adjusted Recreational Fisherman Total (Total PCB Aroclors)								6.3E-06					---
Age-adjusted Recreational Swimmer Total (Total PCB Congeners Measured)								2.5E-06					---
Age-adjusted Recreational Swimmer Total (Mammal TEQ Measured)								---					---
Age-adjusted Recreational Swimmer Total (Total PCB Congeners Measured Minus Mammal TEQ Measured)								2.3E-06					---

TABLE F-97

RAGS Part D TABLE 10.10

RISK SUMMARY

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Age-Adjusted (Child/Adult)

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	Total PCB Aroclors	3.7E-05	---	---	---	3.7E-05	---	---	---	---	---
			Total PCB Congeners (Measured)	5.7E-05	---	---	---	5.7E-05	---	---	---	---	---
			Mammal TEQ (Measured)	3.4E-06	---	---	---	3.4E-06	---	---	---	---	---
			Total PCB Congeners (Measured) Minus TEQ Congeners (Measured)	6.3E-05	---	---	---	6.3E-05	---	---	---	---	---
Age-adjusted Recreational Fisherman Total (Total PCB Aroclors)								3.7E-05					---
Age-adjusted Recreational Swimmer Total (Total PCB Congeners Measured)								5.7E-05					---
Age-adjusted Recreational Swimmer Total (Mammal TEQ Measured)								3.4E-06					---
Age-adjusted Recreational Swimmer Total (Total PCB Congeners Measured Minus Mammal TEQ Measured and Mammal TEQ Measured)								6.6E-05					---

TABLE F-98

RAGS Part D TABLE 10.11

RISK SUMMARY

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish at Areas A & B	Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	6.1	---	---	6.1
			Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	9.4	---	---	9.4
Age-adjusted Recreational Fisherman Total (Total PCB Aroclors)								---					6.1
Age-adjusted Recreational Swimmer Total (Total PCB Congeners Measured)								---					9.4

TABLE F-99

RAGS Part D TABLE 10.12

RISK SUMMARY

CENTRAL TENDENCY EXPOSURE

Fletcher's Paint Works and Storage Facility Superfund Site, Milford, NH

Scenario Timeframe: Current/Future
Receptor Population: Recreational Fisherman
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Contaminant of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Fish Fillet	Fish Fillet	Redbreast Sunfish	Total PCB Aroclors	---	---	---	---	---	Eyes, Immune system	3.1	---	---	3.1
		at Areas A & B	Total PCB Congeners (Measured)	---	---	---	---	---	Eyes, Immune system	4.8	---	---	4.8
Age-adjusted Recreational Fisherman Total (Total PCB Aroclors)								---					3.1
Age-adjusted Recreational Swimmer Total (Total PCB Congeners Measured)								---					4.8

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APPENDIX G

Critical Body Residue Data

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Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	20	MG/KG	Survival	ED100	Combined	Whole Body	Immature	1989	Peterson, R.H., R.A. Bourbonniere, G.L.Lacroix, D.J.Martin-Robichaud, P.Takats and G. Brun	Water, Air and Soil Pollution 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	8	MG/KG	Survival	LOED	Combined	Whole Body	Immature	1989	Peterson, R.H., R.A. Bourbonniere, G.L.Lacroix, D.J.Martin-Robichaud, P.Takats and G. Brun	Water, Air and Soil Pollution 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	7.8	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	0.78	MG/KG	Mortality	LD50 w/ 10-fold EF	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	13.2	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	13.4	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	22.4	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	30	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	30	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	32.6	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	34.4	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	39.8	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	40.8	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	50.2	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	65.2	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salmo salar	Salmon - Atlantic	Aluminum	7429-90-5	77.2	MG/KG	Mortality	LD50	Water	Whole Body	Larval	1989	Peterson RH, RA Bourbonniere, GL Lacruix, DJ Martin-Robichaud, P Takats, G Brun	Water Air Soil Pol 46:399-413
Salvelinus fontinalis	Trout - Brook	Aluminum	7429-90-5	12.5	MG/KG	Growth	NOED	Absorption	Whole Body	Juvenile	1991	Cleveland, L., D.R. Buckler, and W.G. Brumbaugh	Environ Tox & Chem 10:243-248
Oncorhynchus mykiss	Trout - Rainbow	Aluminum	7429-90-5	8.53	MG/KG	Mortality	NOED	Ingestion	Whole Body	Juvenile	1993	Handy, R.D	Journal of Fish Biology 42, 603-606
Salmo salar	Salmon - Atlantic	Barium	7440-39-3	0.15	MG/KG	Growth	ED17	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Barium	7440-39-3	0.15	MG/KG	Growth	ED61	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Barium	7440-39-3	0.15	MG/KG	Growth	ED41	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Salmo salar	Salmon - Atlantic	Barium	7440-39-3	0.15	MG/KG	Growth	ED17	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Barium	7440-39-3	0.015	MG/KG	Growth	ED17 w/ 10 fold EF	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Barium	7440-39-3	0.15	MG/KG	Growth	ED61	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Barium	7440-39-3	0.15	MG/KG	Growth	ED41	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Oncorhynchus tshawytscha	Salmon - Chinook	Chromium	7440-47-3	1.32	MG/KG	Growth	NOED	Water	Whole Body	Juvenile	2006	Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland	Aquat Toxicol 76:246-257
Oncorhynchus tshawytscha	Salmon - Chinook	Chromium	7440-47-3	1.32	MG/KG	Growth	NOED	Water	Whole Body	Juvenile	2006	Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland	Aquat Toxicol 76:246-257
Oncorhynchus tshawytscha	Salmon - Chinook	Chromium	7440-47-3	1.32	MG/KG	Mortality	NOED	Water	Whole Body	Juvenile	2006	Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland	Aquat Toxicol 76:246-257
Oncorhynchus tshawytscha	Salmon - Chinook	Chromium	7440-47-3	1.76	MG/KG	Mortality	NOED	Water	Whole Body	Juvenile	2006	Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland	Aquat Toxicol 76:246-257
Oncorhynchus tshawytscha	Salmon - Chinook	Chromium	7440-47-3	1.76	MG/KG	Growth	NOED	Water	Whole Body	Juvenile	2006	Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland	Aquat Toxicol 76:246-257
Oncorhynchus tshawytscha	Salmon - Chinook	Chromium	7440-47-3	1.76	MG/KG	Growth	NOED	Water	Whole Body	Juvenile	2006	Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland	Aquat Toxicol 76:246-257
Oncorhynchus tshawytscha	Salmon - Chinook	Chromium	7440-47-3	1.3	MG/KG	Mortality	LD13	Water	Whole Body	Juvenile	2006	Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland	Aquat Toxicol 76:246-257
Oncorhynchus tshawytscha	Salmon - Chinook	Chromium	7440-47-3	0.13	MG/KG	Mortality	LD13 w/ 10-fold EF	Water	Whole Body	Juvenile	2006	Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland	Aquat Toxicol 76:246-257
Oncorhynchus tshawytscha	Salmon - Chinook	Chromium	7440-47-3	1.3	MG/KG	Mortality	LD28	Water	Whole Body	Juvenile	2006	Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland	Aquat Toxicol 76:246-257
Oncorhynchus tshawytscha	Salmon - Chinook	Chromium	7440-47-3	1.28	MG/KG	Growth	ED30	Water	Whole Body	Juvenile	2006	Farag AM, T May, GD Marty, M Easton, DD Harper, EE Little, L Cleveland	Aquat Toxicol 76:246-257
Oncorhynchus mykiss	Trout - Rainbow	Chromium VI	18540-29-9	10.5	MG/KG	Mortality	LD50	Absorption	Whole Body	Immature	1981	van De Putte, L., Lubbers, J., Kolar, Z.	Aquat Toxicol 01: 3-18
Oncorhynchus mykiss	Trout - Rainbow	Chromium VI	18540-29-9	8.7	MG/KG	Mortality	LD75	Absorption	Whole Body	Immature	1981	van De Putte, L., Lubbers, J., Kolar, Z.	Aquat Toxicol 01: 3-18
Oncorhynchus mykiss	Trout - Rainbow	Chromium VI	18540-29-9	2.3	MG/KG	Mortality	NOED	Absorption	Whole Body	Immature	1981	van De Putte, L., Lubbers, J., Kolar, Z.	Aquat Toxicol 01: 3-18
Oncorhynchus mykiss	Trout - Rainbow	Chromium VI	18540-29-9	5.5	MG/KG	Mortality	NOED	Absorption	Whole Body	Immature	1981	van De Putte, L., Lubbers, J., Kolar, Z.	Aquat Toxicol 01: 3-18
Salmo salar	Salmon - Atlantic	Copper	7440-50-8	1.7	MG/KG	Growth	ED17	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Copper	7440-50-8	1.7	MG/KG	Growth	ED61	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Copper	7440-50-8	1.7	MG/KG	Growth	ED41	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salvelinus confluentus	Bull Trout	Copper	7440-50-8	19.79	MG/KG	Growth	NOED	Water	Whole Body	Fry	2002	Hansen J.A., P.G. Welsh, J. Lipton, D. Cacela	Trans Am Fish Soc 131:690-697
Salvelinus confluentus	Bull Trout	Copper	7440-50-8	19.79	MG/KG	Growth	NOED	Water	Whole Body	Fry	2002	Hansen J.A., P.G. Welsh, J. Lipton, D. Cacela	Trans Am Fish Soc 131:690-697

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Salvelinus confluentus	Bull Trout	Copper	7440-50-8	7.58	MG/KG	Mortality	LOED	Water	Whole Body	Fry	2002	Hansen J.A., P.G. Welsh, J. Lipton, D. Cacela	Trans Am Fish Soc 131:690-697
Salvelinus confluentus	Bull Trout	Copper	7440-50-8	7.58	MG/KG	Mortality	LD05	Water	Whole Body	Fry	2002	Hansen J.A., P.G. Welsh, J. Lipton, D. Cacela	Trans Am Fish Soc 131:690-697
Salvelinus confluentus	Bull Trout	Copper	7440-50-8	19.79	MG/KG	Mortality	LD05	Water	Whole Body	Fry	2002	Hansen J.A., P.G. Welsh, J. Lipton, D. Cacela	Trans Am Fish Soc 131:690-697
Salvelinus confluentus	Bull Trout	Copper	7440-50-8	19.79	MG/KG	Mortality	LOED	Water	Whole Body	Fry	2002	Hansen J.A., P.G. Welsh, J. Lipton, D. Cacela	Trans Am Fish Soc 131:690-697
Salvelinus confluentus	Bull Trout	Copper	7440-50-8	19.79	MG/KG	Mortality	LOED	Water	Whole Body	Fry	2002	Hansen J.A., P.G. Welsh, J. Lipton, D. Cacela	Trans Am Fish Soc 131:690-697
Cyprinus carpio	Common carp	Copper	7440-50-8	11.44	MG/KG	Mortality	LD14	Water	Whole Body	Larval	1996	Stouthart XJHX, JLM Haans, RAC Lock, SE Wendelaar Bonga	Environ Tox & Chem 15:376-383
Cyprinus carpio	Common carp	Copper	7440-50-8	20.34	MG/KG	Mortality	LD29	Water	Whole Body	Egg	1996	Stouthart XJHX, JLM Haans, RAC Lock, SE Wendelaar Bonga	Environ Tox & Chem 15:376-383
Cyprinus carpio	Common carp	Copper	7440-50-8	8.9	MG/KG	Mortality	LD47	Water	Whole Body	Larval	1996	Stouthart XJHX, JLM Haans, RAC Lock, SE Wendelaar Bonga	Environ Tox & Chem 15:376-383
Cyprinus carpio	Common carp	Copper	7440-50-8	101.68	MG/KG	Mortality	LD81	Water	Whole Body	Larval	1996	Stouthart XJHX, JLM Haans, RAC Lock, SE Wendelaar Bonga	Environ Tox & Chem 15:376-383
Cyprinus carpio	Common carp	Copper	7440-50-8	11.44	MG/KG	Mortality	LOED	Water	Whole Body	Larval	1996	Stouthart XJHX, JLM Haans, RAC Lock, SE Wendelaar Bonga	Environ Tox & Chem 15:376-383
Cyprinus carpio	Common carp	Copper	7440-50-8	20.34	MG/KG	Mortality	LOED	Water	Whole Body	Egg	1996	Stouthart XJHX, JLM Haans, RAC Lock, SE Wendelaar Bonga	Environ Tox & Chem 15:376-383
Cyprinus carpio	Common carp	Copper	7440-50-8	5.08	MG/KG	Mortality	NOED	Water	Whole Body	Larval	1996	Stouthart XJHX, JLM Haans, RAC Lock, SE Wendelaar Bonga	Environ Tox & Chem 15:376-383
Cyprinus carpio	Common carp	Copper	7440-50-8	8.9	MG/KG	Mortality	NOED	Water	Whole Body	Egg	1996	Stouthart XJHX, JLM Haans, RAC Lock, SE Wendelaar Bonga	Environ Tox & Chem 15:376-383
Cyprinus carpio	Common carp	Copper	7440-50-8	11.7	MG/KG	Mortality	LOED	Water	Whole Body	Egg	2002	Flik, G., X.J.H.X. Stouthart, F.A.T. Spanings, R.A.C. Lock, J.C. Fenwick, S.E.W. Bonga	Aquat Toxicol 56:167-176
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	2.6	MG/KG	Mortality	LOED	Water	Whole Body	Fry	2002	Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp	Aquat Toxicol 58:175-188
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	2.6	MG/KG	Mortality	LD10	Water	Whole Body	Fry	2002	Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp	Aquat Toxicol 58:175-188
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	2	MG/KG	Mortality	NOED	Water	Whole Body	Fry	2002	Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp	Aquat Toxicol 58:175-188
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	2.6	MG/KG	Growth	ED33	Water	Whole Body	Fry	2002	Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp	Aquat Toxicol 58:175-188
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	3.22	MG/KG	Mortality	LD45	Water	Whole Body	Fry	2002	Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp	Aquat Toxicol 58:175-188
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	3.22	MG/KG	Growth	ED48	Water	Whole Body	Fry	2002	Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp	Aquat Toxicol 58:175-188
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	2	MG/KG	Growth	ED19	Water	Whole Body	Fry	2002	Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp	Aquat Toxicol 58:175-188
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	1.96	MG/KG	Growth	LOED	Water	Whole Body	Fry	2002	Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp	Aquat Toxicol 58:175-188
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	1.96	MG/KG	Growth	ED15	Water	Whole Body	Fry	2002	Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp	Aquat Toxicol 58:175-188
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	1.68	MG/KG	Growth	NOED	Water	Whole Body	Fry	2002	Hansen, JA, J Lipton, PG Welsh, J Morris, D Cacela, MJ Suedkamp	Aquat Toxicol 58:175-188
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	4.48	MG/KG	Survival	LOED	Combined	Whole Body	Immature	1994	Mount, D.R., A.K. Barth, T.D.Garrison, K.A. Barten, and J.R. Hockett	Environ Tox & Chem 13(12):2031-2041
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	20.6	MG/KG	Growth	ED10	Water	Whole Body	Fry	1996	Marr, J.C.A., J. Lipton, D. Cacela, J. A. Hansen, H. L. Bergman, J.S. Meyer, and C. Hogstrand	Aquat Toxicol

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	18.1	MG/KG	Growth	ED25	Water	Whole Body	Fry	1996	Marr, J.C.A., J. Lipton, D. Cacela, J. A. Hansen, H. L. Bergman, J.S. Meyer, and C. Hogstrand	Aquat Toxicol
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	20.5	MG/KG	Growth	ED25	Water	Whole Body	Fry	1996	Marr, J.C.A., J. Lipton, D. Cacela, J. A. Hansen, H. L. Bergman, J.S. Meyer, and C. Hogstrand	Aquat Toxicol
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	20.9	MG/KG	Growth	ED25	Water	Whole Body	Fry	1996	Marr, J.C.A., J. Lipton, D. Cacela, J. A. Hansen, H. L. Bergman, J.S. Meyer, and C. Hogstrand	Aquat Toxicol
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	18.1	MG/KG	Growth	ED45	Water	Whole Body	Fry	1996	Marr, J.C.A., J. Lipton, D. Cacela, J. A. Hansen, H. L. Bergman, J.S. Meyer, and C. Hogstrand	Aquat Toxicol
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	25.9	MG/KG	Growth	ED50	Water	Whole Body	Fry	1996	Marr, J.C.A., J. Lipton, D. Cacela, J. A. Hansen, H. L. Bergman, J.S. Meyer, and C. Hogstrand	Aquat Toxicol
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	1.6	MG/KG	Mortality	LD100	Absorption	Whole Body	Immature	1981	Dixon, D.G. and J.B. Sprague	Aquat Toxicol 01:69-81.
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	7	MG/KG	Mortality	NA	Absorption	Whole Body	Immature	1981	Dixon, D.G. and J.B. Sprague	Aquat Toxicol 01:69-81.
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	2.22	MG/KG	Mortality	LD50	Absorption	Whole Body	Adult	1992	Handy, R.D.	Arch Environ Contam Toxicol 22:74-81
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	1.72	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	2001	Kamunda CN, M Grosell, JNA Lott, and CM Wood	Can J Fish Aquat Sci 58:293-305
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	1.72	MG/KG	Mortality	NOED	Ingestion	Whole Body	Juvenile	2001	Kamunda CN, M Grosell, JNA Lott, and CM Wood	Can J Fish Aquat Sci 58:293-305
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	5.24	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	2001	Kamunda CN, M Grosell, JNA Lott, and CM Wood	Can J Fish Aquat Sci 58:293-305
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	5.24	MG/KG	Mortality	NOED	Ingestion	Whole Body	Juvenile	2001	Kamunda CN, M Grosell, JNA Lott, and CM Wood	Can J Fish Aquat Sci 58:293-305
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	1.4	MG/KG	Mortality	LD11	Water	Whole Body	Juvenile	2005	Kamunde CN, S Niyogi, CM Wood	Can J Fish Aquat Sci 62:390-399
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	0.14	MG/KG	Mortality	LD11 w/ 10-fold EF	Water	Whole Body	Juvenile	2005	Kamunde CN, S Niyogi, CM Wood	Can J Fish Aquat Sci 62:390-399
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	1.4	MG/KG	Growth	ED35	Water	Whole Body	Juvenile	2005	Kamunde CN, S Niyogi, CM Wood	Can J Fish Aquat Sci 62:390-399
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	1.7	MG/KG	Mortality	LD26	Water	Whole Body	Juvenile	2005	Kamunde CN, S Niyogi, CM Wood	Can J Fish Aquat Sci 62:390-399
Oncorhynchus mykiss	Trout - Rainbow	Copper	7440-50-8	1.7	MG/KG	Growth	ED56	Water	Whole Body	Juvenile	2005	Kamunde CN, S Niyogi, CM Wood	Can J Fish Aquat Sci 62:390-399
Salmo salar	Salmon - Atlantic	Manganese	7439-96-5	2.2	MG/KG	Growth	ED17	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Manganese	7439-96-5	2.2	MG/KG	Growth	ED61	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Manganese	7439-96-5	2.2	MG/KG	Growth	ED41	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Manganese	7439-96-5	0.22	MG/KG	Growth	ED41 w/ 10-fold EF	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	1.02	MG/KG	Mortality	LD50	Injection	Whole Body	Juvenile	1979	Hawryshyn, CW, WC Mackay	Bull Environ Contam Toxicol 23:79-86
Carassius auratus	Goldfish	Mercury	7439-97-6	7	MG/KG	Mortality	LD100	Absorption	Whole Body	Adult	1979	Heisinger, J.F., C.D. Hansen, and J.H. Kim.	Arch Environ Contam Toxicol 08:279-283
Carassius auratus	Goldfish	Mercury	7439-97-6	5.6	MG/KG	Mortality	LD80	Absorption	Whole Body	Adult	1979	Heisinger, J.F., C.D. Hansen, and J.H. Kim.	Arch Environ Contam Toxicol 08:279-283
Carassius auratus	Goldfish	Mercury	7439-97-6	6.2	MG/KG	Mortality	NOED	Absorption	Whole Body	Adult	1979	Heisinger, J.F., C.D. Hansen, and J.H. Kim.	Arch Environ Contam Toxicol 08:279-283
Poecilia reticulata	Guppy	Mercury	7439-97-6	0.2	MG/KG	Mortality	NOED	Absorption	Whole Body	Adult	1979	Kudo, A. and D.C. Mortimer.	Environ Pollut 019:239-245.
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	11.9	MG/KG	Mortality	LD50	Ingestion	Whole Body	NS	1970	Mieltinen, E Blankenstein, K Rissanen, M Valtonen	FAO Tech Conference 99:171-172
Esox lucius	Northern Pike	Mercury	7439-97-6	15	MG/KG	Mortality	LD50	Ingestion	Whole Body	NS	1970	Mieltinen, E Blankenstein, K Rissanen, M Valtonen	FAO Tech Conference 99:171-172
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	12	MG/KG	Survival	NOED	Water	Whole Body	NA	1984	Niimi AJ, L Lowe-Jinde	Arch Environ Contam Toxicol 13:303-311
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	90.2	MG/KG	Mortality	LD100	Absorption	Whole Body	Embryo	1979	Birge WJ, JA Black, AG Westerman, JE Hudson	The Biogeochemistry of Mercury, pg 629-655

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Ictalurus punctatus	Catfish-Channel	Mercury	7439-97-6	0.06	MG/KG	Mortality	LD50	Water	Whole Body	Embryo	1979	Birge WJ, JA Black, AG Westerman, JE Hudson	The Biogeochemistry of Mercury, pg 629-655
Ictalurus punctatus	Catfish-Channel	Mercury	7439-97-6	0.006	MG/KG	Mortality	LD50 w/ 10-fold EF	Water	Whole Body	Embryo	1979	Birge WJ, JA Black, AG Westerman, JE Hudson	The Biogeochemistry of Mercury, pg 629-655
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	26.9	MG/KG	Mortality	LD76	Absorption	Whole Body	Embryo	1979	Birge WJ, JA Black, AG Westerman, JE Hudson	The Biogeochemistry of Mercury, pg 629-655
Anguilla anguilla	European eel	Mercury	7439-97-6	15.3	MG/KG	Mortality	LD25	Absorption	Whole Body	NA	1977	Noel-Lambot, F. and J.M. Bouquegneau.	Bull Environ Contam Toxicol 18(4):418-424
Anguilla anguilla	European eel	Mercury	7439-97-6	0.56	MG/KG	Mortality	NOED	Absorption	Whole Body	NA	1977	Noel-Lambot, F. and J.M. Bouquegneau.	Bull Environ Contam Toxicol 18(4):418-424
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	10.69	MG/KG	Growth	NOED	Water	Whole Body	Embryo	1975	Olson GF, DJ Mount, VM Snarski, TW Thorslund	Bull Environ Contam Toxicol 14:129-134
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	10.69	MG/KG	Survival	NOED	Water	Whole Body	Embryo	1975	Olson GF, DJ Mount, VM Snarski, TW Thorslund	Bull Environ Contam Toxicol 14:129-134
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	0.99	MG/KG	Growth	NOED	Combined	Whole Body	Juvenile	1978	Phillips GR, DR Buhler	Trans Am Fish Soc 107-853-861
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	2.28	MG/KG	Growth	NOED	Water	Whole Body	Juvenile	1978	Phillips GR, DR Buhler	Trans Am Fish Soc 107-853-861
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	2.96	MG/KG	Growth	NOED	Combined	Whole Body	Juvenile	1978	Phillips GR, DR Buhler	Trans Am Fish Soc 107-853-861
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	10	MG/KG	Mortality	LOED	Ingestion	Whole Body	Juvenile	1975	Wobeser, G.	J Fish Res Bd Can 32(11), 2015-2023.
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	1.31	MG/KG	Growth	LOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	1.36	MG/KG	Growth	LOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	1.36	MG/KG	Growth	LOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	4.76	MG/KG	Growth	LOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	18.8	MG/KG	Growth	LOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	4.18	MG/KG	Mortality	LOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	0.32	MG/KG	Growth	NOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	0.32	MG/KG	Growth	NOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	0.8	MG/KG	Growth	NOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	2.64	MG/KG	Growth	NOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	9.41	MG/KG	Growth	NOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	2.75	MG/KG	Mortality	NOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Pimephales promelas	Fathead minnow	Mercury	7439-97-6	7.6	MG/KG	Mortality	NOED	Combined	Whole Body	Adult	1982	Snarski, V.M., Olson, G.F.	Aquat Toxicol
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	15	MG/KG	Mortality	LD100	Injection	Whole Body	Immature	1979	Hawryshyn, C.W. and W.C. Mackay	Bull Environ Contam Toxicol 23:79-86
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	5.1	MG/KG	Mortality	LD50	Injection	Whole Body	Immature	1979	Hawryshyn, C.W. and W.C. Mackay	Bull Environ Contam Toxicol 23:79-86
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	2	MG/KG	Mortality	LOED	Injection	Whole Body	Immature	1979	Hawryshyn, C.W. and W.C. Mackay	Bull Environ Contam Toxicol 23:79-86
Stizostedion vitreum	Walleye	Mercury	7439-97-6	2.37	MG/KG	Growth	LOED	Ingestion	Whole Body	Immature	1996	Friedmann, A.S., M.C. Watzin, T. Brinck-Johnsen and J.C. Leiter	Aquat Toxicol 35:265-278
Stizostedion vitreum	Walleye	Mercury	7439-97-6	0.25	MG/KG	Growth	NOED	Ingestion	Whole Body	Immature	1996	Friedmann, A.S., M.C. Watzin, T. Brinck-Johnsen and J.C. Leiter	Aquat Toxicol 35:265-278
Stizostedion vitreum	Walleye	Mercury	7439-97-6	2.37	MG/KG	Mortality	NOED	Ingestion	Whole Body	Immature	1996	Friedmann, A.S., M.C. Watzin, T. Brinck-Johnsen and J.C. Leiter	Aquat Toxicol 35:265-278
Perca flavescens	Yellow perch	Mercury	7439-97-6	0.135	MG/KG	Growth	NOED	Combined	Whole Body	Adult	1990	Wiener, J.G., Fitzgerald, W.F., Watras, C.J., Rada, R.G.	Environ Tox & Chem 09:909-918
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	0.14	MG/KG	Mortality	NOED	Ingestion	Whole Body	Immature	1985	Boudou, A. and F. Ribeyre	Water Air Soil Pollut. 26:137-148.
Oncorhynchus mykiss	Trout - Rainbow	Mercury	7439-97-6	0.47	MG/KG	Mortality	NOED	Ingestion	Whole Body	Immature	1985	Boudou, A. and F. Ribeyre	Water Air Soil Pollut. 26:137-148.
Thymallus thymallus	Grayling	Mercury	7439-97-6	3.8	MG/KG	Reproduction	LOED	Water	Whole Body	Egg	1998	Vollestad LA, E Fjeld, T Haugen, SA Oxnevad	Environ Pollut 101:349-354
Thymallus thymallus	Grayling	Mercury	7439-97-6	3.8	MG/KG	Mortality	LD53	Water	Whole Body	Egg	1998	Vollestad LA, E Fjeld, T Haugen, SA Oxnevad	Environ Pollut 101:349-354
Thymallus thymallus	Grayling	Mercury	7439-97-6	3.8	MG/KG	Growth	NOED	Water	Whole Body	Egg	1998	Vollestad LA, E Fjeld, T Haugen, SA Oxnevad	Environ Pollut 101:349-354
Thymallus thymallus	Grayling	MeHg	22967-92-6	0.63	MG/KG	Growth	NOED	Absorption	Whole Body	Egg	1998	Fjeld E, TO Haugen, LA Vollestad	Sci Total Environ 213:247-254
Salvelinus fontinalis	Trout - Brook	MeHg	22967-92-6	9.4	MG/KG	Mortality	NOED	Water	Whole Body	Other	1976	McKim JM, GF Olson, GW Holcombe, EP Hunt	J Fish Res Board Can 33:2726-2739
Salvelinus fontinalis	Trout - Brook	MeHg	22967-92-6	9.4	MG/KG	Reproduction	NOED	Water	Whole Body	Other	1976	McKim JM, GF Olson, GW Holcombe, EP Hunt	J Fish Res Board Can 33:2726-2739
Oncorhynchus mykiss	Trout - Rainbow	MeHg	22967-92-6	8	MG/KG	Growth	LOED	Ingestion	Whole Body	Juvenile	1982	Rodgers DW, FWH Beamish	Aquat Toxicol 02:271-290
Oncorhynchus mykiss	Trout - Rainbow	MeHg	22967-92-6	10	MG/KG	Growth	LOED	Ingestion	Whole Body	Juvenile	1982	Rodgers DW, FWH Beamish	Aquat Toxicol 02:271-290

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Pimephales promelas	Fathead minnow	MeHg	22967-92-6	4.06	MG/KG	Reproduction	ED52	Ingestion	Whole Body	Neonate to adult	2002	Hammerschmidt, Chad, Mark Sandheinrich, James Wiener, and Ronald Rada	Environ Sci Tech 36: 877-883
Pimephales promelas	Fathead minnow	MeHg	22967-92-6	2.37	MG/KG	Reproduction	ED78	Ingestion	Whole Body	Neonate to adult	2002	Hammerschmidt, Chad, Mark Sandheinrich, James Wiener, and Ronald Rada	Environ Sci Tech 36: 877-883
Pimephales promelas	Fathead minnow	MeHg	22967-92-6	1.77	MG/KG	Reproduction	NOED	Ingestion	Whole Body	Neonate to adult	2002	Hammerschmidt, Chad, Mark Sandheinrich, James Wiener, and Ronald Rada	Environ Sci Tech 36: 877-883
Pimephales promelas	Fathead minnow	MeHg	22967-92-6	0.7	MG/KG	Reproduction	LOED	Ingestion	Whole Body	Egg	2002	Hammerschmidt, Chad, Mark Sandheinrich, James Wiener, and Ronald Rada	Environ Sci Tech 36: 877-883
Cyprinus carpio	Common carp	Nickel	7440-02-0	118.1	MG/KG	Mortality	LD50	Water	White Muscle	Other	1992	Sreedevi P, A Suresh, B Sivaramakrishna, B Prabhavathi, K Radhadkrishnaiah	Chemosphere 24:29-36
Cyprinus carpio	Common carp	Nickel	7440-02-0	11.81	MG/KG	Mortality	LD50 w/ 10-fold EF	Water	White Muscle	Other	1992	Sreedevi P, A Suresh, B Sivaramakrishna, B Prabhavathi, K Radhadkrishnaiah	Chemosphere 24:29-36
Salmo salar	Salmon - Atlantic	Zinc	7440-66-6	12	MG/KG	Growth	NOED	Water	Whole Body	Juvenile	1979	Farmer GJ, D Ashfield, HS Samant	Environ Pollut 019:103-116
Salmo salar	Salmon - Atlantic	Zinc	7440-66-6	23.6	MG/KG	Growth	NOED	Water	Whole Body	Juvenile	1979	Farmer GJ, D Ashfield, HS Samant	Environ Pollut 019:103-116
Poecilia reticulata	Guppy	Zinc	7440-66-6	0.284	MG/KG	Mortality	NOED	Combined	Whole Body	Immature	1981	Pierson, K.B.	Can J Fish Aquat Sci 38
Jordanella floridae	American flagfish	Zinc	7440-66-6	220	MG/KG	Growth	LOED	Combined	Whole Body	Immature	1976	Spehar, R.L.	J Fish Res Bd Can 33
Jordanella floridae	American flagfish	Zinc	7440-66-6	300	MG/KG	Growth	LOED	Combined	Whole Body	Immature	1976	Spehar, R.L.	J Fish Res Bd Can 33
Jordanella floridae	American flagfish	Zinc	7440-66-6	220	MG/KG	Mortality	LOED	Combined	Whole Body	Immature	1976	Spehar, R.L.	J Fish Res Bd Can 33
Jordanella floridae	American flagfish	Zinc	7440-66-6	190	MG/KG	Growth	NOED	Combined	Whole Body	Immature	1976	Spehar, R.L.	J Fish Res Bd Can 33
Jordanella floridae	American flagfish	Zinc	7440-66-6	230	MG/KG	Growth	NOED	Combined	Whole Body	Immature	1976	Spehar, R.L.	J Fish Res Bd Can 33
Jordanella floridae	American flagfish	Zinc	7440-66-6	220	MG/KG	Mortality	NOED	Combined	Whole Body	Immature	1976	Spehar, R.L.	J Fish Res Bd Can 33
Jordanella floridae	American flagfish	Zinc	7440-66-6	300	MG/KG	Mortality	NOED	Combined	Whole Body	Immature	1976	Spehar, R.L.	J Fish Res Bd Can 33
Jordanella floridae	American flagfish	Zinc	7440-66-6	50	MG/KG	Mortality	LOED	Combined	Whole Body	Immature	1978	Spehar, R.L., Leonard, E.N., Defoe, D.L.	Trans Am Fish Soc 107(2): 354-360
Jordanella floridae	American flagfish	Zinc	7440-66-6	58	MG/KG	Growth	NOED	Combined	Whole Body	Immature	1978	Spehar, R.L., Leonard, E.N., Defoe, D.L.	Trans Am Fish Soc 107(2): 354-360
Jordanella floridae	American flagfish	Zinc	7440-66-6	50	MG/KG	Mortality	NOED	Combined	Whole Body	Immature	1978	Spehar, R.L., Leonard, E.N., Defoe, D.L.	Trans Am Fish Soc 107(2): 354-360
Jordanella floridae	American flagfish	Zinc	7440-66-6	58	MG/KG	Reproduction	NOED	Combined	Whole Body	Immature	1978	Spehar, R.L., Leonard, E.N., Defoe, D.L.	Trans Am Fish Soc 107(2): 354-360
Salvelinus fontinalis	Trout - Brook	Zinc	7440-66-6	4.5	MG/KG	Mortality	LOED	Absorption	Whole Body	Egg-embryo	1979	Holcombe, G.W., Benoit,D.A. and E.N. Leonard	Trans Am Fish Soc 108:76-87
Salvelinus fontinalis	Trout - Brook	Zinc	7440-66-6	3.9	MG/KG	Mortality	NOED	Absorption	Whole Body	Egg-embryo	1979	Holcombe, G.W., Benoit,D.A. and E.N. Leonard	Trans Am Fish Soc 108:76-87
Salmo salar	Salmon - Atlantic	Zinc	7440-66-6	60	MG/KG	Growth	NOED	Absorption	Whole Body	Immature	1979	Farmer, G.J., D. Ashfield and H.S. Samont	Environ Pollut 019:103-117.
Salmo salar	Salmon - Atlantic	Zinc	7440-66-6	60	MG/KG	Mortality	NOED	Absorption	Whole Body	Immature	1979	Farmer, G.J., D. Ashfield and H.S. Samont	Environ Pollut 019:103-117.
Salmo salar	Salmon - Atlantic	Zinc	7440-66-6	4.8	MG/KG	Growth	ED17	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Zinc	7440-66-6	4.8	MG/KG	Growth	ED61	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salmo salar	Salmon - Atlantic	Zinc	7440-66-6	4.8	MG/KG	Growth	ED41	Water	Whole Body	Juvenile	2005	Dube MG, LD MacLatchy, JD Kieffer, NE Glozier, JM Culp, KJ Cash	Sci Total Environ 343:135-154
Salvelinus namaycush	Trout -Lake	4,4`-DDE	72-55-9	0.29	MG/KG	Mortality	LOED	Combined	Whole Body	Fry	1981	Berlin, W.H., R.J. Hesselberg, and M.J. Mac	In Chlorinated Hydrocarbons as a Factor in the Reproduction and Survival of Lake Trout (Salvelinus namaycush) in Lake Michigan. Technical Paper 105. U.S. Fish and Wildlife Service.

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Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Salvelinus namaycush	Trout -Lake	4,4`-DDE	72-55-9	0.029	MG/KG	Mortality	LOED w/ 10-fold EF	Combined	Whole Body	Fry	1981	Berlin, W.H., R.J. Hesselberg, and M.J. Mac	In Chlorinated Hydrocarbons as a Factor in the Reproduction and Survival of Lake Trout (Salvelinus namaycush) in Lake Michigan. Technical Paper 105. U.S. Fish and Wildlife Service.
Salvelinus namaycush	Trout -Lake	4,4`-DDE	72-55-9	2.68	MG/KG	Growth	NOED	Combined	Whole Body	Fry	1981	Berlin, W.H., R.J. Hesselberg, and M.J. Mac	In Chlorinated Hydrocarbons as a Factor in the Reproduction and Survival of Lake Trout (Salvelinus namaycush) in Lake Michigan. Technical Paper 105. U.S. Fish and Wildlife Service.
Salvelinus fontinalis	Trout - Brook	4,4`-DDE	72-55-9	5	MG/KG	Growth	NOED	Injection	Whole Body	Juvenile	1977	Addison, R.F. and M.E. Zinck	J Fish Res Bd Can 34:119-122.
Salvelinus fontinalis	Trout - Brook	4,4`-DDE	72-55-9	5	MG/KG	Mortality	NOED	Injection	Whole Body	Juvenile	1977	Addison, R.F. and M.E. Zinck	J Fish Res Bd Can 34:119-122.
Gambusia affinis	Mosquito fish	4,4`-DDE	72-55-9	150	MG/KG	Mortality	NOED	Combined	Whole Body	NA	1974	Metcalf, R.L.	p. 17-38 in Hayes, W.J., Essays in Toxicology, Volume 5. Academic Press
Salvelinus namaycush	Trout -Lake	4,4`-DDE	72-55-9	0.74	MG/KG	Mortality	LOED	Combined	Whole Body	Egg	1964	Burdick, G.E., Harris, E.J., Dean, H.J., Walker, T.M., Skea, J., Colby, D.	Trans Am Fish Soc 093:127-136
Salvelinus namaycush	Trout -Lake	4,4`-DDE	72-55-9	2.48	MG/KG	Mortality	LOED	Combined	Whole Body	Egg	1964	Burdick, G.E., Harris, E.J., Dean, H.J., Walker, T.M., Skea, J., Colby, D.	Trans Am Fish Soc 093:127-136
Micropterus salmoides	Largemouth Bass	4,4`-DDE	72-55-9	40	MG/KG	Reproduction	NOED	Ingestion	Whole Body	Adult	2007	Johnson KG, JK Muller, B Price, A Ware, MS Sepulveda, CJ Borgert, TS Gross	Environ Tox & Chem 26(5):927-934
Micropterus salmoides	Largemouth Bass	4,4`-DDE	72-55-9	40	MG/KG	Reproduction	NOED	Ingestion	Whole Body	Adult	2007	Johnson KG, JK Muller, B Price, A Ware, MS Sepulveda, CJ Borgert, TS Gross	Environ Tox & Chem 26(5):927-934
Micropterus salmoides	Largemouth Bass	4,4`-DDE	72-55-9	40	MG/KG	Reproduction	NOED	Ingestion	Whole Body	Adult	2007	Johnson KG, JK Muller, B Price, A Ware, MS Sepulveda, CJ Borgert, TS Gross	Environ Tox & Chem 26(5):927-934
Micropterus salmoides	Largemouth Bass	4,4`-DDE	72-55-9	40	MG/KG	Reproduction	NOED	Ingestion	Whole Body	Adult	2007	Johnson KG, JK Muller, B Price, A Ware, MS Sepulveda, CJ Borgert, TS Gross	Environ Tox & Chem 26(5):927-934
Micropterus salmoides	Largemouth Bass	4,4`-DDE	72-55-9	75	MG/KG	Reproduction	IP479	Ingestion	Whole Body	Adult	2007	Johnson KG, JK Muller, B Price, A Ware, MS Sepulveda, CJ Borgert, TS Gross	Environ Tox & Chem 26(5):927-934
Micropterus salmoides	Largemouth Bass	4,4`-DDE	72-55-9	40	MG/KG	Reproduction	NOED	Ingestion	Whole Body	Adult	2007	Johnson KG, JK Muller, B Price, A Ware, MS Sepulveda, CJ Borgert, TS Gross	Environ Tox & Chem 26(5):927-934
Micropterus salmoides	Largemouth Bass	4,4`-DDE	72-55-9	40	MG/KG	Reproduction	ED37	Ingestion	Whole Body	Adult	2007	Johnson KG, JK Muller, B Price, A Ware, MS Sepulveda, CJ Borgert, TS Gross	Environ Tox & Chem 26(5):927-934
Micropterus salmoides	Largemouth Bass	4,4`-DDE	72-55-9	40	MG/KG	Reproduction	NOED	Ingestion	Whole Body	Adult	2007	Johnson KG, JK Muller, B Price, A Ware, MS Sepulveda, CJ Borgert, TS Gross	Environ Tox & Chem 26(5):927-934
Lepomis macrochirus	Bluegill	Lindane	58-89-9	0.016	MG/KG	Reproduction	ED10	Water	Muscle*	Juvenile	1976	Macek KJ, KS Buxton, SK Derr, JW Dean, S Sauter	EPA 600/3-76/046 49pp.
Lepomis macrochirus	Bluegill	Lindane	58-89-9	0.025	MG/KG	Reproduction	ED12	Water	Muscle*	Juvenile	1976	Macek KJ, KS Buxton, SK Derr, JW Dean, S Sauter	EPA 600/3-76/046 49pp.
Lepomis macrochirus	Bluegill	Lindane	58-89-9	0.196	MG/KG	Reproduction	ED30	Water	Muscle*	Juvenile	1976	Macek KJ, KS Buxton, SK Derr, JW Dean, S Sauter	EPA 600/3-76/046 49pp.
Lepomis macrochirus	Bluegill	Lindane	58-89-9	0.062	MG/KG	Reproduction	ED35	Water	Muscle*	Juvenile	1976	Macek KJ, KS Buxton, SK Derr, JW Dean, S Sauter	EPA 600/3-76/046 49pp.
Lepomis macrochirus	Bluegill	Lindane	58-89-9	0.196	MG/KG	Reproduction	ED70	Water	Muscle*	Juvenile	1976	Macek KJ, KS Buxton, SK Derr, JW Dean, S Sauter	EPA 600/3-76/046 49pp.
Lepomis macrochirus	Bluegill	Lindane	58-89-9	0.016	MG/KG	Mortality	LD100	Water	Muscle*	Juvenile	1976	Macek KJ, KS Buxton, SK Derr, JW Dean, S Sauter	EPA 600/3-76/046 49pp.
Lepomis macrochirus	Bluegill	Lindane	58-89-9	0.062	MG/KG	Mortality	LD41	Water	Muscle*	Juvenile	1976	Macek KJ, KS Buxton, SK Derr, JW Dean, S Sauter	EPA 600/3-76/046 49pp.

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Lepomis macrochirus	Bluegill	Lindane	58-89-9	0.196	MG/KG	Mortality	LD86	Water	Muscle*	Juvenile	1976	Macek KJ, KS Buxton, SK Derr, JW Dean, S Sauter	EPA 600/3-76/046 49pp.
Lepomis macrochirus	Bluegill	Lindane	58-89-9	0.025	MG/KG	Mortality	LD88	Water	Muscle*	Juvenile	1976	Macek KJ, KS Buxton, SK Derr, JW Dean, S Sauter	EPA 600/3-76/046 49pp.
Gobio gobio	Gudgeon	Lindane	58-89-9	1.1	MG/KG	Mortality	LD50	Absorption	Muscle*	NA	1983	Marcelle, C. and J.P. Thorne.	Bull Environ Contam Toxicol 31:453-458
Gobio gobio	Gudgeon	Lindane	58-89-9	0.59	MG/KG	Mortality	LD85	Absorption	Muscle*	NA	1983	Marcelle, C. and J.P. Thorne.	Bull Environ Contam Toxicol 31:453-458
Gobio gobio	Gudgeon	Lindane	58-89-9	0.19	MG/KG	Mortality	LOED	Absorption	Muscle*	NA	1983	Marcelle, C. and J.P. Thorne.	Bull Environ Contam Toxicol 31:453-458
Gobio gobio	Gudgeon	Lindane	58-89-9	0.013	MG/KG	Mortality	NOED	Absorption	Muscle*	NA	1983	Marcelle, C. and J.P. Thorne.	Bull Environ Contam Toxicol 31:453-458
Oncorhynchus mykiss	Trout - Rainbow	Lindane	58-89-9	2.3	MG/KG	Mortality	LD	Water	Muscle*	Yearling	1975	Tooby TE and FJ Durbin	Environ Pollut 008:79-89
Salvelinus fontinalis	Trout - Brook	Lindane	58-89-9	1.2	MG/KG	Growth	LOED	Absorption	Muscle*	Immature	1976	Macek, K.J., K.S. Buxton, S.K. Derr, J.W. Dean and S. Sauter	U.S. EPA 600/3-76-046, ORD, Duluth, MN. 50 pp.
Salvelinus fontinalis	Trout - Brook	Lindane	58-89-9	1.2	MG/KG	Reproduction	LOED	Absorption	Muscle*	Immature	1976	Macek, K.J., K.S. Buxton, S.K. Derr, J.W. Dean and S. Sauter	U.S. EPA 600/3-76-046, ORD, Duluth, MN. 50 pp.
Lepomis macrochirus	Bluegill	Lindane	58-89-9	0.297	MG/KG	Growth	NOED	Absorption	Muscle*	Immature	1976	Macek, K.J., K.S. Buxton, S.K. Derr, J.W. Dean and S. Sauter	U.S. EPA 600/3-76-046, ORD, Duluth, MN. 50 pp.
Salvelinus fontinalis	Trout - Brook	Lindane	58-89-9	0.77	MG/KG	Growth	NOED	Absorption	Muscle*	Immature	1976	Macek, K.J., K.S. Buxton, S.K. Derr, J.W. Dean and S. Sauter	U.S. EPA 600/3-76-046, ORD, Duluth, MN. 50 pp.
Lepomis macrochirus	Bluegill	Lindane	58-89-9	0.297	MG/KG	Mortality	NOED	Absorption	Muscle*	Immature	1976	Macek, K.J., K.S. Buxton, S.K. Derr, J.W. Dean and S. Sauter	U.S. EPA 600/3-76-046, ORD, Duluth, MN. 50 pp.
Salvelinus fontinalis	Trout - Brook	Lindane	58-89-9	1.2	MG/KG	Mortality	NOED	Absorption	Muscle*	Immature	1976	Macek, K.J., K.S. Buxton, S.K. Derr, J.W. Dean and S. Sauter	U.S. EPA 600/3-76-046, ORD, Duluth, MN. 50 pp.
Salmo salar	Salmon - Atlantic	Lindane	58-89-9	2	MG/KG	Mortality	NOED	Absorption	Whole Body	Immature	1986	Carlberg, G.E., K. Martinsen, A. Kringstad, E. Gjessing, M. Grande, T. Kallqvist and J.U. Skare	Arch Environ Contam Toxicol 15:543-548
Salmo salar	Salmon - Atlantic	Lindane	58-89-9	20	MG/KG	Mortality	NOED w/ 10-fold EF	Absorption	Whole Body	Immature	1986	Carlberg, G.E., K. Martinsen, A. Kringstad, E. Gjessing, M. Grande, T. Kallqvist and J.U. Skare	Arch Environ Contam Toxicol 15:543-548
Danio rerio	Zebra Danio	PCBs	1336-36-3	0.14	MG/KG	Mortality	NOED	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	1.1	MG/KG	Mortality	LD07	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	1.9	MG/KG	Growth	NOED	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	2.7	MG/KG	Growth	ED59	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	0.14	MG/KG	Reproduction	NOED	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	1.1	MG/KG	Reproduction	ED47	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	1.1	MG/KG	Mortality	LOED	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	2.7	MG/KG	Mortality	LD18	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	0.14	MG/KG	Growth	LOED	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	0.014	MG/KG	Growth	LOED w/ 10-fold EF	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	1.9	MG/KG	Reproduction	NOED	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	1.1	MG/KG	Reproduction	LOED	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Danio rerio	Zebra Danio	PCBs	1336-36-3	2.7	MG/KG	Reproduction	ED54	Ingestion	Whole Body	Adult	1998	Orn, S., P.L. Anderson, L. Forlin, M. Tysklind, L. Norrgren	Arch Environ Contam Toxicol 35:53-57
Oncorhynchus kisutch	Salmon-coho	PCBs	1336-36-3	645	MG/KG	Mortality	ED100	Ingestion	Whole Body	Immature	1977	Mayer, F.L., P.M. Mehrle, and H.O. Sanders	Arch Environ Contam Toxicol 05:501-511
Ictalurus punctatus	Catfish-Channel	PCBs	1336-36-3	14.3	MG/KG	Growth	LOED	Ingestion	Whole Body	Immature	1976	Hansen, L.G., W.B. Wiekhorst and J. Simon	J Fish Res Bd Can 33:1343-1352.

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Ictalurus punctatus	Catfish-Channel	PCBs	1336-36-3	10.9	MG/KG	Mortality	NOED	Ingestion	Whole Body	Immature	1976	Hansen, L.G., W.B. Wiekhorst and J. Simon	J Fish Res Bd Can 33:1343-1352.
Ictalurus punctatus	Catfish-Channel	PCBs	1336-36-3	14.3	MG/KG	Mortality	NOED	Ingestion	Whole Body	Immature	1976	Hansen, L.G., W.B. Wiekhorst and J. Simon	J Fish Res Bd Can 33:1343-1352.
Carassius auratus	Goldfish	PCBs	1336-36-3	250	mg/kg	Mortality	LD50	Absorption	Whole Body	NA	1972	Hattula, M.I. and O. Karlog	Acta Pharmacol. Toxicol. 31:238-240.
Carassius auratus	Goldfish	PCBs	1336-36-3	324	MG/KG	Mortality	LD50	Absorption	Whole Body	Immature	1972	Hattula, M.I. and O. Karlog	Acta Pharmacol. Toxicol. 31:238-240.
Phoxinus phoxinus	Minnow	PCBs	1336-36-3	170	MG/KG	Reproduction	ED83	Ingestion	Whole Body	Adult	1980	Bengtsson, B.E.	Water Res. 14:681-687.
Phoxinus phoxinus	Minnow	PCBs	1336-36-3	180	MG/KG	Growth	LOED	Ingestion	Whole Body	Adult	1980	Bengtsson, B.E.	Water Res. 14:681-687.
Phoxinus phoxinus	Minnow	PCBs	1336-36-3	70	MG/KG	Mortality	LOED	Ingestion	Whole Body	Adult	1980	Bengtsson, B.E.	Water Res. 14:681-687.
Phoxinus phoxinus	Minnow	PCBs	1336-36-3	15	MG/KG	Reproduction	LOED	Ingestion	Whole Body	Adult	1980	Bengtsson, B.E.	Water Res. 14:681-687.
Phoxinus phoxinus	Minnow	PCBs	1336-36-3	1.6	MG/KG	Reproduction	NOED	Ingestion	Whole Body	Adult	1980	Bengtsson, B.E.	Water Res. 14:681-687.
Salvelinus namaycush	Trout -Lake	PCBs	1336-36-3	1.8	MG/KG	Growth	LOED	Combined	Whole Body	Fry	1981	Mac, M.J. and J.G. Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	PCBs	1336-36-3	2.4	MG/KG	Growth	LOED	Combined	Whole Body	Fry	1981	Mac, M.J. and J.G. Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	PCBs	1336-36-3	0.76	MG/KG	Growth	NOED	Absorption	Whole Body	Fry	1981	Mac, M.J. and J.G. Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	PCBs	1336-36-3	1.8	MG/KG	Mortality	NOED	Combined	Whole Body	Fry	1981	Mac, M.J. and J.G. Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	PCBs	1336-36-3	2.4	MG/KG	Mortality	NOED	Combined	Whole Body	Fry	1981	Mac, M.J. and J.G. Seelye	Bull Environ Contam Toxicol 27:359-367
Salmo salar	Salmon - Atlantic	PCBs	1336-36-3	44	MG/KG	Mortality	NOED	Absorption	Whole Body	Immature	1986	Carlberg, G.E., K. Martinsen, A. Kringstad, E. Gjessing, M. Grande, T. Kallqvist and J.U. Skare	Arch Environ Contam Toxicol 15:543-548
Oncorhynchus kisutch	Salmon-coho	PCBs	1336-36-3	0.15	MG/KG	Mortality	LOED	Injection	Whole Body	Immature	1982	Folmar, L.C., W.W. Dickhoff, W.S. Zaugg and H.O. Hodgins	Aquat Toxicol 02:291-299.
Oncorhynchus kisutch	Salmon-coho	PCBs	1336-36-3	2.3	MG/KG	Growth	LOED	Ingestion	Whole Body	Juvenile	1976	Gruger, E.H., T. Hurley and N.L. Karrick	Environ Sci Tech 10:1033-1037
Oncorhynchus kisutch	Salmon-coho	PCBs	1336-36-3	0.6	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	1976	Gruger, E.H., T. Hurley and N.L. Karrick	Environ Sci Tech 10:1033-1037
Oncorhynchus kisutch	Salmon-coho; silver salmon	PCBs	1336-36-3	0.977	MG/KG	Growth	NOED		Whole Body	Juvenile	1976	Gruger, E.H., T. Hurley and N.L. Karrick	Environ Sci Tech 10:1033-1037
Oncorhynchus kisutch	Salmon-coho; silver salmon	PCBs	1336-36-3	3.99	MG/KG	Growth	LOED		Whole Body	Juvenile	1976	Gruger, E.H., T. Hurley and N.L. Karrick	Environ Sci Tech 10:1033-1037
Micropterus salmoides	Largemouth Bass	PCBs	1336-36-3	121	MG/KG	Survival	NOED	Combined	Whole Body	Adult	2004	Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins	Environ Tox & Chem 23:1762-1773
Micropterus salmoides	Largemouth Bass	PCBs	1336-36-3	28	MG/KG	Survival	NOED	Combined	Whole Body	Juvenile	2004	Reiser DW, ES Greenberg, TE Helser, M Branton, KD Jenkins	Environ Tox & Chem 23:1762-1773
Salvelinus fontinalis	Trout - Brook	PCBs	1336-36-3	0.15	MG/KG	Mortality	LOED	Combined	Whole Body	NS	2002	Meador JP, TK Collier and JE Stein	Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Oncorhynchus mykiss	Trout - Rainbow	PCBs	1336-36-3	0.28	MG/KG	Mortality	LOED	Water	Whole Body	NS	2002	Meador JP, TK Collier and JE Stein	Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Oncorhynchus mykiss	Trout - Rainbow	PCBs	1336-36-3	0.46	MG/KG	Mortality	LOED	Water	Whole Body	NS	2002	Meador JP, TK Collier and JE Stein	Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Oncorhynchus kisutch	Salmon-coho	PCBs	1336-36-3	250	MG/KG	Growth	LOED	Ingestion	Whole Body	NS	2002	Meador JP, TK Collier and JE Stein	Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Salmo salar	Salmon - Atlantic	PCBs	1336-36-3	1.1	MG/KG	Growth	LOED	Water	Whole Body	NS	2002	Meador JP, TK Collier and JE Stein	Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Salvelinus fontinalis	Trout - Brook	PCBs	1336-36-3	12.5	MG/KG	Mortality	LOED	Water	Whole Body	NS	2002	Meador JP, TK Collier and JE Stein	Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Oncorhynchus mykiss	Trout - Rainbow	PCBs	1336-36-3	150	MG/KG	Growth	LOED	Ingestion	Whole Body	NS	2002	Meador JP, TK Collier and JE Stein	Aquatic Conserv: Mar. Freshw Ecosyst. 12:493-516
Oncorhynchus mykiss	Trout - Rainbow	Aroclor 1254	11097-69-1	8.2	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	1974	Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.	J. Agr. Food Chem., 22(4):638-642.
Oncorhynchus mykiss	Trout - Rainbow	Aroclor 1254	11097-69-1	8.2	MG/KG	Mortality	NOED	Ingestion	Whole Body	Juvenile	1974	Lieb, A.J., D.D. Bills, and R.O. Sinnhuber.	J. Agr. Food Chem., 22(4):638-642.
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	156	MG/KG	Growth	ED107	Combined	Whole Body	Larval	1981	Mac MJ, JC Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	202	MG/KG	Growth	ED112	Combined	Whole Body	Larval	1981	Mac MJ, JC Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	206	MG/KG	Growth	ED113	Combined	Whole Body	Larval	1981	Mac MJ, JC Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	156	MG/KG	Growth	ED129	Combined	Whole Body	Larval	1981	Mac MJ, JC Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	202	MG/KG	Growth	LOED	Combined	Whole Body	Larval	1981	Mac MJ, JC Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	182	MG/KG	Growth	NOED	Combined	Whole Body	Larval	1981	Mac MJ, JC Seelye	Bull Environ Contam Toxicol 27:359-367

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Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	182	MG/KG	Growth	NOED	Combined	Whole Body	Larval	1981	Mac MJ, JC Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	202	MG/KG	Growth	NOED	Combined	Whole Body	Larval	1981	Mac MJ, JC Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	156	MG/KG	Mortality	NOED	Combined	Whole Body	Larval	1981	Mac MJ, JC Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	206	MG/KG	Mortality	NOED	Combined	Whole Body	Larval	1981	Mac MJ, JC Seelye	Bull Environ Contam Toxicol 27:359-367
Salvelinus fontinalis	Trout - Brook	Aroclor 1254	11097-69-1	419	MG/KG	Mortality	LD100	Absorption	Whole Body	Embryo	1978	Mauck, W.L., P.M. Mehrle, and F.L. Mayer.	J Fish Res Bd Can 35:1084-1088.
Salvelinus fontinalis	Trout - Brook	Aroclor 1254	11097-69-1	284	MG/KG	Mortality	LD50	Absorption	Whole Body	Embryo	1978	Mauck, W.L., P.M. Mehrle, and F.L. Mayer.	J Fish Res Bd Can 35:1084-1088.
Salvelinus fontinalis	Trout - Brook	Aroclor 1254	11097-69-1	125	MG/KG	Mortality	LOED	Absorption	Whole Body	Embryo	1978	Mauck, W.L., P.M. Mehrle, and F.L. Mayer.	J Fish Res Bd Can 35:1084-1088.
Salvelinus fontinalis	Trout - Brook	Aroclor 1254	11097-69-1	31	MG/KG	Growth	NOED	Absorption	Whole Body	Embryo	1978	Mauck, W.L., P.M. Mehrle, and F.L. Mayer.	J Fish Res Bd Can 35:1084-1088.
Salvelinus fontinalis	Trout - Brook	Aroclor 1254	11097-69-1	71	MG/KG	Mortality	NOED	Absorption	Whole Body	Embryo	1978	Mauck, W.L., P.M. Mehrle, and F.L. Mayer.	J Fish Res Bd Can 35:1084-1088.
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	1.53	MG/KG	Mortality	LOED	Combined	Whole Body	Fry	1981	Berlin, W.H., R.J. Hesselberg, and M.J. Mac	In Chlorinated Hydrocarbons as a Factor in the Reproduction and Survival of Lake Trout (Salvelinus namaycush) in Lake Michigan. Technical Paper 105. U.S. Fish and Wildlife Service.
Salvelinus namaycush	Trout -Lake	Aroclor 1254	11097-69-1	26.3	MG/KG	Growth	NOED	Combined	Whole Body	Fry	1981	Berlin, W.H., R.J. Hesselberg, and M.J. Mac	In Chlorinated Hydrocarbons as a Factor in the Reproduction and Survival of Lake Trout (Salvelinus namaycush) in Lake Michigan. Technical Paper 105. U.S. Fish and Wildlife Service.
Oncorhynchus mykiss	Trout - Rainbow	Aroclor 1254	11097-69-1	81	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	1975	Nestel H, Budd J	Can J Comp Med 39:208-215
Oncorhynchus mykiss	Trout - Rainbow	Aroclor 1254	11097-69-1	81	MG/KG	Survival	NOED	Ingestion	Whole Body	Juvenile	1975	Nestel H, Budd J	Can J Comp Med 39:208-215
Oncorhynchus mykiss	Trout - Rainbow	Aroclor 1254	11097-69-1	81	MG/KG	Survival	NOED	Ingestion	Whole Body	Juvenile	1975	Nestel H, Budd J	Can J Comp Med 39:208-215
Brachydanio rerio	Zebra Fish	Aroclor 1254	11097-69-1	4240	MG/KG	Mortality	LD82	Water	Whole Body	NS	1989	Bouraly M, RJ Millischer.	Chemosphere 18:2051-2063
Brachydanio rerio	Zebra Fish	Aroclor 1254	11097-69-1	4240	MG/KG	Growth	NOED	Water	Whole Body	NS	1989	Bouraly M, RJ Millischer.	Chemosphere 18:2051-2063
Oncorhynchus tshawytscha	Salmon - Chinook	Aroclor 1254	11097-69-1	60	MG/KG	Mortality	NOED	Ingestion	Whole Body	Juvenile	2003	Powell DB, RC Palm Jr. A Skillman, K Godtfredsen	Environ Tox & Chem
Oncorhynchus tshawytscha	Salmon - Chinook	Aroclor 1254	11097-69-1	0.16	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	2003	Powell DB, RC Palm Jr. A Skillman, K Godtfredsen	Environ Tox & Chem
Oncorhynchus tshawytscha	Salmon - Chinook	Aroclor 1254	11097-69-1	0.95	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	2003	Powell DB, RC Palm Jr. A Skillman, K Godtfredsen	Environ Tox & Chem
Oncorhynchus tshawytscha	Salmon - Chinook	Aroclor 1254	11097-69-1	0.98	MG/KG	Mortality	NOED	Ingestion	Whole Body	Juvenile	2003	Powell DB, RC Palm Jr. A Skillman, K Godtfredsen	Environ Tox & Chem
Oncorhynchus tshawytscha	Salmon - Chinook	Aroclor 1254	11097-69-1	0.16	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	2003	Powell DB, RC Palm Jr. A Skillman, K Godtfredsen	Environ Tox & Chem
Oncorhynchus tshawytscha	Salmon - Chinook	Aroclor 1254	11097-69-1	0.74	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	2003	Powell DB, RC Palm Jr. A Skillman, K Godtfredsen	Environ Tox & Chem
Oncorhynchus tshawytscha	Salmon - Chinook	Aroclor 1254	11097-69-1	0.95	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	2003	Powell DB, RC Palm Jr. A Skillman, K Godtfredsen	Environ Tox & Chem
Oncorhynchus tshawytscha	Salmon - Chinook	Aroclor 1254	11097-69-1	0.95	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	2003	Powell DB, RC Palm Jr. A Skillman, K Godtfredsen	Environ Tox & Chem
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00452	MG/KG	Survival	ED50	Combined	Whole Body	Immature	1988	Mehrle, P.M., D.R. Buckler, E.E. Little, L.M. Smith, J.D. Petty, P.H. Peterman, D.L. Stalling, G.M. DeGraeve, J.J. Coyle and W.J. Adam	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	1.38	MG/KG	Growth	LOED	Ingestion	Whole Body	Juvenile	1977	Hawkes, C.L. and L.A. Norris.	Trans Am Fish Soc 106:641-645.
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	1.38	MG/KG	Mortality	LOED	Ingestion	Whole Body	Juvenile	1977	Hawkes, C.L. and L.A. Norris.	Trans Am Fish Soc 106:641-645.
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.0016	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	1977	Hawkes, C.L. and L.A. Norris.	Trans Am Fish Soc 106:641-645.
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.0016	MG/KG	Mortality	NOED	Ingestion	Whole Body	Juvenile	1977	Hawkes, C.L. and L.A. Norris.	Trans Am Fish Soc 106:641-645.
Gambusia affinis	Mosquito fish	2,3,7,8-TCDD	1746-01-6	0.0067	MG/KG	Mortality	LD100	Combined	Whole Body	Adult	1978	Isensee, A.R.	Ecol. Bull. (Stockholm) 27:255-262.
Ictalurus punctatus	Catfish-Channel	2,3,7,8-TCDD	1746-01-6	0.19	MG/KG	Mortality	NOED	Absorption	Whole Body	Juvenile	1975	Isensee AR, GE Jones	Environ Sci Tech 09:668-672
Gambusia affinis	Mosquito fish	2,3,7,8-TCDD	1746-01-6	0.9	MG/KG	Mortality	NOED	Absorption	Whole Body	NS	1975	Isensee AR, GE Jones	Environ Sci Tech 09:668-672

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.25	MG/KG	Growth	NOED	Ingestion	Whole Body	Juvenile	1986	Kleeman JM, JR Olson, SM Chen, RE Peterson	Toxicol Appl Pharmacol 083:391-401
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	3.00E-05	MG/KG	Growth	ED13	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	5.00E-05	MG/KG	Growth	ED13	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00041	MG/KG	Growth	ED20	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00087	MG/KG	Growth	ED26	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	3.00E-05	MG/KG	Growth	ED27	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	1.10E-04	MG/KG	Growth	ED51	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00068	MG/KG	Mortality	LD29	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00014	MG/KG	Mortality	LD33	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00142	MG/KG	Mortality	LD43	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00014	MG/KG	Mortality	LD47	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00087	MG/KG	Mortality	LD71	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00086	MG/KG	Mortality	LD73	Water	Whole Body	Larval	1988	Mehrle PM, DR Buckler, EE Little, LM Smith, JD Petty, PH Peterman, DL Stalling, GM DeGraeve, JJ Coyle, and WJ Adams	Environ Tox & Chem 07:47-62
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	0.00478	MG/KG	Growth	ED60	Water	Whole Body	Juvenile	1979	Miller RA, LA Norris and BR Loper	Trans Am Fish Soc 108:401-407
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	0.00478	MG/KG	Growth	ED65	Water	Whole Body	Juvenile	1979	Miller RA, LA Norris and BR Loper	Trans Am Fish Soc 108:401-407
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	2.17	MG/KG	Growth	ED84	Water	Whole Body	Juvenile	1979	Miller RA, LA Norris and BR Loper	Trans Am Fish Soc 108:401-407
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	2.17	MG/KG	Growth	ED93	Water	Whole Body	Juvenile	1979	Miller RA, LA Norris and BR Loper	Trans Am Fish Soc 108:401-407
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	0.00478	MG/KG	Mortality	LD15	Water	Whole Body	Juvenile	1979	Miller RA, LA Norris and BR Loper	Trans Am Fish Soc 108:401-407
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	0.00478	MG/KG	Mortality	LD16	Water	Whole Body	Juvenile	1979	Miller RA, LA Norris and BR Loper	Trans Am Fish Soc 108:401-407
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	2.17	MG/KG	Mortality	LD46	Water	Whole Body	Juvenile	1979	Miller RA, LA Norris and BR Loper	Trans Am Fish Soc 108:401-407

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	0.0021	MG/KG	Growth	NOED	Water	Whole Body	Juvenile	1979	Miller RA, LA Norris and BR Loper	Trans Am Fish Soc 108:401-407
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	0.0021	MG/KG	Survival	NOED	Water	Whole Body	Juvenile	1979	Miller RA, LA Norris and BR Loper	Trans Am Fish Soc 108:401-407
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	4.00E-05	MG/KG	Mortality	LD02	Water	Whole Body	Egg	1991	Spitsbergen JM, MK Walker, JR Olson, RE Peterson	Aquat Toxicol 19:41-72
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	4.00E-05	MG/KG	Mortality	LD02	Water	Whole Body	Egg	1991	Spitsbergen JM, MK Walker, JR Olson, RE Peterson	Aquat Toxicol 19:41-72
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	4.00E-05	MG/KG	Mortality	LD03	Water	Whole Body	Egg	1991	Spitsbergen JM, MK Walker, JR Olson, RE Peterson	Aquat Toxicol 19:41-72
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	4.00E-05	MG/KG	Mortality	LD05	Water	Whole Body	Egg	1991	Spitsbergen JM, MK Walker, JR Olson, RE Peterson	Aquat Toxicol 19:41-72
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.004	MG/KG	Mortality	LD09	Water	Whole Body	Egg	1991	Spitsbergen JM, MK Walker, JR Olson, RE Peterson	Aquat Toxicol 19:41-72
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.004	MG/KG	Mortality	LD100	Water	Whole Body	Egg	1991	Spitsbergen JM, MK Walker, JR Olson, RE Peterson	Aquat Toxicol 19:41-72
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.004	MG/KG	Mortality	LD31	Water	Whole Body	Egg	1991	Spitsbergen JM, MK Walker, JR Olson, RE Peterson	Aquat Toxicol 19:41-72
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.004	MG/KG	Mortality	LD45	Water	Whole Body	Egg	1991	Spitsbergen JM, MK Walker, JR Olson, RE Peterson	Aquat Toxicol 19:41-72
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00258	MG/KG	Growth	ED130	Water	Whole Body	Fry	1985	Branson DR, It Takahashi, WM Parker and GE Blau	Environ Tox & Chem 04:779-788
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00258	MG/KG	Growth	ED136	Water	Whole Body	Fry	1985	Branson DR, It Takahashi, WM Parker and GE Blau	Environ Tox & Chem 04:779-788
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00258	MG/KG	Growth	ED186	Water	Whole Body	Fry	1985	Branson DR, It Takahashi, WM Parker and GE Blau	Environ Tox & Chem 04:779-788
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.000119	MG/KG	Mortality	LD100	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.000145	MG/KG	Mortality	LD100	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.000154	MG/KG	Mortality	LD100	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	5.80E-05	MG/KG	Mortality	LD50	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	6.90E-05	MG/KG	Mortality	LD50	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	8.00E-05	MG/KG	Mortality	LD50	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	4.00E-05	MG/KG	Mortality	LOED	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	5.00E-05	MG/KG	Mortality	LOED	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	5.50E-05	MG/KG	Mortality	LOED	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	2.30E-05	MG/KG	Mortality	NOED	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	3.40E-05	MG/KG	Mortality	NOED	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	4.40E-05	MG/KG	Mortality	NOED	Ingestion	Whole Body	Egg	1994	Walker MK, PM Cook, AR Batterman, BC Butterworth, C Berini, JJ Libal, LC Hufnagle, RE Peterson	Can J Fish Aquat Sci 51:1410-1419
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.001	MG/KG	Mortality	LD100	Injection	Whole Body	Fry	1991	Walker MK and RE Peterson	Aquat Toxicol 21:219-238
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.0002	MG/KG	Mortality	LD25	Injection	Whole Body	Fry	1991	Walker MK and RE Peterson	Aquat Toxicol 21:219-238
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00023	MG/KG	Mortality	LD50	Injection	Whole Body	Fry	1991	Walker MK and RE Peterson	Aquat Toxicol 21:219-238
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00024	MG/KG	Mortality	LD50	Injection	Whole Body	Fry	1991	Walker MK and RE Peterson	Aquat Toxicol 21:219-238
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.0003	MG/KG	Mortality	LD50	Injection	Whole Body	Fry	1991	Walker MK and RE Peterson	Aquat Toxicol 21:219-238
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.000374	MG/KG	Mortality	LD50	Injection	Whole Body	Fry	1991	Walker MK and RE Peterson	Aquat Toxicol 21:219-238
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.000488	MG/KG	Mortality	LD50	Injection	Whole Body	Fry	1991	Walker MK and RE Peterson	Aquat Toxicol 21:219-238
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.0004	MG/KG	Mortality	LD75	Injection	Whole Body	Fry	1991	Walker MK and RE Peterson	Aquat Toxicol 21:219-238
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.0001	MG/KG	Mortality	NOED	Injection	Whole Body	Fry	1991	Walker MK and RE Peterson	Aquat Toxicol 21:219-238
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.00065	MG/KG	Mortality	LD50	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	5.50E-05	MG/KG	Growth	LOED	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.000226	MG/KG	Growth	LOED	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	5.50E-05	MG/KG	Mortality	LOED	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	3.40E-05	MG/KG	Mortality	LD50	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	5.50E-05	MG/KG	Mortality	LD50	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.000121	MG/KG	Mortality	LD50	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.000302	MG/KG	Mortality	LD50	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.000121	MG/KG	Mortality	LD50	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.000226	MG/KG	Mortality	LD50	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	0.000302	MG/KG	Mortality	LD50	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	3.40E-05	MG/KG	Growth	NOED	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	3.40E-05	MG/KG	Mortality	NOED	Water	Whole Body	Egg	1991	Walker MK, JM Spitsbergen, JR Olson, RE Peterson	Can J Fish Aquat Sci 48:875-883
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	8.50E-05	MG/KG	Mortality	LD50	Water	Whole Body	Embryo	1995	Zabel EW, PM Cook, RE Peterson	Environ Tox & Chem 14:2175-2179
Cyprinus carpio	Common carp	2,3,7,8-TCDD	1746-01-6	2.22	MG/KG	Mortality	LD37	Water	Whole Body	Yearling	1991	Cook, PM, DW Kuehl, MK Walker, RE Peterson	Banbury Report 35: Biological Basis for Risk Assessment of Dioxins and Related Compounds
Coregonus clupeaformis	Lake Whitefish	2,3,7,8-TCDD	1746-01-6	0.085	MG/KG	Growth	NA	Ingestion	Whole Body	Early Juvenile	1997	Fisk, A. T., A. L. Yarechewski, D. A. Metner, R. E. Evans, W. L. Lockhart, and D. C. G. Muir	Aquat Toxicol
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.15	MG/KG	Growth	NA	Ingestion	Whole Body	Early Juvenile	1997	Fisk, A. T., A. L. Yarechewski, D. A. Metner, R. E. Evans, W. L. Lockhart, and D. C. G. Muir	Aquat Toxicol
Ictalurus punctatus	Catfish-Channel	2,3,7,8-TCDD	1746-01-6	0.14	MG/KG	Mortality	NOED	Combined	Whole Body	Adult	1975	Isensee, A.R. and G.E. Jones	Environ Sci Tech 09:668-672
Gambusia affinis	Mosquito fish	2,3,7,8-TCDD	1746-01-6	0.44	MG/KG	Mortality	NOED	Combined	Whole Body	Adult	1975	Isensee, A.R. and G.E. Jones	Environ Sci Tech 09:668-672
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.005	MG/KG	Mortality	NOED	Injection	Whole Body	NA	1991	Janz, D.M. and C.D. Metcalfe	Environ Tox & Chem 10:917-923.
Perca flavescens	Yellow perch	2,3,7,8-TCDD	1746-01-6	0.003	MG/KG	Mortality	LD50	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Cyprinus carpio	Common carp	2,3,7,8-TCDD	1746-01-6	0.003	MG/KG	Mortality	LD50	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Ictalurus melas	Black Bullhead	2,3,7,8-TCDD	1746-01-6	0.005	MG/KG	Mortality	LD50	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.01	MG/KG	Mortality	LD50	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Micropterus salmoides	Largemouth Bass	2,3,7,8-TCDD	1746-01-6	0.011	MG/KG	Mortality	LD50	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Lepomis macrochirus	Bluegill	2,3,7,8-TCDD	1746-01-6	0.016	MG/KG	Mortality	LD50	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.005	MG/KG	Growth	LOED	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Perca flavescens	Yellow perch	2,3,7,8-TCDD	1746-01-6	0.005	MG/KG	Growth	LOED	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Lepomis macrochirus	Bluegill	2,3,7,8-TCDD	1746-01-6	0.025	MG/KG	Growth	LOED	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Perca flavescens	Yellow perch	2,3,7,8-TCDD	1746-01-6	0.001	MG/KG	Mortality	NOED	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.001	MG/KG	Mortality	NOED	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Micropterus salmoides	Largemouth Bass	2,3,7,8-TCDD	1746-01-6	0.001	MG/KG	Mortality	NOED	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Lepomis macrochirus	Bluegill	2,3,7,8-TCDD	1746-01-6	0.001	MG/KG	Mortality	NOED	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Ictalurus melas	Black Bullhead	2,3,7,8-TCDD	1746-01-6	0.001	MG/KG	Mortality	NOED	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Cyprinus carpio	Common carp	2,3,7,8-TCDD	1746-01-6	0.001	MG/KG	Mortality	NOED	Injection	Whole Body	NA	1988	Kleeman, J.M., J.R. Olson and R.E. Peterson	Fundam. Appl. Toxicol. 10:206-213.
Perca flavescens	Yellow perch	2,3,7,8-TCDD	1746-01-6	0.000143	MG/KG	Growth	NOED	Ingestion	Whole Body	Immature	1986	Kleeman, J.M., J.R. Olson, S.M. Chen and R.E. Peterson	Toxicol Appl Pharmacol 083:402-411.
Perca flavescens	Yellow perch	2,3,7,8-TCDD	1746-01-6	0.000143	MG/KG	Mortality	NOED	Ingestion	Whole Body	Immature	1986	Kleeman, J.M., J.R. Olson, S.M. Chen and R.E. Peterson	Toxicol Appl Pharmacol 083:402-411.
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00025	MG/KG	Growth	NOED	Ingestion	Whole Body	Immature	1986	Kleeman, J.M., J.R. Olson, S.M. Chen and R.E. Peterson	Toxicol Appl Pharmacol 083:391-401.
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00025	MG/KG	Mortality	NOED	Ingestion	Whole Body	Immature	1986	Kleeman, J.M., J.R. Olson, S.M. Chen and R.E. Peterson	Toxicol Appl Pharmacol 083:391-401.
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	0.00217	MG/KG	Growth	LOED	Absorption	Whole Body	Immature	1979	Miller, R.A., L.A. Norris and B.R. Loper	Trans Am Fish Soc 108:401-407
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	0.00217	MG/KG	Mortality	LOED	Absorption	Whole Body	Immature	1979	Miller, R.A., L.A. Norris and B.R. Loper	Trans Am Fish Soc 108:401-407
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	0.000125	MG/KG	Growth	NOED	Absorption	Whole Body	Immature	1979	Miller, R.A., L.A. Norris and B.R. Loper	Trans Am Fish Soc 108:401-407
Oncorhynchus kisutch	Salmon-coho	2,3,7,8-TCDD	1746-01-6	0.000125	MG/KG	Mortality	NOED	Absorption	Whole Body	Immature	1979	Miller, R.A., L.A. Norris and B.R. Loper	Trans Am Fish Soc 108:401-407
Salvelinus fontinalis	Trout - Brook	2,3,7,8-TCDD	1746-01-6	0.0012	MG/KG	Reproduction	LOED	Ingestion	Whole Body	Immature	1994	Tietge, J.E.	Society of Environmental Toxicology and Chemistry 15th Annual Meeting Abstract
Salvelinus fontinalis	Trout - Brook	2,3,7,8-TCDD	1746-01-6	0.0012	MG/KG	Growth	NOED	Ingestion	Whole Body	Immature	1994	Tietge, J.E.	Society of Environmental Toxicology and Chemistry 15th Annual Meeting Abstract
Salvelinus fontinalis	Trout - Brook	2,3,7,8-TCDD	1746-01-6	0.0012	MG/KG	Mortality	NOED	Ingestion	Whole Body	Immature	1994	Tietge, J.E.	Society of Environmental Toxicology and Chemistry 15th Annual Meeting Abstract
Salvelinus fontinalis	Trout - Brook	2,3,7,8-TCDD	1746-01-6	0.0006	MG/KG	Reproduction	NOED	Ingestion	Whole Body	Immature	1994	Tietge, J.E.	Society of Environmental Toxicology and Chemistry 15th Annual Meeting Abstract
Ictalurus punctatus	Catfish-Channel	2,3,7,8-TCDD	1746-01-6	0.0044	MG/KG	Mortality	LD100	Absorption	Whole Body	NA	1978	Yockim, R.S., Isensee, A.R., Jones, G.E.	Chemosphere 07:215-220
Gambusia affinis	Mosquito fish	2,3,7,8-TCDD	1746-01-6	0.0072	MG/KG	Mortality	LD100	Absorption	Whole Body	NA	1978	Yockim, R.S., Isensee, A.R., Jones, G.E.	Chemosphere 07:215-220

Table G-1
Critical Body Residue Data for Fish Tissue
Fletcher's Paint Superfund Site

Species	Species Common Name	Chemical Name	CAS	Conc_Wet	Conc_Units	Effect	Endpoint	Exposure Route	Body Part	Start LifeStage	Year	Author	Journal
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00065	MG/KG	Growth	LOED	Absorption	Whole Body	Immature	1985	Branson, D.R., L.T. Takahashi, W.M. Parker and G.E. Blau	Environ Tox & Chem 04:779-788
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00065	MG/KG	Growth	LOED	Absorption	Whole Body	Immature	1985	Branson, D.R., L.T. Takahashi, W.M. Parker and G.E. Blau	Environ Tox & Chem 04:779-788
Oncorhynchus mykiss	Trout - Rainbow	2,3,7,8-TCDD	1746-01-6	0.00065	MG/KG	Mortality	LOED	Absorption	Whole Body	Immature	1985	Branson, D.R., L.T. Takahashi, W.M. Parker and G.E. Blau	Environ Tox & Chem 04:779-788
Salvelinus namaycush	Trout -Lake	2,3,7,8-TCDD	1746-01-6	4.40E-05	MG/KG	Mortality	LD50	Absorption	Whole Body	Egg-embryo	1993	Guiney, P., E. Zabel, R. Peterson, P. Cook, J. Casselman, J. Fitzsimons and H. Simonin	Presentation 519, 14th Annual Meeting, SETAC Houston, TX.

Common Name	Scientific Name	CAS	# Doses	Route Of Exposure	Study Length	Unit	Initial Lifestage	Age	Age Units	Sex	General Effect Group	Measurement Description	Response Site	Lipid (%)	Body Weight at Effect Measurement	Endpoint	Significance	Residue	NOEL Total PCB (ug/kg)	LOEL Total PCB (ug/kg)	NOEL Total TEQ (pg/g)	LOEL Total TEQ (pg/g)	Bounded NOEL-LOEL Pair	Author	Reference
Coho salmon,silver salmon	Oncorhynchus kisutch	PCB mixture	4	chemical incorporated into food	72	day(s)	juvenile(s)	~1	yr	Both	Growth	Weight	organism	NR	28.1	NOEC	P<0.05	Wet	3990	NR	0	NR	NR	Gruger EH Jr.;Hruby T;Karrick NL;	Environ.Sci.Technol. 10(10):1033-1037 (1976)
Coho salmon,silver salmon	Oncorhynchus kisutch	PCB mixture	4	chemical incorporated into food	72	day(s)	juvenile(s)	~1	yr	Both	Growth	Relative growth rate	organism	NR	28.1	LOEC	P<0.05	Wet	NR	3990	NR	0	1	Gruger EH Jr.;Hruby T;Karrick NL;	Environ.Sci.Technol. 10(10):1033-1037 (1976)
Coho salmon,silver salmon	Oncorhynchus kisutch	PCB mixture	4	chemical incorporated into food	72	day(s)	juvenile(s)	~1	yr	Both	Growth	Relative growth rate	organism	NR	28.1	NOEC	P<0.05	Wet	977	NR	0	NR	1	Gruger EH Jr.;Hruby T;Karrick NL;	Environ.Sci.Technol. 10(10):1033-1037 (1976)
Coho salmon,silver salmon	Oncorhynchus kisutch	PCB mixture	2	chemical incorporated into food	213	day(s)	Parr	NR	NR	Both	Growth	Weight	organism	3.8	3.06	LOEC	P=0.01	Wet	NR	3480	NR	65	NR	Gruger EH Jr.;Karrick NL;Davidson AI;Hruby T;	Environ.Sci.Technol. 9(2):121-127 (1975)
Coho salmon,silver salmon	Oncorhynchus kisutch	PCB mixture	2	chemical incorporated into food	213	day(s)	Parr	NR	NR	Both	Mortality	Mortality	organism	3.8	3.06	NOEC	10%	Wet	3480	NR	65	NR	NR	Gruger EH Jr.;Karrick NL;Davidson AI;Hruby T;	Environ.Sci.Technol. 9(2):121-127 (1975)
Atlantic salmon	Salmo salar	PCB mixture	5	Renewal	178	hour(s)	Eyed egg or stage, eyed embryo	NR	NR	Both	Growth	Weight	organism	NR	NR	LOEC	P=0.0133	Wet	NR	2500	NR	0.399	NR	Fisher JP;Spitsbergen JM;Bush B;Jahan-Parwar B;	In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.LaPoint (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA :298-314 (1994)
Atlantic salmon	Salmo salar	PCB mixture	5	Renewal	178	hour(s)	Eyed egg or stage, eyed embryo	NR	NR	Both	Mortality	Hatch	embryo	NR	NR	NOEC	<10%	Wet	6000	NR	0.95661	NR	NR	Fisher JP;Spitsbergen JM;Bush B;Jahan-Parwar B;	In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.LaPoint (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA :298-314 (1994)
Atlantic salmon	Salmo salar	PCB mixture	5	Renewal	178	hour(s)	Eyed egg or stage, eyed embryo	NR	NR	Both	Mortality	Mortality	organism	NR	NR	NOEC	<10%	Wet	3000	NR	0.4783	NR	NR	Fisher JP;Spitsbergen JM;Bush B;Jahan-Parwar B;	In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.LaPoint (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA :298-314 (1994)
Atlantic salmon	Salmo salar	PCB mixture	5	Renewal	178	hour(s)	Eyed egg or stage, eyed embryo	NR	NR	Both	Growth	Weight	organism	NR	NR	LOEC	P=0.0133	Wet	NR	2500	NR	0.399	NR	Fisher JP;Spitsbergen JM;Bush B;Jahan-Parwar B;	In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.LaPoint (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA :298-314 (1994)
Atlantic salmon	Salmo salar	PCB mixture	5	Renewal	178	hour(s)	Eyed egg or stage, eyed embryo	NR	NR	Both	Behavior	Phototactic response	organism	NR	NR	LOEC	NR	Wet	NR	2500	NR	0.399	NR	Fisher JP;Spitsbergen JM;Bush B;Jahan-Parwar B;	In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.LaPoint (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA :298-314 (1994)
Atlantic salmon	Salmo salar	PCB mixture	5	Renewal	178	hour(s)	Eyed egg or stage, eyed embryo	NR	NR	Both	Behavior	Predator vulnerability	organism	NR	NR	NOEC	0.025-0.05	Wet	1000	NR	0.15943	NR	1	Fisher JP;Spitsbergen JM;Bush B;Jahan-Parwar B;	In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.LaPoint (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA :298-314 (1994)

Table G-2. Salmon Fry CBR Data
Fletcher's Paint Superfund Site

Common Name	Scientific Name	CAS	# Doses	Route Of Exposure	Study Length	Unit	Initial Lifestage	Age	Age Units	Sex	General Effect Group	Measurement Description	Response Site	Lipid (%)	Body Weight at Effect Measurement	Endpoint	Significance	Residue	NOEL Total PCB (ug/kg)	LOEL Total PCB (ug/kg)	NOEL Total TEQ (pg/g)	LOEL Total TEQ (pg/g)	Bounded NOEL-LOEL Pair	Author	Reference
Atlantic salmon	Salmo salar	PCB mixture	5	Renewal	178	hour(s)	Eyed egg or stage, eyed embryo	NR	NR	Both	Mortality	Hatch	embryo	NR	NR	NOEC	<10%	Wet	6000	NR	0.95661	NR	NR	Fisher JP;Spitsbergen JM;Bush B;Jahan-Parwar B;	In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.LaPoint (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA :298-314 (1994)
Atlantic salmon	Salmo salar	PCB mixture	5	Renewal	178	hour(s)	Eyed egg or stage, eyed embryo	NR	NR	Both	Mortality	Mortality	organism	NR	NR	NOEC	<10%	Wet	3000	NR	0.4783	NR	NR	Fisher JP;Spitsbergen JM;Bush B;Jahan-Parwar B;	In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.LaPoint (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA :298-314 (1994)
Atlantic salmon	Salmo salar	PCB mixture	5	Renewal	178	hour(s)	Eyed egg or stage, eyed embryo	NR	NR	Both	Behavior	Predator vulnerability	organism	NR	NR	LOEC	0.025-0.05	Wet	NR	3000	NR	0.478	1	Fisher JP;Spitsbergen JM;Bush B;Jahan-Parwar B;	In: J.W.Gorsuch, F.J.Dwyer, C.G.Ingersoll, and T.W.LaPoint (Eds.), Environmental Toxicology and Risk Assessment, 2nd Volume, ASTM STP 1216, Philadelphia, PA :298-314 (1994)

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APPENDIX H

Calculation of Ecological Risks

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Table H-1. Hazards to Benthic Invertebrates - Area A/B (AE 1)
Ecological Risk Assessment
Fletcher's Paint Superfund Site

CAS Number	COPC	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value	Max Value	Max Qual	Benchmark	HQ_{high}	HQ_{low}
Metals (mg/kg)										
7429-90-5	Aluminum	37.	37.	100	3,447.97	6,770.	J	na	na	na
7439-92-1	Lead	71.	71.	100	8.45	80.9		35.8	2.3E+00	2.4E-01
7440-22-4	Silver	37.	2.	5	1.2	1.7		1	1.7E+00	1.2E+00
7440-28-0	Thallium	37.	3.	8	3.15	9.7		na	na	na
7440-36-0	Antimony	71.	4.	6	3.9	9.1		na	na	na
7440-38-2	Arsenic	71.	68.	96	4.81	13.3		9.79	1.4E+00	4.9E-01
7440-39-3	Barium	37.	37.	100	18.07	40.2		na	na	na
7440-41-7	Beryllium	37.	29.	78	0.48	9.6		na	na	na
7440-43-9	Cadmium	71.	55.	77	0.39	9.5		0.99	9.6E+00	3.9E-01
7440-48-4	Cobalt	37.	37.	100	2.4	11.4		na	na	na
7440-62-2	Vanadium	71.	71.	100	7.25	15.9		na	na	na
7782-49-2	Selenium	37.	1.	3	4.46	9.5		na	na	na
								Total HI	**1.5E+01**	**2.3E+00**
PCBs (ug/kg)										
11097-69-1	Aroclor 1254	79.	16.	20	47.11	1,400.	E	60	2.3E+01	7.9E-01
11104-28-2	Aroclor 1221	79.	7.	9	135.63	8,690.		120	7.2E+01	1.1E+00
11141-16-5	Aroclor 1232	79.	3.	4	190.25	13,000.		600	2.2E+01	3.2E-01
12672-29-6	Aroclor 1248	79.	26.	33	153.22	6,800.	E	30	2.3E+02	5.1E+00
53469-21-9	Aroclor 1242	79.	30.	38	650.34	26,000.		170	1.5E+02	3.8E+00
31508-00-6	Cl5-BZ#118	13.	8.	62	7.55	45.		na	na	na
32598-13-3	Cl4-BZ#77	13.	8.	62	3.76	22.	J	na	na	na
32598-14-4	Cl5-BZ#105	13.	8.	62	3.56	22.		na	na	na
35065-29-3	Cl7-BZ#180	13.	6.	46	0.9	5.		na	na	na
35065-30-6	Cl7-BZ#170	13.	5.	38	0.55	2.2		na	na	na
38380-08-4	Cl6-BZ#156	13.	4.	31	0.41	1.7		na	na	na
52663-72-6	Cl6-BZ#167	13.	2.	15	0.23	0.68		na	na	na
69782-90-7	Cl6-BZ#157	13.	1.	8	0.21	0.72		na	na	na
70362-50-4	Cl4-BZ#81	13.	2.	15	0.36	1.8	J	na	na	na
70424-68-9/65510-44-3	Cl5-BZ#107/#123	13.	2.	15	1.01	5.6		na	na	na
74472-37-0	Cl5-BZ#114	13.	2.	15	0.45	2.4		na	na	na
TOTAL_PCB congener	Total PCB congener	13.	13.	100	1,162.	11,000.	J	59.8	1.8E+02	1.9E+01
TOTAL_PCB_Aroclor	Total PCB Aroclor	37.	30.	81	697.7	14,860.		na	na	na
	PCB_TEQ_BIRD	13.			0.242	1.233				
	PCB_TEQ_FISH	13.			0.000663	0.00324				
	PCB_TEQ_MAMMAL	13.			0.000948	0.00491				
								Total HI	**6.8E+02**	**3.1E+01**
Pesticides (ug/kg)										
319-84-6	Alpha-BHC	37.	1.	3	4.65	110.	U	6	1.8E+01	7.8E-01
319-85-7	Beta-BHC	37.	5.	14	6.19	110.	U	5	2.2E+01	1.2E+00
58-89-9	Gamma-BHC	30.	2.	7	2.09	12.		2.37	5.1E+00	8.8E-01
72-20-8	Endrin	34.	6.	18	8.93	9.1	JN	2.22	4.1E+00	4.0E+00
53494-70-5	Endrin Ketone	37.	2.	5	9.39	34.		na	na	na
7421-93-4	Endrin Aldehyde	37.	1.	3	8.67	0.86	JN	na	na	na
	TOTAL_ENDRIN	37.			26.258	630.		na	na	na
72-54-8	4,4'-DDD	37.	9.	24	10.1	65.	J	4.88	1.3E+01	2.1E+00
72-55-9	4,4'- DDE	19.	3.	16	2.84	20.		3.16	6.3E+00	9.0E-01
50-29-3	4,4'- DDT	37.	15.	41	10.68	66.	JN	4.16	1.6E+01	2.6E+00
	TOTAL_DDX	37.			16.09	212.7		na	na	na
959-98-8	Endosulfan I	34.	4.	12	1.4	7.9	J	2.9	2.7E+00	4.8E-01
33213-65-9	Endosulfan II	36.	6.	17	9.16	26.		14	1.9E+00	6.5E-01
1031-07-8	Endosulfan Sulfate	37.	3.	8	8.55	3.8	JN	na	na	na
	Total Endosulfan	37.			18.752	420.		na	na	na
								Total HI	**9.0E+01**	**1.4E+01**
PAHs (ug/kg)										
	HPAH	71.			1,256.839	11,470.		1700	6.7E+00	7.4E-01
	LPAH	71.			708.175	2,000.		552	3.6E+00	1.3E+00
								Total HI	**1.0E+01**	**2.0E+00**

Shaded cells indicate HQ>1

Table H-2. Hazards to Benthic Invertebrates - Area C (AE 1)
Ecological Risk Assessment
Fletcher's Paint Superfund Site

CAS Number	Chemical	Samples	Num Detected Results	Frequency of Detect (%)	Avg Value	Max Detected Value	Benchmark	HQ_{low}	HQ_{high}
Metals (mg/kg)									
7429-90-5	Aluminum	5.	5.	100.	4,204.	6,350.	na	na	na
7439-92-1	Lead	5.	5.	100.	10.26	20.5	35.8	2.9E-01	5.7E-01
7439-95-4	Magnesium	5.	5.	100.	1,229.6	1,680.	na	na	na
7440-38-2	Arsenic	5.	5.	100.	6.36	9.2	9.79	6.5E-01	9.4E-01
7440-39-3	Barium	5.	5.	100.	21.94	36.6	na	na	na
7440-41-7	Beryllium	5.	5.	100.	0.402	0.67	na	na	na
7440-43-9	Cadmium	5.	5.	100.	0.312	0.63	0.99	3.2E-01	6.4E-01
7440-48-4	Cobalt	5.	5.	100.	3.12	5.4	na	na	na
7440-62-2	Vanadium	5.	5.	100.	9.04	13.	na	na	na
PCBs (ug/kg)									
11104-28-2	Aroclor 1221	5.	3.	60.	14.35	19.3	120.	1.2E-01	1.6E-01
53469-21-9	Aroclor 1242	5.	1.	20.	12.78	10.8	170	7.5E-02	6.4E-02
12672-29-6	Aroclor 1248	5.	1.	20.	14.12	20.8	30.	4.7E-01	6.9E-01
31508-00-6	Cl5-BZ#118	1.	1.	100.	0.74	0.74	170.	4.4E-03	4.4E-03
TOTAL_PCB congeners	Total PCB congeners	1.	1.	100.	8.	8.	59.8	1.3E-01	1.3E-01
TOTAL_PCB_Aroclor	Total PCB Aroclor	5.	4.	80.	17.3	30.1	na	na	na
	PCB_TEQ_BIRD	1.			7.4E-06	0.0000074	na	na	na
	PCB_TEQ_FISH	1.			3.7E-06	0.0000037	na	na	na
	PCB_TEQ_MAMMAL	1.			2.2E-05	0.0000222	na	na	na
Pesticides (ug/kg)									
1031-07-8	Endosulfan Sulfate	5.	1.	20.	2.106	0.78	na	na	na
	TOTAL_DDX	5.			5.22	6.3	na	na	na
	Total Endosulfan	5.			5.696	7.05	na	na	na
	Total Endrin	5.			7.14	0.	na	na	na
50-29-3	4,4'- DDT	5.	3.	60.	1.98	2.7	4.16	4.8E-01	6.5E-01
72-55-9	4,4'- DDE	3.	2.	67	1.43333	1.2	3.16	4.5E-01	3.8E-01
SVOCs (ug/kg)									
	HPAH	5.			1,824.4	3,265.	1,700.	1.1E+00	1.9E+00
	LPAH	5.			1,514.2	1,799.	552.	2.7E+00	3.3E+00

Shaded cells indicate HQ>1

Table H-3. Hazards to White Sucker - Area A/B (AE 2)
Ecological Risk Assessment
Fletcher's Paint Superfund Site

Chemical	Samples	Num Detected Results	Frequency of Detect (%)	95% UCL	CBR_{NOAEL} [a]	CBR_{LOAEL} [a]	HQ_{NOAEL}	HQ_{LOAEL}
Metals (mg/kg)								
Aluminum	10	8	80	47	0.78	7.8	6.0E+01	6.0E+00
Barium	12	12	100	1.7	0.015	0.15	1.1E+02	1.1E+01
Chromium	12	4	33	0.64	0.13	1.28	4.9E+00	5.0E-01
Cobalt	12	1	8	0.12	na	na	nc	nc
Copper	12	12	100	0.98	0.14	1.4	7.0E+00	7.0E-01
Manganese	12	12	100	28	0.22	2.2	1.3E+02	1.3E+01
Mercury	12	12	100	0.074	0.006	0.06	1.2E+01	1.2E+00
Nickel	12	1	8	0.31	12	120	2.6E-02	2.6E-03
Zinc	12	12	100	23	3.9	4.5	5.8E+00	5.0E+00
PCBs (mg/kg)								
Total PCB congene	12	12	100	22	0.014	0.14	1.6E+03	1.6E+02
Total PCB Aroclor	24	24	100	25	0.014	0.14	1.8E+03	1.8E+02
PCB_TEQ_Fish[b]	12			1.6E-05	0.0016	1.38	1.0E-02	1.2E-05
Pesticides (mg/kg)								
TOTAL_DDX	12			0.001	0.012	0.12	1.2E-01	1.2E-02
TOTAL_BHC	12			0.023	2	20	1.1E-02	1.1E-03

Notes:

[a] Critical Body Residues (CBRs) developed from the Environmental Residue Effects Database (ERED), Jarvinen and Ankley (1999), and the PCB residue database.

[b] CBRs based on toxicity to 2,3,7,8-TCDD

Shaded values indicate HQ > 1.

na - not available; nc - not calculated.

Table H-4. Hazards to White Sucker - Hot Spot Area (AE 2)
Ecological Risk Assessment
Fletcher's Paint Superfund Site

COPC	Average Concentration[a]	CBR_{NOAEL}[b]	CBR_{LOAEL}[b]	HQ_{NOAEL}	HQ_{LOAEL}
Metals (mg/kg)					
Aluminum	29	0.78	7.8	3.8E+01	3.8E+00
Barium	1.7	0.015	0.15	1.2E+02	1.2E+01
Chromium	0.51	0.13	1.28	4.0E+00	4.0E-01
Cobalt	0.11	na	na	nc	nc
Copper	0.84	0.14	1.4	6.0E+00	6.0E-01
Manganese	26	0.22	2.2	1.2E+02	1.2E+01
Mercury	0.07	0.0060	0.06	1.2E+01	1.2E+00
Nickel	0.27	12	120	2.3E-02	2.3E-03
Zinc	22	3.9	4.5	5.5E+00	4.8E+00
PCBs (mg/kg)					
Total PCB congener	16	0.014	0.14	1.2E+03	1.2E+02
PCB_TEQ_Fish[c]	1.4E-05	0.0016	1.38	8.9E-03	1.0E-05
Pesticides (mg/kg)					
TOTAL_DDX	0.022	0.029	0.29	7.7E-01	7.7E-02
TOTAL_BHC	0.0045	2	20	2.3E-03	2.3E-04

Notes:

[a] The average concentrations were used because there were too few white sucker samples collected from Area A to develop reliable 95%UCLs.

[b] Critical Body Residues (CBRs) developed from the Environmental Residue Effects Database (ERED), Jarvinen and Ankley (1999), and the PCB residue database.

[c] CBRs based on toxicity to 2,3,7,8-TCDD.

Shaded values indicate HQ > 1.

na - not available; nc - not calculated.

Table H-5. Hazards to White Sucker - Area C (AE 2)
Ecological Risk Assessment
Fletcher's Paint Superfund Site

COPC	Average Concentration[a]	CBR_{NOAEL}[b]	CBR_{LOAEL}[b]	HQ_{NOAEL}	HQ_{LOAEL}
Metals (mg/kg)					
Aluminum	22	0.78	7.8	2.9E+01	2.9E+00
Barium	1.3	0.015	0.15	8.4E+01	8.4E+00
Chromium	0.25	0.13	1.28	1.9E+00	2.0E-01
Cobalt	0.086	na	na	nc	nc
Copper	0.31	0.14	1.4	2.2E+00	2.2E-01
Manganese	24.	0.22	2.2	1.1E+02	1.1E+01
Mercury	0.07	0.006	0.06	1.2E+01	1.2E+00
Nickel	0.64	12	120	5.3E-02	5.3E-03
Zinc	20	3.9	4.5	5.0E+00	4.3E+00
PCBs (mg/kg)					
Total PCB congener	1.1	0.014	0.14	7.9E+01	7.9E+00
PCB_TEQ_Fish[c]	7.2E-06	0.0016	1.38	4.5E-03	5.2E-06
Pesticides (mg/kg)					
TOTAL_DDX	0.0046	0.029	0.29	1.6E-01	1.6E-02
TOTAL_BHC	0.021	2	20	1.0E-02	1.0E-03

Notes:

[a] The average concentrations were used because there were too few white sucker samples collected from Area C to develop reliable 95%UCLs.

[b] Critical Body Residues (CBRs) developed from the Environmental Residue Effects Database (ERED), Jarvinen and Ankley (1999), and the PCB residue database.

[c] CBRs based on toxicity to 2,3,7,8-TCDD.

Shaded values indicate HQ > 1.

na - not available; nc - not calculated.

Table H-6. Hazards to Red Breast Sunfish - Area A/B (AE 2)
Ecological Risk Assessment
Fletcher's Paint Superfund Site

Chemical	Samples	Num Detected Results	Results Frequency of Detect (%)	95% UCL	CBR_{NOAEL} [a]	CBR_{LOAEL} [a]	HQ_{NOAEL}	HQ_{LOAEL}
Metals (mg/kg)								
Aluminum	12	9	75	7.2	0.78	7.8	9.3E+00	9.3E-01
Barium	12	0	0	nd	0.015	0.15	nc	nc
Chromium	12	0	0	nd	0.13	1.28	nc	nc
Cobalt	12	0	0	nd	na	na	nc	nc
Copper	12	5	42	0.45	0.14	1.4	3.2E+00	3.2E-01
Manganese	12	12	100	1.5	0.22	2.2	6.9E+00	6.9E-01
Mercury	12	12	100	0.14	0.006	0.06	2.3E+01	2.3E+00
Nickel	12	0	0	nd	12	120	nc	nc
Zinc	12	12	100	7.3	3.9	4.5	1.9E+00	1.6E+00
PCBs (mg/kg)								
Total PCB congener	12	12	100	3.2	0.014	0.14	2.3E+02	2.3E+01
Total PCB Aroclor	12	12	100	2.1	0.014	0.14	1.5E+02	1.5E+01
PCB_TEQ_Fish[b]	12	11	92	3.6E-06	0.0016	1.38	2.2E-03	2.6E-06
Pesticides (mg/kg)								
TOTAL_DDX	12	10	83	0.010	0.029	0.29	3.5E-01	3.5E-02
TOTAL_BHC	12	0	0	0.0051	2	20	2.6E-03	2.6E-04

Notes:
[a] Critical Body Residues (CBRs) developed from the Environmental Residue Effects Database (ERED), Jarvinen and Ankley (1999), and the PCB residue database.
[b] CBRs based on toxicity to 2,3,7,8-TCDD
Shaded values indicate HQ > 1.
nd - not detected; na - not available; nc - not calculated.

Table H-7. Hazards to Red Breast Sunfish - Hot Spot Area (AE 2)
Ecological Risk Assessment
Fletcher's Paint Superfund Site

Chemical	Average Concentration[a]	CBR_{NOAEL} [b]	CBR_{LOAEL} [b]	HQ_{NOAEL}	HQ_{LOAEL}
Metals (mg/kg)					
Aluminum	5.2	0.78	7.8	6.6E+00	6.6E-01
Barium	nd	0.015	0.15	nc	nc
Chromium	nd	0.13	1.28	nc	nc
Cobalt	nd	na	na	nc	nc
Copper	0.57	0.14	1.4	4.1E+00	4.1E-01
Manganese	1.4	0.22	2.2	6.4E+00	6.4E-01
Mercury	0.14	0.006	0.06	2.3E+01	2.3E+00
Nickel	nd	12	120	nc	nc
Zinc	7.2	3.9	4.5	1.8E+00	1.6E+00
PCBs (mg/kg)					
Total PCB congener	0.98	0.014	0.14	7.0E+01	7.0E+00
Total PCB Aroclor	1.4	0.014	0.14	9.9E+01	9.9E+00
PCB_TEQ_Fish[b]	1.0E-06	0.0016	1.38	6.5E-04	7.6E-07
Pesticides (mg/kg)					
TOTAL_DDX	0.0062	0.029	0.29	2.1E-01	2.1E-02
TOTAL_BHC	na	2	20	nc	nc

Notes:

[a] The average concentrations were used because there were too few sunfish samples collected from Area A to develop reliable 95%UCLs.

[b] Critical Body Residues (CBRs) developed from the Environmental Residue Effects Database (ERED), Jarvinen and Ankley (1999), and the PCB residue database.

[c] CBRs based on toxicity to 2,3,7,8-TCDD.

Shaded values indicate HQ > 1.

nd - not detected; na - not available; nc - not calculated.

Table H-8. Hazards to Red Breast Sunfish - Area C (AE 2)
Ecological Risk Assessment
Fletcher's Paint Superfund Site

Chemical	Average Concentration[a]	CBR_{NOAEL} [b]	CBR_{LOAEL} [b]	HQ_{NOAEL}	HQ_{LOAEL}
Metals (mg/kg)					
Aluminum	4.5	0.78	7.8	5.8E+00	5.8E-01
Barium	0.090	0.015	0.15	6.0E+00	6.0E-01
Chromium	0.31	0.13	1.28	2.4E+00	2.4E-01
Cobalt	0.090	na	na	nc	nc
Copper	0.28	0.14	1.4	2.0E+00	2.0E-01
Manganese	2.2	0.22	2.2	9.8E+00	9.8E-01
Mercury	0.15	0.006	0.06	2.5E+01	2.5E+00
Nickel	0.28	12	120	2.3E-02	2.3E-03
Zinc	6.6	3.9	4.5	1.7E+00	1.5E+00
PCBs (mg/kg)					
Total PCB congener	0.014	0.014	0.14	9.7E-01	9.7E-02
Total PCB Aroclor	0.027	0.014	0.14	1.9E+00	1.9E-01
PCB_TEQ_Fish[c]	6.8E-08	0.0016	1.38	4.3E-05	4.9E-08
Pesticides (mg/kg)					
TOTAL_DDX	0.0074	0.029	0.29	2.6E-01	2.6E-02
TOTAL_BHC	nd	2	20	nc	nc

[a] The average concentrations were used because there were too few sunfish samples collected from Area A to develop reliable 95%UCLs.

[b] Critical Body Residues (CBRs) developed from the Environmental Residue Effects Database (ERED), Jarvinen and Ankley (1999), and the PCB residue database.

[c] CBRs based on toxicity to 2,3,7,8-TCDD.

Shaded values indicate HQ > 1.

nd - not detected; na - not available; nc - not calculated.

APPENDIX I

Dose Models for Upper Trophic Level Wildlife

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TABLE I-1
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / KINGFISHER - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA AB
RECEPTOR: KINGFISHER - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.047	USEPA, 1993; Suter, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	100%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Brooks and Davis, 1987	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	50%	Bent, 1940	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.15	Brooks and Davis, 1987	

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Brooks, R.P., and W.J. Davis, 1987. Habitat selection by breeding belted kingfishers (Ceryl alcyon); Am. Midl. Nat. 117:63-70.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-2
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / KINGFISHER - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA AB
RECEPTOR: KINGFISHER - Sucker

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	6.4E-01	mg/kg	1.0E-01	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	3.8E-02	3.8E-03
Copper	9.8E-01	mg/kg	1.6E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.9E-02	1.3E-02
Mercury	7.4E-02	mg/kg	1.2E-02	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	1.5E-01	1.5E-02
Nickel	3.1E-01	mg/kg	5.0E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	7.5E-03	7.5E-04
Zinc	2.3E+01	mg/kg	3.6E+00	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	5.5E-02	5.5E-03
Total PCB (Aroclor)	2.5E+01	mg/kg	4.1E+00	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	**1.0E+01**	**8.1E+00**
Total PCB (Congener)	2.2E+01	mg/kg	3.5E+00	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	**8.7E+00**	**7.0E+00**
BHC	1.4E-03	mg/kg	2.3E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	4.1E-04	9.9E-05
Total DDx	2.3E-02	mg/kg	3.7E-03	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	1.6E-02	1.6E-03
PCB_TEQ_BIRD	5.7E-03	mg/kg	9.2E-04	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	**6.6E+01**	**6.6E+00**
Aluminum	4.7E+01	mg/kg	7.6E+00	mg/kg-d	NA	NA			
Barium	1.7E+00	mg/kg	2.7E-01	mg/kg-d	NA	NA			
Cobalt	1.2E-01	mg/kg	1.9E-02	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	2.6E-03	2.6E-04
Manganese	2.8E+01	mg/kg	4.5E+00	mg/kg-d	1.8E+02	1.8E+03	mg/kg-d	2.5E-02	2.5E-03
							HAZARD INDICES:	**8.5E+01**	**2.2E+01**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-1.
b. Reference Dose Values presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-3
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : KINGFISHER - Sucke

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA AB
RECEPTOR: KINGFISHER - Sucker
TOTAL RISK (HI): 8.5E+01

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
PCB_TEQ_BIRD					6.6E+01	***6.6E+01***	***77%***
Total PCB (Aroclor)					1.0E+01	***1.0E+01***	***12%***
Total PCB (Congener)					8.7E+00	***8.7E+00***	***10%***
Mercury					1.5E-01	1.5E-01	0%
Zinc					5.5E-02	5.5E-02	0%
Copper					3.9E-02	3.9E-02	0%
Chromium					3.8E-02	3.8E-02	0%
Manganese					2.5E-02	2.5E-02	0%
Total DDx					1.6E-02	1.6E-02	0%
Nickel					7.5E-03	7.5E-03	0%
Cobalt					2.6E-03	2.6E-03	0%
BHC					4.1E-04	4.1E-04	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**-**	**-**	**-**	**8.5E+01**	**8.5E+01**	
PERCENTAGE OF TOTAL RISK					**100%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-4
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : KINGFISHER - Sucke

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA AB
RECEPTOR: KINGFISHER - Sucker
TOTAL RISK (HI): 2.2E+01

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Total PCB (Aroclor)					8.1E+00	***8.1E+00***	***37%***
Total PCB (Congener)					7.0E+00	***7.0E+00***	***32%***
PCB_TEQ_BIRD					6.6E+00	***6.6E+00***	***30%***
Mercury					1.5E-02	1.5E-02	0%
Copper					1.3E-02	1.3E-02	0%
Zinc					5.5E-03	5.5E-03	0%
Chromium					3.8E-03	3.8E-03	0%
Manganese					2.5E-03	2.5E-03	0%
Total DDx					1.6E-03	1.6E-03	0%
Nickel					7.5E-04	7.5E-04	0%
Cobalt					2.6E-04	2.6E-04	0%
BHC					9.9E-05	9.9E-05	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**-**	**-**	**-**	**2.2E+01**	**2.2E+01**	
PERCENTAGE OF TOTAL RISK					**100%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-5
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / KINGFISHER - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA AB
RECEPTOR: KINGFISHER - Sunfish

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.047	USEPA, 1993; Suter, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	100%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Brooks and Davis, 1987	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	50%	Bent, 1940	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.15	Brooks and Davis, 1987	

REFERENCES

Bent, A.C., 1940. Life histories of North American cuckoos, goat suckers, hummingbirds, and their allies; Washington, D.C.; U.S. Government Printing Office; Smithsonian Inst. U.S. Nat. Mus. Bull. 176.

Brooks, R.P., and W.J. Davis, 1987. Habitat selection by breeding belted kingfishers (Ceryl alcyon); Am. Midl. Nat. 117:63-70.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-6
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / KINGFISHER - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site **18-Jan-10** **Upgraded worksheet protection**
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA AB
RECEPTOR: KINGFISHER - Sunfish

Prepared:	**14-Jan-10**	**NR**
Checked:	**18-Jan-10**	**RB**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Aluminum	7.2E+00	mg/kg	1.2E+00	mg/kg-d	NA	NA			
Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-d	NA	NA			
Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	0.0E+00	0.0E+00
Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	0.0E+00	0.0E+00
Copper	4.5E-01	mg/kg	7.2E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.8E-02	5.9E-03
Manganese	1.5E+00	mg/kg	2.4E-01	mg/kg-d	1.8E+02	1.8E+03	mg/kg-d	1.4E-03	1.4E-04
Mercury	1.4E-01	mg/kg	2.3E-02	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	2.8E-01	2.8E-02
Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	0.0E+00	0.0E+00
Zinc	7.3E+00	mg/kg	1.2E+00	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	1.8E-02	1.8E-03
Total PCB (Aroclor)	2.1E+00	mg/kg	3.3E-01	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	8.3E-01	6.6E-01
BHC	5.1E-03	mg/kg	8.3E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	1.5E-03	3.6E-04
Total DDx	1.0E-02	mg/kg	1.6E-03	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	7.3E-03	7.3E-04
PCB_TEQ_BIRD	1.3E-03	mg/kg	2.2E-04	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	**1.5E+01**	**1.5E+00**
Total PCB (Congener)	3.2E+00	mg/kg	5.1E-01	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	**1.3E+00**	**1.0E+00**
							HAZARD INDICES:	**1.8E+01**	**3.3E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-5.
b. Reference Dose Values presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-7
UMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : KINGFISHER - Sunfis

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

18-Jan-10 :d worksheet pı

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA AB
RECEPTOR: KINGFISHER - Sunfish
TOTAL RISK (HI): 1.8E+01

Prepared:	**14-Jan-10**	**NR**
Checked:	**18-Jan-10**	**RB**

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
PCB_TEQ_BIRD					1.5E+01	***1.5E+01***	***86%***
Total PCB (Congener)					1.3E+00	***1.3E+00***	7%
Total PCB (Aroclor)					8.3E-01	8.3E-01	5%
Mercury					2.8E-01	2.8E-01	2%
Zinc					1.8E-02	1.8E-02	0%
Copper					1.8E-02	1.8E-02	0%
Total DDx					7.3E-03	7.3E-03	0%
BHC					1.5E-03	1.5E-03	0%
Manganese					1.4E-03	1.4E-03	0%
Chromium					-		
Nickel					-		
Cobalt					-		
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**-**	**-**	**-**	**1.8E+01**	**1.8E+01**	
PERCENTAGE OF TOTAL RISK					**100%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-8

SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : KINGFISHER - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

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SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA AB
RECEPTOR: KINGFISHER - Sunfish
TOTAL RISK (HI): 3.3E+00

Prepared:	**14-Jan-10**	**NR**
Checked:	**18-Jan-10**	**RB**

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
PCB_TEQ_BIRD					1.5E+00	***1.5E+00***	***47%***
Total PCB (Congener)					1.0E+00	***1.0E+00***	***31%***
Total PCB (Aroclor)					6.6E-01	6.6E-01	***20%***
Copper					5.9E-03	5.9E-03	0%
Mercury					2.8E-02	2.8E-02	1%
Zinc					1.8E-03	1.8E-03	0%
Total DDx					7.3E-04	7.3E-04	0%
BHC					3.6E-04	3.6E-04	0%
Manganese					1.4E-04	1.4E-04	0%
Chromium					-		
Nickel					-		
Cobalt					-		
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**-**	**-**	**-**	**3.3E+00**	**3.3E+00**	
PERCENTAGE OF TOTAL RISK					**100%**	**100%**	

Footnotes:

a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.

b. Combined risk across all media exposures.

c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-9
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / KINGFISHER - Sucker
KINGFISHER - White Sucker
Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C
RECEPTOR: KINGFISHER - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.047	USEPA, 1993; Suter, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	100%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Brooks and Davis, 1987	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	50%	Bent, 1940	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.15	Brooks and Davis, 1987	

REFERENCES

Bent, A.C., 1940. Life histories of North American cuckoos, goat suckers, hummingbirds, and their allies; Washington, D.C.; U.S. Government Printing Office; Smithsonian Inst. U.S. Nat. Mus. Bull. 176.

Brooks, R.P., and W.J. Davis, 1987. Habitat selection by breeding belted kingfishers (Ceryl alcyon); Am. Midl. Nat. 117:63-70.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-10
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / KINGFISHER - Sucker
KINGFISHER - White Sucker
Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C
RECEPTOR: KINGFISHER - Sucker

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	2.5E-01	mg/kg	4.0E-02	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	1.5E-02	1.5E-03
Copper	3.1E-01	mg/kg	5.0E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.2E-02	4.2E-03
Mercury	7.0E-02	mg/kg	1.1E-02	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	1.4E-01	1.4E-02
Nickel	6.4E-01	mg/kg	1.0E-01	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	1.5E-02	1.5E-03
Zinc	2.0E+01	mg/kg	3.2E+00	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	4.8E-02	4.8E-03
Total PCB (Aroclor)	2.4E+00	mg/kg	3.9E-01	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	9.8E-01	7.8E-01
Total PCB (Congener)	1.1E+00	mg/kg	1.8E-01	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	4.4E-01	3.6E-01
BHC	4.6E-03	mg/kg	7.4E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	1.3E-03	3.2E-04
Total DDx	2.1E-02	mg/kg	3.3E-03	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	1.5E-02	1.5E-03
PCB_TEQ_BIRD	3.6E-04	mg/kg	5.8E-05	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	**4.2E+00**	4.2E-01
Aluminum	2.2E+01	mg/kg	3.6E+00	mg/kg-d	NA	NA			
Barium	1.3E+00	mg/kg	2.0E-01	mg/kg-d	NA	NA			
Cobalt	8.6E-02	mg/kg	1.4E-02	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	1.8E-03	1.8E-04
Manganese	2.4E+01	mg/kg	3.9E+00	mg/kg-d	1.8E+02	1.8E+03	mg/kg-d	2.2E-02	2.2E-03
							HAZARD INDICES:	**5.8E+00**	**1.6E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-9.
b. Reference Dose Values presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-11
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : KINGFISHER - Sucker
KINGFISHER - White Sucker
Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C
RECEPTOR: KINGFISHER - Sucker
TOTAL RISK (HI): 5.8E+00

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
PCB_TEQ_BIRD					4.2E+00	***4.2E+00***	***71%***
Total PCB (Aroclor)					9.8E-01	9.8E-01	***17%***
Total PCB (Congener)					4.4E-01	4.4E-01	8%
Mercury					1.4E-01	1.4E-01	2%
Zinc					4.8E-02	4.8E-02	1%
Manganese					2.2E-02	2.2E-02	0%
Nickel					1.5E-02	1.5E-02	0%
Chromium					1.5E-02	1.5E-02	0%
Total DDx					1.5E-02	1.5E-02	0%
Copper					1.2E-02	1.2E-02	0%
Cobalt					1.8E-03	1.8E-03	0%
BHC					1.3E-03	1.3E-03	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**-**	**-**	**-**	**5.8E+00**	**5.8E+00**	
PERCENTAGE OF TOTAL RISK					**100%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-12
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : KINGFISHER - Sucker
KINGFISHER - White Sucker
Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C
RECEPTOR: KINGFISHER - Sucker
TOTAL RISK (HI): 1.6E+00

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Total PCB (Aroclor)					7.8E-01	7.8E-01	***49%***
PCB_TEQ_BIRD					4.2E-01	4.2E-01	***26%***
Total PCB (Congener)					3.6E-01	3.6E-01	***22%***
Mercury					1.4E-02	1.4E-02	1%
Zinc					4.8E-03	4.8E-03	0%
Copper					4.2E-03	4.2E-03	0%
Manganese					2.2E-03	2.2E-03	0%
Nickel					1.5E-03	1.5E-03	0%
Chromium					1.5E-03	1.5E-03	0%
Total DDx					1.5E-03	1.5E-03	0%
BHC					3.2E-04	3.2E-04	0%
Cobalt					1.8E-04	1.8E-04	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**-**	**-**	**-**	**1.6E+00**	**1.6E+00**	
PERCENTAGE OF TOTAL RISK					**100%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-13
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / KINGFISHER - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C
RECEPTOR: KINGFISHER - Sunfish

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.047	USEPA, 1993; Suter, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	100%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	Brooks and Davis, 1987	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	50%	Bent, 1940	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.15	Brooks and Davis, 1987	

REFERENCES

Bent, A.C., 1940. Life histories of North American cuckoos, goat suckers, hummingbirds, and their allies; Washington, D.C.; U.S. Government Printing Office; Smithsonian Inst. U.S. Nat. Mus. Bull. 176.

Brooks, R.P., and W.J. Davis, 1987. Habitat selection by breeding belted kingfishers (Ceryl alcyon); Am. Midl. Nat. 117:63-70.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-14
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / KINGFISHER - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C
RECEPTOR: KINGFISHER - Sunfish

Prepared:	**14-Jan-10**	**NR**
Checked:		

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	3.1E-01	mg/kg	5.0E-02	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	1.9E-02	1.9E-03
Copper	2.8E-01	mg/kg	4.5E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.1E-02	3.7E-03
Mercury	1.5E-01	mg/kg	2.4E-02	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	3.0E-01	3.0E-02
Nickel	2.8E-01	mg/kg	4.5E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	6.7E-03	6.7E-04
Zinc	6.6E+00	mg/kg	1.1E+00	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	1.6E-02	1.6E-03
Total PCB (Aroclor)	2.7E-02	mg/kg	4.3E-03	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	1.1E-02	8.6E-03
BHC	5.1E-03	mg/kg	8.2E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	1.5E-03	3.6E-04
Total DDx	7.4E-03	mg/kg	1.2E-03	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	5.2E-03	5.2E-04
PCB_TEQ_BIRD	2.3E-05	mg/kg	3.7E-06	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	2.6E-01	2.6E-02
Aluminum	4.5E+00	mg/kg	7.3E-01	mg/kg-d	NA	NA			
Barium	9.0E-02	mg/kg	1.4E-02	mg/kg-d	NA	NA			
Cobalt	9.0E-02	mg/kg	1.4E-02	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	1.9E-03	1.9E-04
Manganese	2.2E+00	mg/kg	3.5E-01	mg/kg-d	1.8E+02	1.8E+03	mg/kg-d	1.9E-03	1.9E-04
Total PCB (Congener)	1.4E-02	mg/kg	2.2E-03	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	5.4E-03	4.3E-03
							HAZARD INDICES:	6.5E-01	7.9E-02

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-13.
b. Reference Dose Values presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-15
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : KINGFISHER - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C
RECEPTOR: KINGFISHER - Sunfish
TOTAL RISK (HI): 6.5E-01

Prepared:	**14-Jan-10**	**NR**
Checked:		

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Mercury					3.0E-01	3.0E-01	***47%***
PCB_TEQ_BIRD					2.6E-01	2.6E-01	***41%***
Chromium					1.9E-02	1.9E-02	3%
Zinc					1.6E-02	1.6E-02	3%
Copper					1.1E-02	1.1E-02	2%
Total PCB (Aroclor)					1.1E-02	1.1E-02	2%
Nickel					6.7E-03	6.7E-03	1%
Total PCB (Congener)					5.4E-03	5.4E-03	1%
Total DDx					5.2E-03	5.2E-03	1%
Manganese					1.9E-03	1.9E-03	0%
Cobalt					1.9E-03	1.9E-03	0%
BHC					1.5E-03	1.5E-03	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**-**	**-**	**-**	**6.5E-01**	**6.5E-01**	
PERCENTAGE OF TOTAL RISK					**100%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-16
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : KINGFISHER - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C
RECEPTOR: KINGFISHER - Sunfish
TOTAL RISK (HI): 7.9E-02

Prepared:	14-Jan-10	NR
Checked:		

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Mercury					3.0E-02	3.0E-02	***38%***
PCB_TEQ_BIRD					2.6E-02	2.6E-02	***34%***
Total PCB (Aroclor)					8.6E-03	8.6E-03	***11%***
Total PCB (Congener)					4.3E-03	4.3E-03	6%
Copper					3.7E-03	3.7E-03	5%
Chromium					1.9E-03	1.9E-03	2%
Zinc					1.6E-03	1.6E-03	2%
Nickel					6.7E-04	6.7E-04	1%
Total DDx					5.2E-04	5.2E-04	1%
BHC					3.6E-04	3.6E-04	0%
Manganese					1.9E-04	1.9E-04	0%
Cobalt					1.9E-04	1.9E-04	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**-**	**-**	**-**	**7.9E-02**	**7.9E-02**	
PERCENTAGE OF TOTAL RISK					**100%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-17
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : SEDIMENT (0-7 inches) / MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA A/B - Aroclor
RECEPTOR: MINK - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0033	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	58%	Mitchell, 1961	$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

REFERENCES

Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-18
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : SEDIMENT (0-7 inches) / MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA A/B - Aroclor
RECEPTOR: MINK - Sucker

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Aluminum	3.8E+03	mg/kg	1.3E+01	mg/kg-d	NA	NA			
Barium	2.1E+01	mg/kg	6.9E-02	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	1.3E-03	1.3E-04
Cobalt	3.8E+00	mg/kg	1.3E-02	mg/kg-d	7.3E+00	7.3E+01	mg/kg-d	1.7E-03	1.7E-04
Chromium	7.8E+00	mg/kg	2.6E-02	mg/kg-d	2.4E+00	2.4E+01	mg/kg-d	1.1E-02	1.1E-03
Copper	4.2E+00	mg/kg	1.4E-02	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	2.5E-03	1.5E-03
Mercury	1.2E-02	mg/kg	3.9E-05	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	7.1E-04	2.2E-04
Nickel	4.2E+00	mg/kg	1.4E-02	mg/kg-d	1.7E+00	3.4E+00	mg/kg-d	8.2E-03	4.1E-03
Zinc	3.8E+01	mg/kg	1.3E-01	mg/kg-d	7.5E+01	7.5E+02	mg/kg-d	1.7E-03	1.7E-04
Total PCB (Aroclor)	3.4E+00	mg/kg	1.1E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	1.4E-01	1.2E-01
BHC	1.3E-02	mg/kg	4.2E-05	mg/kg-d	1.4E-02	1.4E-01	mg/kg-d	3.0E-03	3.0E-04
Total DDx	4.4E-02	mg/kg	1.5E-04	mg/kg-d	1.5E-01	7.4E-01	mg/kg-d	1.0E-03	2.0E-04
PCB_TEQ_MAMMAL	4.9E-06	mg/kg	1.6E-08	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	2.0E-01	7.3E-03
Total PCB (Congener)	5.4E+00	mg/kg	1.8E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	2.2E-01	1.9E-01
							HAZARD INDICES:	6.0E-01	3.2E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-17.
b. Reference Dose Values presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-19
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA A/B - Aroclor
RECEPTOR: MINK - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.16	USEPA, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	100%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	58%	Mitchell, 1961	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

REFERENCES

Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-20
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA A/B - Aroclor
RECEPTOR: MINK - Sucker

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Aluminum	4.7E+01	mg/kg	7.8E+00	mg/kg-d	NA	NA			
Barium	1.7E+00	mg/kg	2.8E-01	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	5.5E-03	5.5E-04
Cobalt	1.2E-01	mg/kg	2.0E-02	mg/kg-d	7.3E+00	7.3E+01	mg/kg-d	2.8E-03	2.8E-04
Chromium	6.4E-01	mg/kg	1.1E-01	mg/kg-d	2.4E+00	2.4E+01	mg/kg-d	4.4E-02	4.4E-03
Copper	9.8E-01	mg/kg	1.6E-01	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	2.9E-02	1.7E-02
Manganese	2.8E+01	mg/kg	4.7E+00	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	9.1E-02	9.1E-03
Mercury	7.4E-02	mg/kg	1.2E-02	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	2.2E-01	6.8E-02
Nickel	3.1E-01	mg/kg	5.2E-02	mg/kg-d	1.7E+00	3.4E+00	mg/kg-d	3.1E-02	1.5E-02
Zinc	2.3E+01	mg/kg	3.8E+00	mg/kg-d	7.5E+01	7.5E+02	mg/kg-d	5.0E-02	5.0E-03
Total PCB (Aroclor)	2.5E+01	mg/kg	4.2E+00	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	**5.3E+01**	**4.4E+01**
BHC	1.4E-03	mg/kg	2.4E-04	mg/kg-d	1.4E-02	1.4E-01	mg/kg-d	1.7E-02	1.7E-03
Total DDx	2.3E-02	mg/kg	3.8E-03	mg/kg-d	1.5E-01	7.4E-01	mg/kg-d	2.6E-02	5.2E-03
PCB_TEQ_MAMMAL	7.9E-05	mg/kg	1.3E-05	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**1.6E+02**	**5.9E+00**
Total PCB (Congener)	2.2E+01	mg/kg	3.6E+00	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	**4.5E+01**	**3.8E+01**
							HAZARD INDICES:	**2.6E+02**	**8.8E+01**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-19.
b. Toxicity Reference Doses presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-21

SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA A/B - Aroclor
RECEPTOR: MINK - Sucker
TOTAL RISK (HI): 2.6E+02

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
PCB_TEQ_MAMMAL		2.0E-01			1.6E+02	***1.6E+02***	***62%***
Total PCB (Aroclor)		1.4E-01			5.3E+01	***5.3E+01***	***20%***
Total PCB (Congener)		2.2E-01			4.5E+01	***4.5E+01***	***17%***
Mercury		7.1E-04			2.2E-01	2.2E-01	0%
Manganese					9.1E-02	9.1E-02	0%
Chromium		1.1E-02			4.4E-02	5.5E-02	0%
Zinc		1.7E-03			5.0E-02	5.2E-02	0%
Nickel		8.2E-03			3.1E-02	3.9E-02	0%
Copper		2.5E-03			2.9E-02	3.2E-02	0%
Total DDx		1.0E-03			2.6E-02	2.7E-02	0%
BHC		3.0E-03			1.7E-02	2.0E-02	0%
Barium		1.3E-03			5.5E-03	6.8E-03	0%
Cobalt		1.7E-03			2.8E-03	4.5E-03	0%
Aluminum							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**6.0E-01**	**-**	**-**	**2.6E+02**	**2.6E+02**	
PERCENTAGE OF TOTAL RISK		**0%**			**100%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-22
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs :
MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA A/B - Aroclor
RECEPTOR: MINK - Sucker
TOTAL RISK (HI): 8.8E+01

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
Total PCB (Aroclor)		1.2E-01			4.4E+01	***4.4E+01***	***50%***
Total PCB (Congener)		1.9E-01			3.8E+01	***3.8E+01***	***43%***
PCB_TEQ_MAMMAL		7.3E-03			5.9E+00	***5.9E+00***	7%
Mercury		2.2E-04			6.8E-02	6.9E-02	0%
Nickel		4.1E-03			1.5E-02	1.9E-02	0%
Copper		1.5E-03			1.7E-02	1.9E-02	0%
Manganese					9.1E-03	9.1E-03	0%
Chromium		1.1E-03			4.4E-03	5.5E-03	0%
Total DDx		2.0E-04			5.2E-03	5.4E-03	0%
Zinc		1.7E-04			5.0E-03	5.2E-03	0%
BHC		3.0E-04			1.7E-03	2.0E-03	0%
Barium		1.3E-04			5.5E-04	6.8E-04	0%
Cobalt		1.7E-04			2.8E-04	4.5E-04	0%
Aluminum							
TOTAL MEDIUM-SPEC	**-**	**3.2E-01**	**-**	**-**	**8.8E+01**	**8.8E+01**	
PERCENTAGE OF TOT		**0%**			**100%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-23
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : SEDIMENT (0-7 inches) / MINK

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA A/B - Aroclor -Sunfish
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0033	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	58%	Mitchell, 1961	$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

REFERENCES

Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-24
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : SEDIMENT (0-7 inches) / MINK

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA A/B - Aroclor -Sunfish
RECEPTOR: MINK

Prepared:	**14-Dec-09**	**AM**
Checked:	**15-Dec-09**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Aluminum	3.8E+03	mg/kg	1.3E+01	mg/kg-d	NA	NA			
Barium	2.1E+01	mg/kg	6.9E-02	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	1.3E-03	1.3E-04
Cobalt	3.8E+00	mg/kg	1.3E-02	mg/kg-d	7.3E+00	7.3E+01	mg/kg-d	1.7E-03	1.7E-04
Chromium	7.8E+00	mg/kg	2.6E-02	mg/kg-d	2.4E+00	2.4E+01	mg/kg-d	1.1E-02	1.1E-03
Copper	4.2E+00	mg/kg	1.4E-02	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	2.5E-03	1.5E-03
Mercury	1.2E-02	mg/kg	3.9E-05	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	7.1E-04	2.2E-04
Nickel	4.2E+00	mg/kg	1.4E-02	mg/kg-d	1.7E+00	3.4E+00	mg/kg-d	8.2E-03	4.1E-03
Zinc	3.8E+01	mg/kg	1.3E-01	mg/kg-d	7.5E+01	7.5E+02	mg/kg-d	1.7E-03	1.7E-04
Total PCB (Aroclor)	3.4E+00	mg/kg	1.1E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	1.4E-01	1.2E-01
BHC	1.3E-02	mg/kg	4.2E-05	mg/kg-d	1.4E-02	1.4E-01	mg/kg-d	3.0E-03	3.0E-04
Total DDx	4.4E-02	mg/kg	1.5E-04	mg/kg-d	1.5E-01	7.4E-01	mg/kg-d	1.0E-03	2.0E-04
PCB_TEQ_MAMMAL	4.9E-06	mg/kg	1.6E-08	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	2.0E-01	7.3E-03
Total PCB (Congener)	5.4E+00	mg/kg	1.8E-02	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	2.2E-01	1.9E-01
							HAZARD INDICES:	6.0E-01	3.2E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-23.
b. Reference Dose Values presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-25
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / MINK

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA A/B - Aroclor -Sunfish
RECEPTOR: MINK

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.16	USEPA, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	100%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	58%	Mitchell, 1961	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

REFERENCES

Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-26
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / MINK

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA A/B - Aroclor -Sunfish
RECEPTOR: MINK

Prepared:	**14-Dec-09**	**AM**
Checked:	**15-Dec-09**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Aluminum	7.2E+00	mg/kg	1.2E+00	mg/kg-d	NA	NA			
Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	0.0E+00	0.0E+00
Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-d	7.3E+00	7.3E+01	mg/kg-d	0.0E+00	0.0E+00
Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-d	2.4E+00	2.4E+01	mg/kg-d	0.0E+00	0.0E+00
Copper	4.5E-01	mg/kg	7.4E-02	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	1.3E-02	8.0E-03
Manganese	1.5E+00	mg/kg	2.5E-01	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	4.9E-03	4.9E-04
Mercury	1.4E-01	mg/kg	2.3E-02	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	4.2E-01	1.3E-01
Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-d	1.7E+00	3.4E+00	mg/kg-d	0.0E+00	0.0E+00
Zinc	7.3E+00	mg/kg	1.2E+00	mg/kg-d	7.5E+01	7.5E+02	mg/kg-d	1.6E-02	1.6E-03
Total PCB (Aroclor)	2.1E+00	mg/kg	3.4E-01	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	**4.3E+00**	**3.6E+00**
BHC	5.1E-03	mg/kg	8.6E-04	mg/kg-d	1.4E-02	1.4E-01	mg/kg-d	6.1E-02	6.1E-03
Total DDx	1.0E-02	mg/kg	1.7E-03	mg/kg-d	1.5E-01	7.4E-01	mg/kg-d	1.2E-02	2.3E-03
PCB_TEQ_MAMMAL	2.5E-06	mg/kg	4.2E-07	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**5.3E+00**	1.9E-01
Total PCB (Congener)	3.2E+00	mg/kg	5.3E-01	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	**6.6E+00**	**5.5E+00**
							HAZARD INDICES:	**1.7E+01**	**9.4E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-25.
b. Toxicity Reference Doses presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-27
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : MINK

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA A/B - Aroclor -Sunfish
RECEPTOR: MINK
TOTAL RISK (HI): 1.7E+01

Prepared:	**14-Dec-09**	**AM**
Checked:	**15-Dec-09**	**NR**

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
Total PCB (Congener)		2.2E-01			6.6E+00	***6.8E+00***	***39%***
PCB_TEQ_MAMMAL		2.0E-01			5.3E+00	***5.5E+00***	***32%***
Total PCB (Aroclor)		1.4E-01			4.3E+00	***4.4E+00***	***26%***
BHC		3.0E-03			6.1E-02	6.4E-02	0%
Mercury		7.1E-04			4.2E-01	4.3E-01	2%
Zinc		1.7E-03			1.6E-02	1.8E-02	0%
Copper		2.5E-03			1.3E-02	1.6E-02	0%
Total DDx		1.0E-03			1.2E-02	1.3E-02	0%
Chromium		1.1E-02			-	1.1E-02	0%
Nickel		8.2E-03			-	8.2E-03	0%
Manganese					4.9E-03	4.9E-03	0%
Cobalt		1.7E-03			-	1.7E-03	0%
Barium		1.3E-03			-	1.3E-03	0%
Aluminum							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**6.0E-01**	**-**	**-**	**1.7E+01**	**1.7E+01**	
PERCENTAGE OF TOTAL RISK		**3%**			**97%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-28
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : MINK

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA A/B - Aroclor -Sunfish
RECEPTOR: MINK
TOTAL RISK (HI): 9.7E+00

Prepared:	**14-Dec-09**	**AM**
Checked:	**15-Dec-09**	**NR**

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
Total PCB (Congener)		1.9E-01			5.5E+00	***5.7E+00***	***58%***
Total PCB (Aroclor)		1.2E-01			3.6E+00	***3.7E+00***	***38%***
PCB_TEQ_MAMMAL		7.3E-03			1.9E-01	2.0E-01	2%
Mercury		2.2E-04			1.3E-01	1.3E-01	1%
Copper		1.5E-03			8.0E-03	9.5E-03	0%
BHC		3.0E-04			6.1E-03	6.4E-03	0%
Nickel		4.1E-03			-	4.1E-03	0%
Total DDx		2.0E-04			2.3E-03	2.5E-03	0%
Zinc		1.7E-04			1.6E-03	1.8E-03	0%
Chromium		1.1E-03			-	1.1E-03	0%
Manganese					4.9E-04	4.9E-04	0%
Cobalt		1.7E-04			-	1.7E-04	0%
Barium		1.3E-04			-	1.3E-04	0%
Aluminum							
TOTAL MEDIUM-SPEC	**-**	**3.2E-01**	**-**	**-**	**9.4E+00**	**9.7E+00**	
PERCENTAGE OF TOT		**3%**			**97%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-29
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : SEDIMENT (0-7 inches) / MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0033	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	58%	Mitchell, 1961	$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

REFERENCES

Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-30
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : SEDIMENT (0-7 inches) / MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sucker

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	1.0E+01	mg/kg	3.5E-02	mg/kg-d	2.4E+00	2.4E+01	mg/kg-d	1.4E-02	1.4E-03
Copper	5.2E+00	mg/kg	1.7E-02	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	3.1E-03	1.9E-03
Mercury	4.5E-02	mg/kg	1.5E-04	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	2.8E-03	8.4E-04
Nickel	4.6E+00	mg/kg	1.5E-02	mg/kg-d	1.7E+00	3.4E+00	mg/kg-d	8.9E-03	4.5E-03
Zinc	3.8E+01	mg/kg	1.3E-01	mg/kg-d	7.5E+01	7.5E+02	mg/kg-d	1.7E-03	1.7E-04
Total PCB (Aroclor)	1.7E-02	mg/kg	5.8E-05	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	7.2E-04	6.0E-04
BHC	na								
Total DDx	5.2E-03	mg/kg	1.7E-05	mg/kg-d	1.5E-01	7.4E-01	mg/kg-d	1.2E-04	2.4E-05
PCB_TEQ_MAMMAL	2.2E-08	mg/kg	7.4E-11	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	9.3E-04	3.3E-05
Aluminum	4.2E+03	mg/kg	1.4E+01	mg/kg-d	NA	NA			
Barium	2.2E+01	mg/kg	7.3E-02	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	1.4E-03	1.4E-04
Cobalt	3.1E+00	mg/kg	1.0E-02	mg/kg-d	7.3E+00	7.3E+01	mg/kg-d	1.4E-03	1.4E-04
Total PCB (Congener)	8.0E-03	mg/kg	2.7E-05	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	3.3E-04	2.8E-04
							HAZARD INDICES:	3.6E-02	1.0E-02

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-29.
b. Reference Dose Values presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-31
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.16	USEPA, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	100%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	58%	Mitchell, 1961	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

REFERENCES

Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-32
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sucker

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	2.5E-01	mg/kg	4.2E-02	mg/kg-d	2.4E+00	2.4E+01	mg/kg-d	1.7E-02	1.7E-03
Copper	3.1E-01	mg/kg	5.2E-02	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	9.3E-03	5.6E-03
Mercury	7.0E-02	mg/kg	1.2E-02	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	2.1E-01	6.5E-02
Nickel	6.4E-01	mg/kg	1.1E-01	mg/kg-d	1.7E+00	3.4E+00	mg/kg-d	6.3E-02	3.1E-02
Zinc	2.0E+01	mg/kg	3.3E+00	mg/kg-d	7.5E+01	7.5E+02	mg/kg-d	4.3E-02	4.3E-03
Total PCB (Arolcor)	2.4E+00	mg/kg	4.0E-01	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	**5.1E+00**	**4.2E+00**
BHC	4.6E-03	mg/kg	7.7E-04	mg/kg-d	1.4E-02	1.4E-01	mg/kg-d	5.5E-02	5.5E-03
Total DDx	2.1E-02	mg/kg	3.5E-03	mg/kg-d	1.5E-01	7.4E-01	mg/kg-d	2.4E-02	4.7E-03
PCB_TEQ_MAMMAL	1.7E-04	mg/kg	2.8E-05	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	**3.4E+02**	**1.2E+01**
Aluminum	2.2E+01	mg/kg	3.7E+00	mg/kg-d	NA	NA			
Barium	1.3E+00	mg/kg	2.1E-01	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	4.1E-03	4.1E-04
Cobalt	8.6E-02	mg/kg	1.4E-02	mg/kg-d	7.3E+00	7.3E+01	mg/kg-d	2.0E-03	2.0E-04
Manganese	2.4E+01	mg/kg	4.0E+00	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	7.8E-02	7.8E-03
Total PCB (Congener)	1.1E+00	mg/kg	1.8E-01	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	**2.3E+00**	**1.9E+00**
							HAZARD INDICES:	**3.5E+02**	**1.9E+01**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-31.
b. Toxicity Reference Doses presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-33
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sucker
TOTAL RISK (HI): 3.5E+02

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
PCB_TEQ_MAMMAL		9.3E-04			3.4E+02	***3.4E+02***	***98%***
Total PCB (Aroclor)		7.2E-04			5.1E+00	***5.1E+00***	1%
Total PCB (Congener)		3.3E-04			2.3E+00	***2.3E+00***	1%
Mercury		2.8E-03			2.1E-01	2.2E-01	0%
Manganese					7.8E-02	7.8E-02	0%
Nickel		8.9E-03			6.3E-02	7.2E-02	0%
BHC					5.5E-02	5.5E-02	0%
Zinc		1.7E-03			4.3E-02	4.5E-02	0%
Chromium		1.4E-02			1.7E-02	3.2E-02	0%
Total DDx		1.2E-04			2.4E-02	2.4E-02	0%
Copper		3.1E-03			9.3E-03	1.2E-02	0%
Barium		1.4E-03			4.1E-03	5.5E-03	0%
Cobalt		1.4E-03			2.0E-03	3.4E-03	0%
Aluminum							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**3.6E-02**	**-**	**-**	**3.5E+02**	**3.5E+02**	
PERCENTAGE OF TOTAL RISK		**0%**			**100%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-34
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : MINK - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sucker
TOTAL RISK (HI): 1.9E+01

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
PCB_TEQ_MAMMAL		3.3E-05			1.2E+01	***1.2E+01***	***66%***
Total PCB (Aroclor)		6.0E-04			4.2E+00	***4.2E+00***	***23%***
Total PCB (Congener)		2.8E-04			1.9E+00	***1.9E+00***	***10%***
Mercury		8.4E-04			6.5E-02	6.6E-02	0%
Nickel		4.5E-03			3.1E-02	3.6E-02	0%
Manganese					7.8E-03	7.8E-03	0%
Copper		1.9E-03			5.6E-03	7.4E-03	0%
BHC					5.5E-03	5.5E-03	0%
Total DDx		2.4E-05			4.7E-03	4.7E-03	0%
Zinc		1.7E-04			4.3E-03	4.5E-03	0%
Chromium		1.4E-03			1.7E-03	3.2E-03	0%
Barium		1.4E-04			4.1E-04	5.5E-04	0%
Cobalt		0.000142			2.0E-04	3.4E-04	0%
Aluminum							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.0E-02**	**-**	**-**	**1.9E+01**	**1.9E+01**	
PERCENTAGE OF TOTAL RISK		**0%**			**100%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-35
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : SEDIMENT (0-7 inches) / MINK - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sunfish

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0033	assumption	
	SFF	SITE FORAGING FREQUENCY	unitless	58%	Mitchell, 1961	$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

REFERENCES

Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-36
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : SEDIMENT (0-7 inches) / MINK - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sunfish

Prepared:	**14-Dec-09**	**AM**
Checked:	**15-Dec-09**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	1.0E+01	mg/kg	3.5E-02	mg/kg-d	2.4E+00	2.4E+01	mg/kg-d	1.4E-02	1.4E-03
Copper	5.2E+00	mg/kg	1.7E-02	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	3.1E-03	1.9E-03
Mercury	4.5E-02	mg/kg	1.5E-04	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	2.8E-03	8.4E-04
Nickel	4.6E+00	mg/kg	1.5E-02	mg/kg-d	1.7E+00	3.4E+00	mg/kg-d	8.9E-03	4.5E-03
Zinc	3.8E+01	mg/kg	1.3E-01	mg/kg-d	7.5E+01	7.5E+02	mg/kg-d	1.7E-03	1.7E-04
Total PCB (Aroclor)	1.7E-02	mg/kg	5.8E-05	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	7.2E-04	6.0E-04
BHC	na								
Total DDx	5.2E-03	mg/kg	1.7E-05	mg/kg-d	1.5E-01	7.4E-01	mg/kg-d	1.2E-04	2.4E-05
PCB_TEQ_MAMMAL	2.2E-08	mg/kg	7.4E-11	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	9.3E-04	3.3E-05
Aluminum	4.2E+03	mg/kg	1.4E+01	mg/kg-d	NA	NA			
Barium	2.2E+01	mg/kg	7.3E-02	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	1.4E-03	1.4E-04
Cobalt	3.1E+00	mg/kg	1.0E-02	mg/kg-d	7.3E+00	7.3E+01	mg/kg-d	1.4E-03	1.4E-04
Total PCB (Congener)	8.0E-03	mg/kg	2.7E-05	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	3.3E-04	2.8E-04
							HAZARD INDICES:	3.6E-02	1.0E-02

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-35.
b. Reference Dose Values presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-37
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / MINK - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sunfish

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.16	USEPA, 1993	
	P_{fish}	PERCENT FISH IN DIET	unitless	100%	assumption	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	58%	Mitchell, 1961	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	100%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.57	Mitchell, 1961	

REFERENCES

Mitchell, J.L., 1961. Mink movements and populations on a Montana river; J. Wildl. Manage. 25:48-54.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

TABLE I-38
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / MINK - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: Fish
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sunfish

Prepared:	**14-Dec-09**	**AM**
Checked:	**15-Dec-09**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	3.1E-01	mg/kg	5.2E-02	mg/kg-d	2.4E+00	2.4E+01	mg/kg-d	2.2E-02	2.2E-03
Copper	2.8E-01	mg/kg	4.7E-02	mg/kg-d	5.6E+00	9.3E+00	mg/kg-d	8.3E-03	5.0E-03
Mercury	1.5E-01	mg/kg	2.5E-02	mg/kg-d	5.5E-02	1.8E-01	mg/kg-d	4.5E-01	1.4E-01
Nickel	2.8E-01	mg/kg	4.7E-02	mg/kg-d	1.7E+00	3.4E+00	mg/kg-d	2.7E-02	1.4E-02
Zinc	6.6E+00	mg/kg	1.1E+00	mg/kg-d	7.5E+01	7.5E+02	mg/kg-d	1.5E-02	1.5E-03
Total PCB (Aroclor)	2.7E-02	mg/kg	4.4E-03	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	5.5E-02	4.6E-02
BHC	5.1E-03	mg/kg	8.5E-04	mg/kg-d	1.4E-02	1.4E-01	mg/kg-d	6.1E-02	6.1E-03
Total DDx	7.4E-03	mg/kg	1.2E-03	mg/kg-d	1.5E-01	7.4E-01	mg/kg-d	8.4E-03	1.7E-03
PCB_TEQ_MAMMAL	1.8E-07	mg/kg	3.0E-08	mg/kg-d	8.0E-08	2.2E-06	mg/kg-d	3.8E-01	1.3E-02
Aluminum	4.5E+00	mg/kg	7.6E-01	mg/kg-d	NA	NA			
Barium	9.0E-02	mg/kg	1.5E-02	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	2.9E-04	2.9E-05
Cobalt	9.0E-02	mg/kg	1.5E-02	mg/kg-d	7.3E+00	7.3E+01	mg/kg-d	2.0E-03	2.0E-04
Manganese	2.2E+00	mg/kg	3.6E-01	mg/kg-d	5.2E+01	5.2E+02	mg/kg-d	7.0E-03	7.0E-04
Total PCB (Congener)	1.4E-02	mg/kg	2.3E-03	mg/kg-d	8.0E-02	9.6E-02	mg/kg-d	2.8E-02	2.3E-02
							HAZARD INDICES:	**1.1E+00**	2.5E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-37.
b. Toxicity Reference Doses presented in Table TRVs.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-39
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : MINK - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sunfish
TOTAL RISK (HI): 1.1E+00

Prepared:	**14-Dec-09**	**AM**
Checked:	**15-Dec-09**	**NR**

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Mercury		2.8E-03			4.5E-01	4.6E-01	***42%***
PCB_TEQ_MAMMAL		9.3E-04			3.8E-01	3.8E-01	***34%***
BHC					6.1E-02	6.1E-02	6%
Total PCB (Aroclor)		7.2E-04			5.5E-02	5.6E-02	5%
Nickel		8.9E-03			2.7E-02	3.6E-02	3%
Chromium		1.4E-02			2.2E-02	3.6E-02	3%
Total PCB (Congener)		3.3E-04			2.8E-02	2.9E-02	3%
Zinc		1.7E-03			1.5E-02	1.6E-02	1%
Copper		3.1E-03			8.3E-03	1.1E-02	1%
Total DDx		1.2E-04			8.4E-03	8.5E-03	1%
Manganese					7.0E-03	7.0E-03	1%
Cobalt		1.4E-03			2.0E-03	3.5E-03	0%
Barium		1.4E-03			2.9E-04	1.7E-03	0%
Aluminum							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**3.6E-02**	**-**	**-**	**1.1E+00**	**1.1E+00**	
PERCENTAGE OF TOTAL RISK		**3%**			**97%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-40
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : MINK - Sunfish

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C
RECEPTOR: MINK - Sunfish
TOTAL RISK (HI): 2.6E-01

Prepared:	**14-Dec-09**	**AM**
Checked:	**15-Dec-09**	**NR**

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
Mercury		8.4E-04			1.4E-01	1.4E-01	***53%***
Total PCB (Aroclor)		6.0E-04			4.6E-02	4.7E-02	***18%***
Total PCB (Congener)		2.8E-04			2.3E-02	2.4E-02	9%
Nickel		4.5E-03			1.4E-02	1.8E-02	7%
PCB_TEQ_MAMMAL		3.3E-05			1.3E-02	1.4E-02	5%
Copper		1.9E-03			5.0E-03	6.9E-03	3%
BHC					6.1E-03	6.1E-03	2%
Chromium		1.4E-03			2.2E-03	3.6E-03	1%
Total DDx		2.4E-05			1.7E-03	1.7E-03	1%
Zinc		1.7E-04			1.5E-03	1.6E-03	1%
Manganese					7.0E-04	7.0E-04	0%
Cobalt		0.000142			2.0E-04	3.5E-04	0%
Barium		1.4E-04			2.9E-05	1.7E-04	0%
Aluminum							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.0E-02**	**-**	**-**	**2.5E-01**	**2.6E-01**	
PERCENTAGE OF TOTAL RISK		**4%**			**96%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-41
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : SEDIMENT (0-7 inches) / GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA AB - Aroclors
RECEPTOR: GREEN HERON - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0082	USEPA, 2003	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-42
ALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : SEDIMENT (0-7 inches) / GREEN HERON - Suck

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA AB - Aroclors
RECEPTOR: GREEN HERON - Sucker

Prepared:	**I/2008, 4-29-**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	7.8E+00	mg/kg	1.4E-01	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	5.2E-02	5.2E-03
Copper	4.2E+00	mg/kg	7.5E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.9E-02	6.2E-03
Mercury	1.2E-02	mg/kg	2.1E-04	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	2.6E-03	2.6E-04
Nickel	4.2E+00	mg/kg	7.5E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	1.1E-02	1.1E-03
Zinc	3.8E+01	mg/kg	6.8E-01	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	1.0E-02	1.0E-03
Total PCB (Aroclor)	3.4E+00	mg/kg	6.0E-02	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	1.5E-01	1.2E-01
BHC	1.3E-02	mg/kg	2.2E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	4.0E-04	9.8E-05
Total DDx	4.4E-02	mg/kg	7.9E-04	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	3.5E-03	3.5E-04
PCB_TEQ_BIRD	1.2E-03	mg/kg	2.2E-05	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	**1.6E+00**	1.6E-01
Aluminum	3.8E+03	mg/kg	6.7E+01	mg/kg-d	NA	NA			
Barium	2.1E+01	mg/kg	3.7E-01	mg/kg-d	NA	NA			
Cobalt	3.8E+00	mg/kg	6.7E-02	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	8.9E-03	8.9E-04
Total PCB (Congener)	5.4E+00	mg/kg	9.6E-02	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	2.4E-01	1.9E-01
							HAZARD INDICES:	**2.1E+00**	4.9E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-41.
b. Reference Dose Values presented in Table 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-43
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : AQUATIC INVERTEBRATES / GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 2
EXPOSURE MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE POINT: AREA AB - Aroclors
RECEPTOR: GREEN HERON - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		$EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.087	Nagy, 1987; USEPA, 2003	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	20%	USEPA, 2003	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$C_{invert} = C_{sed} * BAF_{invert}$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

Nagy, K.A., 1987. Field metabolic rate and food requirement scaling in mammals and birds; Ecol. Monogr. 57:111-128.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-44
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : AQUATIC INVERTEBRATES / GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 2
EXPOSURE MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE POINT: AREA AB - Aroclors
RECEPTOR: GREEN HERON - Sucker

Prepared:	**l/2008, 4-29-**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	9.4E+00	mg/kg	3.6E-01	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	1.3E-01	1.3E-02
Copper	3.1E+01	mg/kg	1.2E+00	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	2.9E-01	9.8E-02
Mercury	4.7E-02	mg/kg	1.8E-03	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	2.2E-02	2.2E-03
Nickel	1.9E+00	mg/kg	7.4E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	1.1E-02	1.1E-03
Zinc	8.5E+02	mg/kg	3.2E+01	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	4.9E-01	4.9E-02
Total PCB (Aroclor)	3.8E+00	mg/kg	1.4E-01	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	3.6E-01	2.9E-01
BHC	1.3E-02	mg/kg	4.9E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	8.8E-04	2.1E-04
Total DDx	4.8E-02	mg/kg	1.8E-03	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	8.0E-03	8.0E-04
PCB_TEQ_BIRD	1.3E-03	mg/kg	5.1E-05	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	**3.7E+00**	3.7E-01
Aluminum	3.2E+01	mg/kg	1.2E+00	mg/kg-d	NA	NA			
Barium	3.8E-01	mg/kg	1.4E-02	mg/kg-d	NA	NA			
Cobalt	9.2E-02	mg/kg	3.5E-03	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	4.6E-04	4.6E-05
Total PCB (Congener)	6.0E+00	mg/kg	2.3E-01	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	5.7E-01	4.6E-01
							HAZARD INDICES:	**5.5E+00**	**1.3E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-43.
b. Reference Dose Values presented in 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-45
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 3
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA AB - Aroclors
RECEPTOR: GREEN HERON - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.087	Nagy, 1987; USEPA, 2003	
	P_{fish}	PERCENT FISH IN DIET	unitless	80%	USEPA, 2003	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

Nagy, K.A., 1987. Field metabolic rate and food requirement scaling in mammals and birds; Ecol. Monogr. 57:111-128.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-46
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 3
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA AB - Aroclors
RECEPTOR: GREEN HERON - Sucker

Prepared:	**I/2008, 4-29-**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	6.4E-01	mg/kg	9.7E-02	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	3.6E-02	3.6E-03
Copper	9.8E-01	mg/kg	1.5E-01	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.7E-02	1.2E-02
Mercury	7.4E-02	mg/kg	1.1E-02	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	1.4E-01	1.4E-02
Nickel	3.1E-01	mg/kg	4.8E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	7.1E-03	7.1E-04
Zinc	2.3E+01	mg/kg	3.4E+00	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	5.2E-02	5.2E-03
Total PCB (Aroclor)	2.5E+01	mg/kg	3.9E+00	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	**9.6E+00**	**7.7E+00**
BHC	1.4E-03	mg/kg	2.2E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	3.9E-04	9.4E-05
Total DDx	2.3E-02	mg/kg	3.5E-03	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	1.5E-02	1.5E-03
PCB_TEQ_BIRD	5.7E-03	mg/kg	8.7E-04	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	**6.2E+01**	**6.2E+00**
Aluminum	4.7E+01	mg/kg	7.1E+00	mg/kg-d	NA	NA			
Barium	1.7E+00	mg/kg	2.6E-01	mg/kg-d	NA	NA			
Cobalt	1.2E-01	mg/kg	1.8E-02	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	2.4E-03	2.4E-04
Manganese	2.8E+01	mg/kg	4.3E+00	mg/kg-d	1.8E+02	1.8E+03	mg/kg-d	2.4E-02	2.4E-03
Total PCB (Congener)	2.2E+01	mg/kg	3.3E+00	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	**8.3E+00**	**6.6E+00**
							HAZARD INDICES:	**8.0E+01**	**2.1E+01**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-45.
b. Reference Dose Values presented in 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-47
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE	
EXPOSURE POINT: AREA AB - Aroclors	
RECEPTOR: GREEN HERON - Sucker	
TOTAL RISK (HI):	**8.8E+01**

Prepared:	**/1/2008, 4-29-0**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Exposure Medium[a] Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
PCB_TEQ_BIRD	-	1.6E+00	-	3.7E+00	6.2E+01	***6.8E+01***	***77%***
Total PCB (Aroclor)	-	1.5E-01	-	3.6E-01	9.6E+00	***1.0E+01***	***12%***
Total PCB (Congener)	-	2.4E-01	-	5.7E-01	8.3E+00	***9.1E+00***	***10%***
Zinc	-	1.0E-02	-	4.9E-01	5.2E-02	5.5E-01	1%
Copper	-	1.9E-02	-	2.9E-01	3.7E-02	3.5E-01	0%
Chromium	-	5.2E-02	-	1.3E-01	3.6E-02	2.2E-01	0%
Mercury	-	2.6E-03	-	2.2E-02	1.4E-01	1.6E-01	0%
Nickel	-	1.1E-02	-	1.1E-02	7.1E-03	2.9E-02	0%
Total DDx	-	3.5E-03	-	8.0E-03	1.5E-02	2.7E-02	0%
Manganese					2.4E-02	2.4E-02	0%
Cobalt		8.9E-03	-	4.6E-04	2.4E-03	1.2E-02	0%
BHC	-	4.0E-04	-	8.8E-04	3.9E-04	1.7E-03	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**2.1E+00**	**-**	**5.5E+00**	**8.0E+01**	**8.8E+01**	
PERCENTAGE OF TOTAL RISK		**2%**		**6%**	**91%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-48
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA AB - Aroclors
RECEPTOR: GREEN HERON - Sucker
TOTAL RISK (HI): 2.2E+01

Prepared:	**/1/2008, 4-29-0**	**MB**
Checked:	**29-Apr-08**	**NR**

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
Total PCB (Aroclor)	-	1.2E-01	-	2.9E-01	7.7E+00	***8.1E+00***	***36%***
Total PCB (Congener)	-	1.9E-01	-	4.6E-01	6.6E+00	***7.3E+00***	***32%***
PCB_TEQ_BIRD	-	1.6E-01	-	3.7E-01	6.2E+00	***6.8E+00***	***30%***
Copper	-	6.2E-03	-	9.8E-02	1.2E-02	1.2E-01	1%
Zinc	-	1.0E-03	-	4.9E-02	5.2E-03	5.5E-02	0%
Chromium	-	5.2E-03	-	1.3E-02	3.6E-03	2.2E-02	0%
Mercury	-	2.6E-04	-	2.2E-03	1.4E-02	1.6E-02	0%
Nickel	-	1.1E-03	-	1.1E-03	7.1E-04	2.9E-03	0%
Total DDx	-	3.5E-04	-	8.0E-04	1.5E-03	2.7E-03	0%
Manganese					2.4E-03	2.4E-03	0%
Cobalt		8.9E-04	-	4.6E-05	2.4E-04	1.2E-03	0%
BHC	-	9.8E-05	-	2.1E-04	9.4E-05	4.0E-04	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**4.9E-01**	**-**	**1.3E+00**	**2.1E+01**	**2.2E+01**	
PERCENTAGE OF TOTAL RISK		**2%**		**6%**	**92%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-49
ESTIMATED AQUATIC PREY TISSUE CONCENTRATIONS DERIVED USING LITERATURE-BASED BAFs

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: AQUATIC PREY
EXPOSURE POINT: AREA AB - Congeners - Sunfish

Prepared:	**NR**	**14-Jan-10**
Checked:	**RB**	**18-Jan-10**

		Literature-based BAFs[a]				Estimated Tissue Concentration[b]		
Analyte	Medium EPC Value	Aquatic Plants	Aquatic Invertebrates	Note	Fish	Aquatic Plants	Aquatic Invertebrates	Fish
Chromium	7.8E+00		1.2E+00	2			9.4E+00	
Copper	4.2E+00		7.4E+00	2			3.1E+01	
Mercury	1.2E-02		4.0E+00	2			4.7E-02	
Nickel	4.2E+00		4.6E-01	2			1.9E+00	
Zinc	3.8E+01		2.2E+01	2			8.5E+02	
Total PCB (Congener)	1.9E+00		1.1E+00	1			2.1E+00	
BHC	1.3E-02		1.0E+00	1			1.3E-02	
Total DDx	4.4E-02		1.1E+00	1			4.8E-02	
PCB_TEQ_BIRD	3.1E-03		1.1E+00	1			3.3E-03	
Aluminum	3.8E+03		8.6E-03	3			3.2E+01	
Barium	2.1E+01		1.8E-02	3			3.8E-01	
Cobalt	3.8E+00		2.4E-02	3			9.2E-02	

Footnotes:
BAFs derived using the following approaches (see Note column).

1. Calculated using soil water to invertebrate equilibrium partitioning model (Jager, 1998); model estimated BCFs were divided by the soil partition coefficient to derive the BSAF. Units in kgsoil/kgworm. Model was parameterized with bulk density (water,lipid) and fraction water values as presented in Jager, 1998. Soil organic carbon content assumed to be 0 percent.
2. Values as recommended in Sample et al., (1998); regression estimates based on the following sediment concentrations (ug/g dry weight): 10,10,10 and 10 for chromium, copper, nickel and zinc, respectively.
3. BAFs for uptake of inorganics from soil to invertebrates were derived from information summarized in Sample et al., 1998. Regression estimates based on the following soil concentrations (ug/g dw): 10,10,10,10,,10,10,10 and 10 for, arsenic, cadmium, copper, lead, manganese, mercury, nickel, selenium, and zinc, respectively.

b. Estimated prey item concentrations calculated by multiplying the sediment EPC concentration (mg/kg[dw] by the tissue-specific BAF (mg/kg[ww]). Estimated tissue concentrations reported in units of mg/kg [wet weight tissue].

TABLE I-50
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : SEDIMENT (0-7 inches) / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA AB - Congeners - Sunfish
RECEPTOR: GREEN HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0082	USEPA, 2003	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-51
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : SEDIMENT (0-7 inches) / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA AB - Congeners - Sunfish
RECEPTOR: GREEN HERON

Prepared:	**NR**	**14-Jan-10**
Checked:	**RB**	**18-Jan-10**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	7.8E+00	mg/kg	1.4E-01	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	5.2E-02	5.2E-03
Copper	4.2E+00	mg/kg	7.5E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.9E-02	6.2E-03
Mercury	1.2E-02	mg/kg	2.1E-04	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	2.6E-03	2.6E-04
Nickel	4.2E+00	mg/kg	7.5E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	1.1E-02	1.1E-03
Zinc	3.8E+01	mg/kg	6.8E-01	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	1.0E-02	1.0E-03
Total PCB (Congener)	1.9E+00	mg/kg	3.4E-02	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	8.5E-02	6.8E-02
BHC	1.3E-02	mg/kg	2.2E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	4.0E-04	9.8E-05
Total DDx	4.4E-02	mg/kg	7.9E-04	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	3.5E-03	3.5E-04
PCB_TEQ_BIRD	3.1E-03	mg/kg	5.5E-05	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	**3.9E+00**	3.9E-01
Aluminum	3.8E+03	mg/kg	6.7E+01	mg/kg-d	NA	NA			
Barium	2.1E+01	mg/kg	3.7E-01	mg/kg-d	NA	NA			
Cobalt	3.8E+00	mg/kg	6.7E-02	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	8.9E-03	8.9E-04
							HAZARD INDICES:	**4.1E+00**	4.7E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-50.
b. Reference Dose Values presented in Table 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-52
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : AQUATIC INVERTEBRATES / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 2
EXPOSURE MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE POINT: AREA AB - Congeners - Sunfish
RECEPTOR: GREEN HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		$EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.087	Nagy, 1987; USEPA, 2003	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	20%	USEPA, 2003	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$C_{invert} = C_{sed} * BAF_{invert}$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

Nagy, K.A., 1987. Field metabolic rate and food requirement scaling in mammals and birds; Ecol. Monogr. 57:111-128.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.
USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-53
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : AQUATIC INVERTEBRATES / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 2
EXPOSURE MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE POINT: AREA AB - Congeners - Sunfish
RECEPTOR: GREEN HERON

Prepared:	**NR**	**14-Jan-10**
Checked:	**RB**	**18-Jan-10**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	9.4E+00	mg/kg	3.6E-01	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	1.3E-01	1.3E-02
Copper	3.1E+01	mg/kg	1.2E+00	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	2.9E-01	9.8E-02
Mercury	4.7E-02	mg/kg	1.8E-03	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	2.2E-02	2.2E-03
Nickel	1.9E+00	mg/kg	7.4E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	1.1E-02	1.1E-03
Zinc	8.5E+02	mg/kg	3.2E+01	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	4.9E-01	4.9E-02
Total PCB (Congener)	2.1E+00	mg/kg	8.0E-02	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	2.0E-01	1.6E-01
BHC	1.3E-02	mg/kg	4.9E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	8.8E-04	2.1E-04
Total DDx	4.8E-02	mg/kg	1.8E-03	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	8.0E-03	8.0E-04
PCB_TEQ_BIRD	3.3E-03	mg/kg	1.3E-04	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	**9.1E+00**	9.1E-01
Aluminum	3.2E+01	mg/kg	1.2E+00	mg/kg-d	NA	NA			
Barium	3.8E-01	mg/kg	1.4E-02	mg/kg-d	NA	NA			
Cobalt	9.2E-02	mg/kg	3.5E-03	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	4.6E-04	4.6E-05
							HAZARD INDICES:	**1.0E+01**	**1.2E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-52.
b. Reference Dose Values presented in 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-54
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 3
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA AB - Congeners - Sunfish
RECEPTOR: GREEN HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.087	Nagy, 1987; USEPA, 2003	
	P_{fish}	PERCENT FISH IN DIET	unitless	80%	USEPA, 2003	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

Nagy, K.A., 1987. Field metabolic rate and food requirement scaling in mammals and birds; Ecol. Monogr. 57:111-128.
USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.
USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-55
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 3
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA AB - Congeners - Sunfish
RECEPTOR: GREEN HERON

Prepared:	**NR**	**14-Jan-10**
Checked:	**RB**	**18-Jan-10**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Aluminum	7.2E+00	mg/kg	1.1E+00	mg/kg-d	NA	NA			
Barium	0.0E+00	mg/kg	0.0E+00	mg/kg-d	NA	NA			
Cobalt	0.0E+00	mg/kg	0.0E+00	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	0.0E+00	0.0E+00
Chromium	0.0E+00	mg/kg	0.0E+00	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	0.0E+00	0.0E+00
Copper	4.5E-01	mg/kg	6.8E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.7E-02	5.6E-03
Manganese	1.5E+00	mg/kg	2.3E-01	mg/kg-d	1.8E+02	1.8E+03	mg/kg-d	1.3E-03	1.3E-04
Mercury	1.4E-01	mg/kg	2.1E-02	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	2.7E-01	2.7E-02
Nickel	0.0E+00	mg/kg	0.0E+00	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	0.0E+00	0.0E+00
Zinc	7.3E+00	mg/kg	1.1E+00	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	1.7E-02	1.7E-03
Total PCB (Aroclor)	2.1E+00	mg/kg	3.1E-01	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	7.8E-01	6.3E-01
BHC	5.1E-03	mg/kg	7.8E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	1.4E-03	3.4E-04
Total DDx	1.0E-02	mg/kg	1.6E-03	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	6.9E-03	6.9E-04
PCB_TEQ_BIRD	1.3E-03	mg/kg	2.1E-04	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	**1.5E+01**	**1.5E+00**
Total PCB (Congener)	3.2E+00	mg/kg	4.8E-01	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	**1.2E+00**	9.6E-01
							HAZARD INDICES:	**1.7E+01**	**3.1E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-54.
b. Reference Dose Values presented in 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-56
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA AB - Congeners - Sunfish
RECEPTOR: GREEN HERON
TOTAL RISK (HI): 3.1E+01

Prepared:	**NR**	**14-Jan-10**
Checked:	**RB**	**18-Jan-10**

	Exposure Medium[a]						
Analyte	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish	Combined HQs[b]	Percent Contribution[c]
PCB_TEQ_BIRD	-	3.9E+00	-	9.1E+00	1.5E+01	***2.8E+01***	***88%***
Total PCB (Congener)	-	8.5E-02	-	2.0E-01	1.2E+00	***1.5E+00***	5%
Total PCB (Aroclor)	-				7.8E-01	7.8E-01	3%
Zinc	-	1.0E-02	-	4.9E-01	1.7E-02	5.1E-01	2%
Copper	-	1.9E-02	-	2.9E-01	1.7E-02	3.3E-01	1%
Chromium	-	5.2E-02	-	1.3E-01	-	1.9E-01	1%
Mercury	-	2.6E-03	-	2.2E-02	2.7E-01	2.9E-01	1%
Nickel	-	1.1E-02	-	1.1E-02	-	2.2E-02	0%
Total DDx	-	3.5E-03	-	8.0E-03	6.9E-03	1.8E-02	0%
Cobalt		8.9E-03	-	4.6E-04	-	9.3E-03	0%
BHC	-	4.0E-04	-	8.8E-04	1.4E-03	2.7E-03	0%
Manganese					1.3E-03	1.3E-03	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**4.1E+00**	**-**	**1.0E+01**	**1.7E+01**	**3.1E+01**	
PERCENTAGE OF TOTAL RISK		**13%**		**33%**	**54%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-57
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA AB - Congeners - Sunfish
RECEPTOR: GREEN HERON
TOTAL RISK (HI): 4.8E+00

Prepared:	**NR**	**14-Jan-10**
Checked:	**RB**	**18-Jan-10**

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
PCB_TEQ_BIRD	-	3.9E-01	-	9.1E-01	1.5E+00	***2.8E+00***	***58%***
Total PCB (Congener)	-	6.8E-02	-	1.6E-01	9.6E-01	***1.2E+00***	***25%***
Total PCB (Aroclor)	-				6.3E-01	6.3E-01	***13%***
Copper	-	6.2E-03	-	9.8E-02	5.6E-03	1.1E-01	2%
Zinc	-	1.0E-03	-	4.9E-02	1.7E-03	5.1E-02	1%
Chromium	-	5.2E-03	-	1.3E-02	-	1.9E-02	0%
Mercury	-	2.6E-04	-	2.2E-03	2.7E-02	2.9E-02	1%
Nickel	-	1.1E-03	-	1.1E-03	-	2.2E-03	0%
Total DDx	-	3.5E-04	-	8.0E-04	6.9E-04	1.8E-03	0%
Cobalt		8.9E-04	-	4.6E-05	-	9.3E-04	0%
BHC	-	9.8E-05	-	2.1E-04	3.4E-04	6.5E-04	0%
Manganese					1.3E-04	1.3E-04	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**4.7E-01**	**-**	**1.2E+00**	**3.1E+00**	**4.8E+00**	
PERCENTAGE OF TOTAL RISK		**10%**		**26%**	**64%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-58
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : SEDIMENT (0-7 inches) / GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA C
RECEPTOR: GREEN HERON - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0082	USEPA, 2003	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-59
ALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : SEDIMENT (0-7 inches) / GREEN HERON - Suck

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA C
RECEPTOR: GREEN HERON - Sucker

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Aluminum	4.2E+03	mg/kg	7.5E+01	mg/kg-d	NA	NA			
Barium	2.2E+01	mg/kg	3.9E-01	mg/kg-d	Not available	Not available			
Cobalt	3.1E+00	mg/kg	5.6E-02	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	7.3E-03	7.3E-04
Chromium	1.0E+01	mg/kg	1.9E-01	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	7.0E-02	7.0E-03
Copper	5.2E+00	mg/kg	9.3E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	2.3E-02	7.6E-03
Mercury	4.5E-02	mg/kg	8.1E-04	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	1.0E-02	1.0E-03
Nickel	4.6E+00	mg/kg	8.1E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	1.2E-02	1.2E-03
Zinc	3.8E+01	mg/kg	6.8E-01	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	1.0E-02	1.0E-03
Total PCB (Aroclor)	1.7E-02	mg/kg	3.1E-04	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	7.7E-04	6.2E-04
BHC	na								
Total DDx	5.2E-03	mg/kg	9.3E-05	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	4.1E-04	4.1E-05
PCB_TEQ_BIRD	7.4E-09	mg/kg	1.3E-10	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	9.4E-06	9.4E-07
Total PCB (Congener)	8.0E-03	mg/kg	1.4E-04	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	3.6E-04	2.9E-04
							HAZARD INDICES:	1.3E-01	2.0E-02

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-58.
b. Reference Dose Values presented in Table 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-60
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : AQUATIC INVERTEBRATES / GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 2
EXPOSURE MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE POINT: AREA C
RECEPTOR: GREEN HERON - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		$EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.087	Nagy, 1987; USEPA, 2003	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	20%	USEPA, 2003	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$C_{invert} = C_{sed} * BAF_{invert}$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

Nagy, K.A., 1987. Field metabolic rate and food requirement scaling in mammals and birds; Ecol. Monogr. 57:111-128.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-61
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : AQUATIC INVERTEBRATES / GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 2
EXPOSURE MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE POINT: AREA C
RECEPTOR: GREEN HERON - Sucker

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Aluminum	3.6E+01	mg/kg	1.4E+00	mg/kg-d	NA	NA			
Barium	4.0E-01	mg/kg	1.5E-02	mg/kg-d	Not available	Not available			
Cobalt	7.6E-02	mg/kg	2.9E-03	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	3.8E-04	3.8E-05
Chromium	1.3E+01	mg/kg	4.8E-01	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	1.8E-01	1.8E-02
Copper	3.8E+01	mg/kg	1.5E+00	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.6E-01	1.2E-01
Mercury	1.8E-01	mg/kg	6.9E-03	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	8.6E-02	8.6E-03
Nickel	2.1E+00	mg/kg	8.1E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	1.2E-02	1.2E-03
Zinc	8.6E+02	mg/kg	3.3E+01	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	4.9E-01	4.9E-02
Total PCB (Aroclor)	1.9E-02	mg/kg	7.3E-04	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	1.8E-03	1.5E-03
BHC									
Total DDx	5.7E-03	mg/kg	2.2E-04	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	9.5E-04	9.5E-05
PCB_TEQ_BIRD	8.1E-09	mg/kg	3.1E-10	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	2.2E-05	2.2E-06
Total PCB (Congener)	8.9E-03	mg/kg	3.4E-04	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	8.5E-04	6.8E-04
							HAZARD INDICES:	**1.1E+00**	2.0E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-60.
b. Reference Dose Values presented in 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-62
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 3
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C
RECEPTOR: GREEN HERON - Sucker

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.087	Nagy, 1987; USEPA, 2003	$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	P_{fish}	PERCENT FISH IN DIET	unitless	80%	USEPA, 2003	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

Nagy, K.A., 1987. Field metabolic rate and food requirement scaling in mammals and birds; Ecol. Monogr. 57:111-128.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-63
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 3
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C
RECEPTOR: GREEN HERON - Sucker

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Aluminum	2.2E+01	mg/kg	3.4E+00	mg/kg-d	NA	NA			
Barium	1.3E+00	mg/kg	1.9E-01	mg/kg-d	Not available	Not available			
Cobalt	8.6E-02	mg/kg	1.3E-02	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	1.7E-03	1.7E-04
Manganese	2.4E+01	mg/kg	3.6E+00	mg/kg-d	1.8E+02	1.8E+03	mg/kg-d	2.0E-02	2.0E-03
Chromium	2.5E-01	mg/kg	3.8E-02	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	1.4E-02	1.4E-03
Copper	3.1E-01	mg/kg	4.8E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.2E-02	3.9E-03
Mercury	7.0E-02	mg/kg	1.1E-02	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	1.3E-01	1.3E-02
Nickel	6.4E-01	mg/kg	9.7E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	1.5E-02	1.5E-03
Zinc	2.0E+01	mg/kg	3.0E+00	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	4.5E-02	4.5E-03
Total PCB (Aroclor)	2.4E+00	mg/kg	3.7E-01	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	9.2E-01	7.4E-01
BHC	4.6E-03	mg/kg	7.0E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	1.2E-03	3.0E-04
Total DDx	2.1E-02	mg/kg	3.2E-03	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	1.4E-02	1.4E-03
PCB_TEQ_BIRD	3.6E-04	mg/kg	5.5E-05	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	**3.9E+00**	3.9E-01
Total PCB (Congener)	1.1E+00	mg/kg	1.7E-01	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	4.2E-01	3.4E-01
							HAZARD INDICES:	**5.5E+00**	**1.5E+00**

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-62.
b. Reference Dose Values presented in 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-64
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C
RECEPTOR: GREEN HERON - Sucker
TOTAL RISK (HI): 6.8E+00

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
PCB_TEQ_BIRD	-	9.4E-06	-	2.2E-05	3.9E+00	***3.9E+00***	***58%***
Total PCB (Aroclor)	-	7.7E-04	-	1.8E-03	9.2E-01	9.3E-01	***14%***
Zinc	-	1.0E-02	-	4.9E-01	4.5E-02	5.5E-01	8%
Total PCB (Congener)	-	3.6E-04	-	8.5E-04	4.2E-01	4.2E-01	6%
Copper	-	2.3E-02	-	3.6E-01	1.2E-02	3.9E-01	6%
Chromium	-	7.0E-02	-	1.8E-01	1.4E-02	2.6E-01	4%
Mercury	-	1.0E-02	-	8.6E-02	1.3E-01	2.3E-01	3%
Nickel	-	1.2E-02	-	1.2E-02	1.5E-02	3.9E-02	1%
Manganese					2.0E-02	2.0E-02	0%
Total DDx	-	4.1E-04	-	9.5E-04	1.4E-02	1.5E-02	0%
Cobalt		7.3E-03	-	3.8E-04	1.7E-03	9.4E-03	0%
BHC	-				1.2E-03	1.2E-03	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.3E-01**	**-**	**1.1E+00**	**5.5E+00**	**6.8E+00**	
PERCENTAGE OF TOTAL RISK		**2%**		**17%**	**81%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-65
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : GREEN HERON - Sucker

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C
RECEPTOR: GREEN HERON - Sucker
TOTAL RISK (HI): 1.7E+00

Prepared:	**1-Feb-08**	**MB**
Checked:	**29-Apr-08**	**NR**

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Total PCB (Aroclor)	-	6.2E-04	-	1.5E-03	7.4E-01	7.4E-01	***43%***
PCB_TEQ_BIRD	-	9.4E-07	-	2.2E-06	3.9E-01	3.9E-01	***23%***
Total PCB (Congener)	-	2.9E-04	-	6.8E-04	3.4E-01	3.4E-01	***20%***
Copper	-	7.6E-03	-	1.2E-01	3.9E-03	1.3E-01	8%
Zinc	-	1.0E-03	-	4.9E-02	4.5E-03	5.5E-02	3%
Chromium	-	7.0E-03	-	1.8E-02	1.4E-03	2.6E-02	2%
Mercury	-	1.0E-03	-	8.6E-03	1.3E-02	2.3E-02	1%
Nickel	-	1.2E-03	-	1.2E-03	1.5E-03	3.9E-03	0%
Manganese					2.0E-03	2.0E-03	0%
Total DDx	-	4.1E-05	-	9.5E-05	1.4E-03	1.5E-03	0%
Cobalt		7.3E-04	-	3.8E-05	1.7E-04	9.4E-04	0%
BHC	-				3.0E-04	3.0E-04	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**2.0E-02**	**-**	**2.0E-01**	**1.5E+00**	**1.7E+00**	
PERCENTAGE OF TOTAL RISK		**1%**		**12%**	**87%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-66
ESTIMATED AQUATIC PREY TISSUE CONCENTRATIONS DERIVED USING LITERATURE-BASED BAFs

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: AQUATIC PREY
EXPOSURE POINT: AREA C - Sunfish

Prepared:	**14-Jan-10**	**NR**
Checked:		

		Literature-based BAFs[a]				Estimated Tissue Concentration[b]		
Analyte	Medium EPC Value	Aquatic Plants	Aquatic Invertebrates	Note	Fish	Aquatic Plants	Aquatic Invertebrates	Fish
Aluminum	4.2E+03		8.6E-03	3			3.6E+01	
Barium	2.2E+01		1.8E-02	3			4.0E-01	
Cobalt	3.1E+00		2.4E-02	3			7.6E-02	
Chromium	1.0E+01		1.2E+00	2			1.3E+01	
Copper	5.2E+00		7.4E+00	2			3.8E+01	
Mercury	4.5E-02		4.0E+00	2			1.8E-01	
Nickel	4.6E+00		4.6E-01	2			2.1E+00	
Zinc	3.8E+01		2.2E+01	2			8.6E+02	
Total PCB (Aroclor)	1.7E-02		1.1E+00	1			1.9E-02	
BHC	na		1.0E+00	1				
Total DDx	5.2E-03		1.1E+00	1			5.7E-03	
PCB_TEQ_BIRD	7.4E-09		1.1E+00	1			8.1E-09	
Total PCB (Congener)	8.0E-03		1.1E+00	1			8.9E-03	

Footnotes:
BAFs derived using the following approaches (see Note column).

1. Calculated using soil water to invertebrate equilibrium partitioning model (Jager, 1998); model estimated BCFs were divided by the soil partition coefficient to derive the BSAF. Units in kgsoil/kgworm. Model was parameterized with bulk density (water,lipid) and fraction water values as presented in Jager, 1998. Soil organic carbon content assumed to be 0 percent.
2. Values as recommended in Sample et al., (1998); regression estimates based on the following sediment concentrations (ug/g dry weight): 10,10,10 and 10 for chromium, copper, nickel and zinc, respectively.
3. BAFs for uptake of inorganics from soil to invertebrates were derived from information summarized in Sample et al., 1998. Regression estimates based on the following soil concentrations (ug/g dw): 10,10,10,10,,10,10,10 and 10 for, arsenic, cadmium, copper, lead, manganese, mercury, nickel, selenium, and zinc, respectively.

b. Estimated prey item concentrations calculated by multiplying the sediment EPC concentration (mg/kg[dw] by the tissue-specific BAF (mg/kg[ww]). Estimated tissue concentrations reported in units of mg/kg [wet weight tissue].

TABLE I-67
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : SEDIMENT (0-7 inches) / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA C - Sunfish
RECEPTOR: GREEN HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{sed}	ESTIMATED DAILY INTAKE VIA SEDIMENT INGESTION	mg/kg-d	calculated		SEDIMENT INTAKE-INGESTION
	C_{sed}	CHEMICAL CONCENTRATION IN SEDIMENT	mg/kg	chemical-specific		
	IR_{sed}	INGESTION RATE OF SEDIMENT	kg/day	0.0082	USEPA, 2003	
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$EDI_{sed} = C_{sed} * IR_{sed} * SFF * EF * 1/BW$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-68
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : SEDIMENT (0-7 inches) / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: SEDIMENT
EXPOSURE MEDIUM: SEDIMENT (0-7 inches)
EXPOSURE POINT: AREA C - Sunfish
RECEPTOR: GREEN HERON

Prepared:	**14-Jan-10**	**NR**
Checked:		

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Aluminum	4.2E+03	mg/kg	7.5E+01	mg/kg-d	NA	NA			
Barium	2.2E+01	mg/kg	3.9E-01	mg/kg-d	Not available	Not available			
Cobalt	3.1E+00	mg/kg	5.6E-02	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	7.3E-03	7.3E-04
Chromium	1.0E+01	mg/kg	1.9E-01	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	7.0E-02	7.0E-03
Copper	5.2E+00	mg/kg	9.3E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	2.3E-02	7.6E-03
Mercury	4.5E-02	mg/kg	8.1E-04	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	1.0E-02	1.0E-03
Nickel	4.6E+00	mg/kg	8.1E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	1.2E-02	1.2E-03
Zinc	3.8E+01	mg/kg	6.8E-01	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	1.0E-02	1.0E-03
Total PCB (Aroclor)	1.7E-02	mg/kg	3.1E-04	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	7.7E-04	6.2E-04
BHC	na								
Total DDx	5.2E-03	mg/kg	9.3E-05	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	4.1E-04	4.1E-05
PCB_TEQ_BIRD	7.4E-09	mg/kg	1.3E-10	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	9.4E-06	9.4E-07
Total PCB (Congener)	8.0E-03	mg/kg	1.4E-04	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	3.6E-04	2.9E-04
							HAZARD INDICES:	1.3E-01	2.0E-02

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-67.
b. Reference Dose Values presented in Table 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-69
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : AQUATIC INVERTEBRATES / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 2
EXPOSURE MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE POINT: AREA C - Sunfish
RECEPTOR: GREEN HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{invert}	ESTIMATED DAILY INTAKE VIA INVERTEBRATE INGESTION	mg/kg-d	calculated		INVERTEBRATE INTAKE-INGESTION
	C_{invert}	CHEMICAL CONCENTRATION IN INVERTEBRATES	mg/kg	chemical-specific		$EDI_{invert} = C_{invert} * IR_{food} * P_{invert} * SFF * EF * 1/BW$
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.087	Nagy, 1987; USEPA, 2003	
	P_{invert}	PERCENT INVERTEBRATES IN DIET	unitless	20%	USEPA, 2003	Where C_{invert} is estimated using site-specific tissue data or calculated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$C_{invert} = C_{sed} * BAF_{invert}$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

Nagy, K.A., 1987. Field metabolic rate and food requirement scaling in mammals and birds; Ecol. Monogr. 57:111-128.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-70
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : AQUATIC INVERTEBRATES / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 2
EXPOSURE MEDIUM: AQUATIC INVERTEBRATES
EXPOSURE POINT: AREA C - Sunfish
RECEPTOR: GREEN HERON

Prepared:	**14-Jan-10**	**NR**
Checked:		

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Aluminum	3.6E+01	mg/kg	1.4E+00	mg/kg-d	NA	NA			
Barium	4.0E-01	mg/kg	1.5E-02	mg/kg-d	Not available	Not available			
Cobalt	7.6E-02	mg/kg	2.9E-03	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	3.8E-04	3.8E-05
Chromium	1.3E+01	mg/kg	4.8E-01	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	1.8E-01	1.8E-02
Copper	3.8E+01	mg/kg	1.5E+00	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	3.6E-01	1.2E-01
Mercury	1.8E-01	mg/kg	6.9E-03	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	8.6E-02	8.6E-03
Nickel	2.1E+00	mg/kg	8.1E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	1.2E-02	1.2E-03
Zinc	8.6E+02	mg/kg	3.3E+01	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	4.9E-01	4.9E-02
Total PCB (Aroclor)	1.9E-02	mg/kg	7.3E-04	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	1.8E-03	1.5E-03
BHC									
Total DDx	5.7E-03	mg/kg	2.2E-04	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	9.5E-04	9.5E-05
PCB_TEQ_BIRD	8.1E-09	mg/kg	3.1E-10	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	2.2E-05	2.2E-06
Total PCB (Congener)	8.9E-03	mg/kg	3.4E-04	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	8.5E-04	6.8E-04
							HAZARD INDICES:	**1.1E+00**	2.0E-01

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-69.
b. Reference Dose Values presented in 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-71
PARAMETER VALUES USED TO CALCULATE ESTIMATED DAILY INTAKE : FISH / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 3
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C - Sunfish
RECEPTOR: GREEN HERON

EXPOSURE ROUTE	PARAMETER SYMBOL	PARAMETER DEFINITION	UNITS	RME VALUE	RME RATIONALE/ REFERENCE	INTAKE EQUATION/ MODEL NAME
INGESTION	EDI_{fish}	ESTIMATED DAILY INTAKE VIA FISH INGESTION	mg/kg-d	calculated		FISH INTAKE-INGESTION
	C_{fish}	CHEMICAL CONCENTRATION IN FISH	mg/kg	chemical-specific		
	IR_{food}	INGESTION RATE OF FOOD	kg/day	0.087	Nagy, 1987; USEPA, 2003	$EDI_{fish} = C_{fish} * IR_{food} * P_{fish} * SFF * EF * 1/BW$
	P_{fish}	PERCENT FISH IN DIET	unitless	80%	USEPA, 2003	Where C_{fish} is estimated using site-specific tissue data or estimated using the following equation:
	SFF	SITE FORAGING FREQUENCY	unitless	100%	USEPA, 2003	$C_{fish} = C_{sed} * BAF_{fish}$
	EF	EXPOSURE FREQUENCY	unitless	50%	USEPA, 1993	Bioaccumulation Factors [mg(ww tissue)/ kg(dw sediment)] provided separately.
	BW	BODY WEIGHT	kg	0.23	USEPA, 2003	

REFERENCES

Nagy, K.A., 1987. Field metabolic rate and food requirement scaling in mammals and birds; Ecol. Monogr. 57:111-128.

USEPA, 1993. Wildlife Exposure Factors Handbook; United States Environmental Protection Agency, Office of Research and Development; EPA/600/R-93/187a; December 1993; Washington, D.C.

USEPA, 2003. Multimedia, Multipathway, and Multirecepotr Risk Assessment Modeling System; Volume II: Site-based, Regional, and National Data; EPA530-D-001b.

TABLE I-72
CALCULATION OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS : FISH / GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
MEDIUM: BIOTA 3
EXPOSURE MEDIUM: FISH
EXPOSURE POINT: AREA C - Sunfish
RECEPTOR: GREEN HERON

Prepared:	**14-Jan-10**	**NR**
Checked:		

Analyte	Medium EPC	Medium EPC Units	Estimated Daily Intake[a]	Daily Intake Units	Reference Dose (NOAEL)[b]	Reference Dose (LOAEL)[b]	Reference Dose Units	Hazard Quotient (NOAEL)[c]	Hazard Quotient (LOAEL)[c]
Chromium	3.1E-01	mg/kg	4.7E-02	mg/kg-d	2.7E+00	2.7E+01	mg/kg-d	1.8E-02	1.8E-03
Copper	2.8E-01	mg/kg	4.3E-02	mg/kg-d	4.1E+00	1.2E+01	mg/kg-d	1.1E-02	3.5E-03
Mercury	1.5E-01	mg/kg	2.3E-02	mg/kg-d	8.0E-02	8.0E-01	mg/kg-d	2.9E-01	2.9E-02
Nickel	2.8E-01	mg/kg	4.3E-02	mg/kg-d	6.7E+00	6.7E+01	mg/kg-d	6.3E-03	6.3E-04
Zinc	6.6E+00	mg/kg	1.0E+00	mg/kg-d	6.6E+01	6.6E+02	mg/kg-d	1.5E-02	1.5E-03
Total PCB (Aroclor)	2.7E-02	mg/kg	4.0E-03	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	1.0E-02	8.1E-03
BHC	5.1E-03	mg/kg	7.8E-04	mg/kg-d	5.6E-01	2.3E+00	mg/kg-d	1.4E-03	3.4E-04
Total DDx	7.4E-03	mg/kg	1.1E-03	mg/kg-d	2.3E-01	2.3E+00	mg/kg-d	5.0E-03	5.0E-04
PCB_TEQ_BIRD	2.3E-05	mg/kg	3.5E-06	mg/kg-d	1.4E-05	1.4E-04	mg/kg-d	2.5E-01	2.5E-02
Aluminum	4.5E+00	mg/kg	6.9E-01	mg/kg-d	NA	NA			
Barium	9.0E-02	mg/kg	1.4E-02	mg/kg-d	Not available	Not available			
Cobalt	9.0E-02	mg/kg	1.4E-02	mg/kg-d	7.6E+00	7.6E+01	mg/kg-d	1.8E-03	1.8E-04
Manganese	2.2E+00	mg/kg	3.3E-01	mg/kg-d	1.8E+02	1.8E+03	mg/kg-d	1.8E-03	1.8E-04
Total PCB (Congener)	1.4E-02	mg/kg	2.1E-03	mg/kg-d	4.0E-01	5.0E-01	mg/kg-d	5.1E-03	4.1E-03
							HAZARD INDICES:	6.1E-01	7.4E-02

Notes:
a. Estimated Daily Intake (EDI) calculated using parameters presented in Table I-71.
b. Reference Dose Values presented in 5-7.
c. Hazard Quotients (HQs) calculated by dividing the Estimated Daily Intake dose by either the NOAEL- or LOAEL-based Reference Dose.

TABLE I-73
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING NOAEL-BASED RTVs : GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C - Sunfish
RECEPTOR: GREEN HERON
TOTAL RISK (HI): 1.9E+00

Prepared:	**14-Jan-10**	**NR**
Checked:		

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Zinc		1.0E-02	-	4.9E-01	1.5E-02	5.2E-01	***28%***
Copper		2.3E-02	-	3.6E-01	1.1E-02	3.9E-01	***21%***
Mercury		1.0E-02	-	8.6E-02	2.9E-01	3.8E-01	***20%***
Chromium		7.0E-02	-	1.8E-01	1.8E-02	2.7E-01	***14%***
PCB_TEQ_BIRD		9.4E-06	-	2.2E-05	2.5E-01	2.5E-01	***13%***
Nickel		1.2E-02	-	1.2E-02	6.3E-03	3.0E-02	2%
Total PCB (Aroclor)		7.7E-04	-	1.8E-03	1.0E-02	1.3E-02	1%
Cobalt		7.3E-03	-	3.8E-04	1.8E-03	9.5E-03	1%
Total PCB (Congener)		3.6E-04	-	8.5E-04	5.1E-03	6.3E-03	0%
Total DDx		4.1E-04	-	9.5E-04	5.0E-03	6.3E-03	0%
Manganese					1.8E-03	1.8E-03	0%
BHC					1.4E-03	1.4E-03	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**1.3E-01**	**-**	**1.1E+00**	**6.1E-01**	**1.9E+00**	
PERCENTAGE OF TOTAL RISK		**7%**		**60%**	**32%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.

TABLE I-74
SUMMARY OF EXPOSURE PATHWAY/MEDIUM-SPECIFIC HAZARD QUOTIENTS USING LOAEL-BASED RTVs : GREEN HERON

Supplemental Baseline Ecological Risk Assessment
Fletcher's Paint Superfund Site
Milford, NH

SCENARIO TIMEFRAME: CURRENT/FUTURE
EXPOSURE POINT: AREA C - Sunfish
RECEPTOR: GREEN HERON
TOTAL RISK (HI): 2.9E-01

Prepared:	**14-Jan-10**	**NR**
Checked:		

Analyte	Exposure Medium[a]					Combined HQs[b]	Percent Contribution[c]
	Surface Water	Sediment	Aquatic Plants	Aquatic Invertebrates	Fish		
Copper		7.6E-03	-	1.2E-01	3.5E-03	1.3E-01	***45%***
Zinc		1.0E-03	-	4.9E-02	1.5E-03	5.2E-02	***18%***
Mercury		1.0E-03	-	8.6E-03	2.9E-02	3.8E-02	***13%***
Chromium		7.0E-03	-	1.8E-02	1.8E-03	2.7E-02	9%
PCB_TEQ_BIRD		9.4E-07	-	2.2E-06	2.5E-02	2.5E-02	9%
Total PCB (Aroclor)		6.2E-04	-	1.5E-03	8.1E-03	1.0E-02	3%
Total PCB (Congener)		2.9E-04	-	6.8E-04	4.1E-03	5.1E-03	2%
Nickel		1.2E-03	-	1.2E-03	6.3E-04	3.0E-03	1%
Cobalt		7.3E-04	-	3.8E-05	1.8E-04	9.5E-04	0%
Total DDx		4.1E-05	-	9.5E-05	5.0E-04	6.3E-04	0%
BHC					3.4E-04	3.4E-04	0%
Manganese					1.8E-04	1.8E-04	0%
Aluminum							
Barium							
TOTAL MEDIUM-SPECIFIC RISK	**-**	**2.0E-02**	**-**	**2.0E-01**	**7.4E-02**	**2.9E-01**	
PERCENTAGE OF TOTAL RISK		**7%**		**68%**	**25%**	**100%**	

Footnotes:
a. Hazard Quotients presented by exposure medium; a blank cell indicates that the analyte was not a COPC for that medium; a dash entry indicates that there was no assumed exposure to that medium.
b. Combined risk across all media exposures.
c. Relative contribution of COPC to total risk associated with the ingestion exposure pathway.