*FINAL*

# RECORD OF DECISION TO ADDRESS SURFACE WATER AND SEDIMENT AT OPERABLE UNIT 51 ENVIRONMENTAL RESTORATION PROGRAM SITE SS-63 LANGLEY AIR FORCE BASE, VIRGINIA

**August 2008**

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AFB | Air Force Base |
| ARAR | applicable or relevant and appropriate requirement |
| BLRA | baseline risk assessment |
| CDI | chronic daily intake |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund") |
| CFR | Code of Federal Regulations |
| COC | contaminant of concern |
| COPC | chemical of potential concern |
| COPEC | chemical of potential ecological concern |
| CSF | carcinogenic slope factor |
| CSM | conceptual site model |
| EPA | U.S. Environmental Protection Agency |
| EPC | exposure point concentration |
| ERA | Ecological Risk Assessment |
| ERP | Environmental Restoration Program |
| FDA | Food and Drug Administration |
| FS | Feasibility Study |
| HGL | HydroGeoLogic, Inc. |
| HHRA | human health risk assessment |
| HI | hazard index |
| HQ | hazard quotient |
| IRP | Installation Restoration Program |
| LOAEL | lowest observed adverse effect level |
| LTA | Lighter-than-Air |
| LTM | long-term monitoring |
| LUC | land use control |
| MCPP | 2-(2-methyl-4-chlorophenoxy)propionic acid |
| mg/kg | milligrams per kilogram |
| mg/kg-day | milligrams of chemical per kilogram of body weight per day |
| NASA | National Aeronautics and Space Administration |
| NCEA | National Center for Environmental Assessment |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |

## LIST OF ACRONYMS AND ABBREVIATIONS (continued)

| | |
|---|---|
| NOAEL | no observed adverse effect level |
| O&M | operation and maintenance |
| OU | Operable Unit |
| PA | Preliminary Assessment |
| PAH | polynuclear aromatic hydrocarbon |
| PCB | polychlorinated biphenyl |
| PCT | polychlorinated terphenyl |
| RAB | Restoration Advisory Board |
| RAO | remedial action objective |
| RBSL | risk-based screening level |
| RfD | reference dose |
| RI | remedial investigation |
| RME | reasonable maximum exposure |
| ROD | Record of Decision |
| SARA | Superfund Amendments and Reauthorization Act |
| SI | site inspection |
| SVOC | semivolatile organic compound |
| TRV | toxicity reference value |
| UTL | upper tolerance limit |
| VDEQ | Virginia Department of Environmental Quality |
| VOC | volatile organic compound |

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# AUGUST 2008

## 1.0 DECLARATION

### 1.1 SITE NAME AND LOCATION

Operable Unit 51 (OU51), Environmental Restoration Program (ERP) Site SS-63
Langley Air Force Base (AFB), Virginia
EPA ID No. VA2800005033

### 1.2 STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the Selected Remedy for addressing surface water and sediment at OU51 (ERP Site SS-63) at Langley AFB in Hampton, Virginia. The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the information contained in the Administrative Record file for the Site, and this ROD will become part of the Administrative Record.

The U.S. Air Force is the lead agency and provides funding for site clean-up activities at Langley AFB. The U.S. Air Force and U.S. Environmental Protection Agency (EPA) Region III have co-selected the remedy presented in this ROD. The Virginia Department of Environmental Quality (VDEQ) concurs with the Selected Remedy.

### 1.3 ASSESSMENT OF THE SITE

OU51 is one of the 24 ERP OUs identified under CERCLA at Langley AFB. ERP Site SS-63 encompasses surface water and sediment in the Back River system along the shoreline of Langley AFB. The Back River is a tidal estuary that discharges into the Chesapeake Bay. Previous investigations identified two areas of ERP Site SS-63 that showed elevated concentrations of chemicals in sediment. These investigations did not identify chemical constituents in surface water at concentrations that pose a threat to human health or the environment. The first area (approximately 2-acres) identified was the Lighter-than-Air (LTA) Cove, located along the Northwest Branch Back River. The Site is adjacent to the former trap and skeet ranges at OU34 (ERP Site LF-17), which has resulted in lead pellet deposition and contaminant impacts similar to those observed at ERP Site LF-17. Langley AFB determined that lead-contaminated sediment within the LTA Cove area would likely require the same or similar treatment methods as the soils characterized with lead contamination at ERP Site LF-17. Accordingly, Langley AFB, in consultation with EPA and VDEQ, decided that remedial action in the ERP Site SS-63 LTA Cove would be conducted concurrent with remediation at ERP Site LF-17. Based on this administrative decision, the LTA Cove portion of ERP Site SS-63 is addressed in the ROD for OU34 (ERP Site LF-17) (HydroGeoLogic, Inc. [HGL], 2007a).

The second area requiring remediation is located along the Langley AFB shoreline of the Southwest Branch of the Back River. This area contains elevated concentrations of polychlorinated biphenyls (PCBs) and polychlorinated terphenyls (PCTs) that pose a potential threat to human health and the environment. The response action presented in this ROD for the Back River along the Langley AFB shoreline is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

## 1.4 DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy for ERP Site SS-63, excluding the LTA Cove portion, addresses the medium of concern (sediment in the Southwest Branch) and comprises the final remedial action for this Site. The major components of the Selected Remedy include the following:

- Construction of temporary dams to isolate and dewater the contaminated areas.
- Dry excavation of sediment using conventional earthmoving equipment (e.g., backhoe) and transfer to an on-shore staging area.
- Containment and treatment of decant water from the sediment on shore.
- Off-site disposal of contaminated sediment.

The active remedy (dry excavation with off-site disposal) was selected to address human health risks associated with the indirect exposure of potential receptors to the site-related contaminants of concern (COCs) in sediment at the Southwest Branch portion of ERP Site SS-63. Once the remedial action is complete, all site-related COCs in sediment would be removed to a concentration that would allow for unlimited use and unrestricted exposure at the Site under this CERCLA action. The use of the term unlimited use and unrestricted exposure in this ROD does not supersede the existing Virginia Department of Health condemnations or advisories pertaining to shellfishing, fishing, or recreation in the Back River and several of its tributaries including the Northwest Branch and Southwest Branch.

## 1.5 STATUTORY DETERMINATIONS

The Selected Remedy for ERP Site SS-63 is protective of human health and the environment and complies with federal and state regulations that are applicable or relevant and appropriate to the remedial action, are cost-effective, and utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable. In addition, the Selected Remedy attains the mandates of CERCLA Section 121, and to the extent practicable, the regulatory requirements of the NCP. The remedy for this OU does not satisfy the CERCLA statutory preference for treatment as a principal element for the remedy (40 Code of Federal Regulations [CFR] 300.430(a)(1)(iii)(A)). However, this element is not required because there are no principal threat wastes located at the site. Because the Selected Remedy will not result in site-related pollutants or contaminants remaining on-site above levels that would pose unacceptable risk to human health or the environment, a 5-year review will not be required for this remedial action.

## 1.6 DATA CERTIFICATION CHECKLIST

The following information is included in the ROD. Additional information can be found in the Administrative Record file for Langley AFB.

- Chemicals of potential concern (COPCs) and chemicals of potential ecological concern (COPECs) and their respective concentrations (Section 2.7 and associated tables).
- Baseline risk represented by the COPCs and COPECs (Section 2.7).
- Current and reasonably anticipated future land and resource use (Section 2.6).
- Potential land use that will be available at the Site as a result of the Selected Remedy (Section 2.12.1.4).
- Estimated capital costs, annual maintenance and performance costs, and total present worth costs; discount rate; and the number of years over which the remedy cost estimates are projected (Section 2.12.1.3; Table 2.19).
- Key factors that led to selecting the remedy and how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria (Section 2.12.1.1).
- Sediment cleanup goals established for COCs and the basis for those goals (Section 2.8).

## 1.7 AUTHORIZING SIGNATURES

18 AUG 08

TIMOTHY A. BYERS — Date
Brigadier General, USAF
Director of Installations and Mission Support (A7)

9/3/08

JAMES J. BURKE, Director — Date
Hazardous Site Cleanup Division
EPA Region III

# 2.0 DECISION SUMMARY

## 2.1 SITE NAME, LOCATION, AND DESCRIPTION

Langley AFB is located near Hampton, Virginia, between the Northwest Branch and the Southwest Branch of the Back River, a tidal estuary of the Chesapeake Bay. The location of Langley AFB is shown on Figure 2.1. The site layout of ERP Site SS-63, which includes portions of the Back River and its tributaries, is shown on Figure 2.2. Langley AFB was listed jointly on the Superfund National Priorities List with the National Aeronautics and Space Administration (NASA) Langley Research Center in 1994 (EPA ID: VA2800005033). However, the CERCLA investigations for these two facilities are conducted separately. Langley AFB investigations and site cleanups are funded by the U.S. Air Force while the NASA Langley Research Center investigations and site cleanups are funded by NASA. The U.S. Air Force is the lead agency and provides funding for site clean-up activities at Langley AFB. The U.S. Air Force and U.S. EPA Region III have co-selected the remedy presented in this ROD. The VDEQ concurs with the Selected Remedy.

ERP Site SS-63 is composed of areas in the Back River system along the shoreline of Langley AFB. The Back River is a tidal estuary that discharges into the Chesapeake Bay, as shown in Figure 2.2. The peninsula containing Langley AFB divides the main channel of the river into the Northwest Branch and the Southwest Branch. Brick Kiln Creek and Tabbs Creek are the primary tributaries to the Northwest Branch. Newmarket Creek and Tides Mill Creek are the main tributaries to the Southwest Branch. Large areas along the shoreline of the Back River and its tributaries consist of wetlands, including the Plum Tree Island National Wildlife Refuge, which is located along the north bank of the main channel near the mouth of the river. Beds of submerged aquatic vegetation are present near the shores of the main channel. These areas of wetland and submerged aquatic vegetation provide important nursery and feeding habitat for a variety of species of fish and shellfish.

## 2.2 SUMMARY OF STUDIES AND INVESTIGATIONS

The following subsections provide summaries of the investigations that have been conducted to address surface water and sediment at ERP Site SS-63. There have been no CERCLA enforcement activities at Langley AFB.

### 2.2.1 Non-CERCLA Investigations

This section summarizes the non-CERCLA investigations that have been conducted for ERP Site SS-63.

#### 2.2.1.1 <u>Fish and Wildlife Report Summary for Langley AFB (U.S. Fish and Wildlife Service, 1993)</u>

In 1993, a study was conducted by the U.S. Fish and Wildlife Service in response to a 1987 study that identified the presence of polynuclear aromatic hydrocarbons (PAHs) and PCTs in sediments near outfalls to the Back River. The goal of the 1993 study was to identify the area within the Back River affected by contaminants, to assess the extent of contamination in the food chain, and to determine toxicity of sediments in areas with PCT concentrations. Sediment and biota samples were collected and analyzed for PCTs, PAHs, and metals. In addition, sediment samples were used in bioassays to assess toxicity. Areas of PCT, PAH, and metals (silver, chromium, zinc, copper, mercury, nickel, and lead) contamination were identified. The highest PCT concentrations in sediment were observed in samples collected from Tabbs Creek and from the vicinity of Outfall 4 (current Outfall 7) (Figure 2.3) in the Southwest Branch of the Back River. PCTs were detected in some of the biota samples. Based on the bioassay results, the study concluded that none of the sample locations could be considered critically contaminated (i.e., survival of organisms was depressed, but reproduction was still possible).

#### 2.2.1.2 Water Quality Assessment of the Back River (CH2M Hill, 1997)

In 1997, a Draft Water Quality Assessment of the Back River was prepared in support of natural resources compliance programs at Langley AFB. This study included collection of 23 co-located surface water and sediment samples and biota samples (6 locations) throughout the estuary. Sediment, surface water, and biota samples were analyzed for semivolatile organic compounds (SVOCs), PCBs, PCTs, pesticides, and selected metals. The study concluded that PCTs and some metals were present at higher concentrations in the Northwest Branch and the Southwest Branch of the Back River as compared to the main channel.

### 2.2.2 Preliminary Assessment/Site Inspection Report (Radian, 1999)

In 1998, a Preliminary Assessment/Site Inspection (PA/SI) was conducted for the Back River to characterize better the concentrations of chemicals in river sediment and to assess the potential impact of these chemicals on ecological receptors. This study included collection and analysis of sediment samples, as well as modeling contributions from surface water discharge and groundwater discharge to contaminant loading in the Back River. The sediment data showed higher chemical concentrations in sediments of the Northwest Branch and the Southwest Branch of the Back River as compared to the main channel. The report included a screening-level ecological risk assessment (SLERA) and a qualitative human health risk assessment (HHRA). The results of these assessments indicated an additional assessment of ecological effects was warranted, and that a baseline ecological risk assessment (ERA) should be performed. The PA/SI recommended preparation of a remedial investigation/feasibility study (RI/FS) for the Back River.

### 2.2.3 Remedial Investigation Report (URS Corporation, 2003)

An RI was conducted in 2000 to further characterize potential contamination identified during previous investigations, conduct a baseline ERA and HHRA, and to evaluate potential impacts to the Back River from Langley AFB ERP sites situated along the shoreline (Figure 2.3). The RI included the following sampling: collection of 30 sediment samples for chemical analysis (metals, cyanide, pesticides, PCBs, PCTs, chlorinated herbicides, SVOCs, and volatile organic compounds [VOCs]); collection of 20 sediment samples for benthic invertebrate identification and enumeration; collection of 10 sediment samples for toxicity testing;

collection of 10 surface water samples for chemical analysis (metals, cyanide, pesticides, PCBs, PCTs, chlorinated herbicides, SVOCs, and VOCs); collection of biota (sport fish, killifish, bivalves, and crabs) samples for chemical analysis (metals, cyanide, pesticides, PCBs, PCTs, chlorinated herbicides, and SVOCs); and pathologic examination of fish from select locations.

Based on the RI data, two areas with elevated concentrations of chemicals were identified: LTA Cove and the shoreline of the Southwest Branch of the Back River. As previously mentioned, this ROD does not address sediment within the LTA Cove portion of ERP Site SS-63. The LTA Cove portion of ERP Site SS-63 is addressed in the ROD for ERP Site LF-17.

Along the Langley AFB shoreline of the Southwest Branch of the Back River, sediment samples collected from the vicinity of Outfall 4 (current Outfall 7 [Figure 2.3]) were characterized by elevated PCB/PCT concentrations. The PCBs/PCTs observed in sediment samples from the Southwest Branch of the Back River originated from a release in the 1980s at an electrical substation that was transported through the Langley AFB storm sewer system and discharged at Outfall 4 (current Outfall 7). The cause of the release was corrected by Langley AFB, and the impacted section of the storm sewer system was decontaminated in 1996.

As described in Section 2.7, the RI included a quantitative HHRA and ERA to evaluate potential threats from chemicals in the Back River sediment and surface water. For human health, there are no unacceptable risks associated with direct exposure to surface water or sediment. The only exposure pathway that posed an unacceptable risk was indirect exposure to chemicals in the sediment through consumption of fish, bivalves, and crabs (fish being the primary exposure route) that had accumulated sediment contaminants in their tissues. The contaminants that were associated with unacceptable health risks were PCBs and PCTs. The ERA concluded that chemicals in ERP Site SS-63 sediment and surface water were not adversely affecting ecological receptors. The RI recommended preparation of a FS to evaluate possible remedial alternatives to address the contaminated sediment.

### 2.2.4 2004 Back River Sediment Sampling (URS Corporation, 2004)

In July and August 2004, sediment samples were collected along the Southwest Branch to determine whether the PCB/PCT contamination detected in 2000 during the RI had migrated as a result of Hurricane Isabel (which struck Langley AFB in September 2003) and to refine the estimated cost for the potential remedial action. For this investigation, samples were collected from 118 locations in the Southwest Branch of the Back River and analyzed for PCBs and PCTs.

Generally, the 2004 samples were characterized by lower concentrations of PCBs/PCTs than observed during previous sampling efforts. Relatively high concentrations (i.e., greater than 1 milligram per kilogram [mg/kg]) of PCBs/PCTs were detected in the general vicinity of Outfall 4 (current Outfall 7) and Outfall 6. The highest concentration of total PCBs/PCTs (15.2 mg/kg) was detected adjacent to a jet fuel unloading facility north of Outfall 4 (Figure 2.3).

### 2.2.5 Feasibility Study (HydroGeoLogic, 2006)

Following completion of the RI, an FS was conducted to evaluate, screen, and develop remedial alternatives for ERP Site SS-63. During the FS, remedial objectives were identified and alternatives were developed to address risks to human health and the environment posed by the PCB/PCT contaminated sediment. The following alternatives were evaluated to address the contaminated sediment at the Southwest Branch:

- Alternative No. 1 – No action (Natural Recovery)
- Alternative No. 2 – Manage waste in place – Monitoring
- Alternative No. 3 – Mechanical dredging with off-site disposal
- Alternative No. 4 – Dry excavation with off-site disposal of impacted sediment
- Alternative No. 5 – Capping impacted sediment

A detailed and comparative analysis was performed on the remedial alternatives developed for ERP Site SS-63. Both analyses evaluated the alternatives with respect to the nine criteria outlined in Section 300.430 (e) of the NCP and CERCLA Section 121. In the detailed analysis, the acceptability and performance of each alternative against the criteria were evaluated individually (without consideration of other alternatives) so that relative strengths and weaknesses could be identified. The comparative analysis evaluated the performance of each remedial alternative relative to one another to identify its advantages and disadvantages. Alternative Nos. 1 and 2 were determined not to be protective of human health. Alternative Nos. 3, 4, and 5 were determined to be protective of human health and feasible.

### 2.2.6 Proposed Plan (HydroGeoLogic, 2007b)

Pursuant to CERCLA Section 117 (42 U.S.C. Section 9617) and the NCP at 40 CFR 300.430(f)(2), Langley AFB issued a Proposed Plan for ERP Site SS-63 in December 2007. The Proposed Plan identified the Preferred Alternative, Dry Excavation with Off-site Disposal, for addressing the PCB/PCT contaminated sediment at the Southwest Branch portion of ERP Site SS-63. The U.S. Air Force issued a public notice of availability, provided a public comment period, and held a public meeting as required by the NCP (see Section 2.3). No significant changes were made to the preferred remedial action alternative identified in the Proposed Plan as a result of the public meeting and comment period.

## 2.3 COMMUNITY PARTICIPATION

The U.S. Air Force and EPA provide information regarding the cleanup of Langley AFB to the public through the community relations program, which includes a Restoration Advisory Board (RAB), public meetings, the Administrative Record file for the Site, the information repository, and announcements published in local newspapers. The public participation activities were consistent with the requirements of CERCLA Sections 113(k)(2)(B)(i-v) and 117, 42 U.S.C. Sections 9613(k)(2)(B)(i-v) and 9617.

Langley AFB provided a public comment period from December 16, 2007 through January 15, 2008, for the Proposed Plan for ERP Site SS-63. To fulfill the public participation requirement under Section 117(a) of CERCLA, as amended by SARA, a Notice of Availability of the Proposed Plan and supporting documentation, the public comment period, and the public meeting was published in the *Daily Press* (Newport News) newspaper. The public meeting to present the Proposed Plan was held on January 8, 2008, at the Machen Elementary School, located in Hampton, Virginia.

The Proposed Plan and previous investigation reports for ERP Site SS-63 are available to the public in the Administrative Record maintained at:

Langley AFB
37 Sweeney Boulevard
Langley AFB, Virginia 23665
By Appointment
Mr. John Tice
(757) 764-1082

## 2.4 SCOPE AND ROLE OF THE RESPONSE ACTION

The U.S. Air Force has organized work to date at Langley AFB into 24 OUs. The current CERCLA status and schedule of remedial actions for each OU is detailed in the Management Action Plan, which can be found in the information repository maintained at Langley AFB.

This ROD documents the rationale for the Selected Remedy to address the contaminated sediment at Southwest Branch portion of ERP Site SS-63. The LTA Cove portion of ERP Site SS-63 is addressed in the ROD for ERP Site LF-17. Surface water at ERP Site SS-63 does not present a risk to human health and the environment; therefore, no action is required for this medium. The Selected Remedy for ERP Site SS-63 will be the final CERCLA action for sediment at the Site. The general remedial objective at ERP Site SS-63 is to prevent current and future indirect exposure to the COCs in sediment through excavation and disposal of the contaminated material. Once the remedial action is complete, all site-related COCs in sediment would be removed to levels that would no longer present an unacceptable risk to human health or the environment.

## 2.5 SITE CHARACTERISTICS

Because historical accounts indicate that potentially hazardous materials were released from the Langley AFB storm sewer system, investigations were conducted at ERP Site SS-63 to determine the nature and extent of any potential contamination. The results of these investigations are summarized in Section 2.2. For further information, all of the documents summarized in Section 2.2, and in the site characterization discussion below, can be found in the associated Information Repository and Administrative Record files at the location provided in Section 2.3.

### 2.5.1 Conceptual Site Model

The source of contamination at ERP Site SS-63 is the PCB and PCT contaminated sediment at the Southwest Branch. The conceptual site models (CSMs) for human health (Figure 2.4) and ecological receptors (Figure 2.5) show potential exposure pathways for ERP Site SS-63. The baseline risk assessment (BLRA) and ERA and the subsequent remedial action objectives (RAOs) for ERP Site SS-63 (see Section 2.8) were based on these CSMs.

### 2.5.2 Site Overview

ERP Site SS-63 is composed of areas in the Back River system along the shoreline of Langley AFB. Langley AFB is located on a peninsula between the Northwest Branch and Southwest Branch of the Back River, which is a tidal estuary of the Chesapeake Bay. Along the shoreline within Langley AFB, which borders the Southwest Branch, development generally extends to, or near to, the riverbank although a narrow buffer of grassland is present in some locations. Langley AFB operations along the Southwest Branch include airfield and support facilities, research and development facilities, testing facilities, fuel docking and storage facilities, office and storage buildings, military housing, and the Langley AFB Marina.

Surface water and sediment contamination along the Langley AFB shoreline has resulted primarily from activities that occurred on land. Contaminants may have been transported to the river by point source discharges (collection of runoff and discharge through creeks, ditches or pipelines) and non-point source discharges (runoff directly into the river from the land surface) to surface water. Numerous storm water outfalls drain the land area occupied by Langley AFB and are potential conduits for contamination to the river. Other potential sources of contamination not related to Langley AFB include the NASA Langley Research Center, several marinas located along the shores of the Back River, and other developed areas along the tributaries that drain into the watershed. An additional potential source of contamination is discharge of contaminated groundwater from Langley AFB to the river. However, surface water and groundwater modeling studies performed as part of the PA/SI have indicated that groundwater discharge is not likely to contribute significantly to contamination in the Back River, given that groundwater discharge appears to be between 41 and 7,450 times less contaminated than the surface water discharge.

### 2.5.3 Sampling Strategy

A variety of sediment and biota samples were collected and analyzed to characterize the nature and extent of contamination and potential risks to human health and the environment at ERP Site SS-63 as part of the RI conducted in 2000 (URS, 2003). The RI sample locations are shown in Figure 2.6. The sampling strategy included conducting the following tasks:

- Collection of sediment samples from 30 locations for chemical analysis (metals, cyanide, pesticides, PCBs, PCTs, chlorinated herbicides, SVOCs, and VOCs).
- Collection of sediment samples from 20 locations for identification and enumeration of benthic macroinvertebrates.

- Collection of sediment samples from 10 locations for a solid-phase sediment toxicity test using *Leptocheirus plumulosus* (benthic invertebrate) and an elutriate toxicity test using *Mysodopsis bahia* (mysid shrimp).
- Collection of surface water samples (total and dissolved) at 10 locations for chemical analysis (metals, cyanide, pesticides, PCBs, PCTs, chlorinated herbicides, SVOCs, and VOCs).
- Collection of biota samples (sport fish from 10 locations; killifish and bivalves from 12 locations; and crabs [crabmeat and soft tissue] from 6 locations) for chemical analysis (metals, cyanide, pesticides, PCBs, PCTs, chlorinated herbicides, SVOCs, and VOCs).
- Pathologic examination of fish from selected locations.

In July and August 2004, sediment samples were collected along the Southwest Branch to determine whether the PCB/PCT contamination detected in 2000 during the ERP Site SS-63 RI (URS, 2003) had migrated as a result of Hurricane Isabel (which struck Langley AFB in September 2003) and to refine the estimated cost for the potential remedial action. For this investigation, samples were collected from 118 locations in the Southwest Branch of the Back River and analyzed for PCBs and PCTs (URS, 2004). These sample locations are provided in Figures 2.7 and 2.8.

### 2.5.4 Nature of Contamination and Potential Routes of Migration

This section discusses the nature of contamination and the potential routes of migration based on the data collected during the ERP Site SS-63 RI and July/August 2004 sampling event. To focus discussion on significant analytical results, this section discusses the results for compounds present at concentrations greater than the matrix-specific background upper tolerance limits (UTLs) (Radian, 1997) and/or human health Risk-Based Screening Levels (RBSLs). This section does not discuss the nature of contamination associated with the LTA Cove portion of ERP Site SS-63 because it is addressed in the ROD for ERP Site LF-17.

#### 2.5.4.1 Sediment

Samples collected adjacent to Outfall 4 (current Outfall 7) in the Southwest Branch contained maximum concentrations for many of the organics detected during the ERP Site SS-63 RI (i.e., PAHs, PCBs/PCTs, and pesticides), which also frequently exceeded evaluation criteria. Sediment sample locations around Outfall 4 (current Outfall 7) include SD-10, SD-11, SD-12, TOX-05, TOX-06, and TOX-07. Sediment sampling results are provided in Table 2.1. The next most contaminated location for organics was along the Southwest Branch between the marina and Tide Mill Creek (samples SD-14, SD-15, SD-16, SD-17, and SD-18). Samples collected from the Northwest Branch generally had lower frequency of detection and lower concentrations of organics than samples collected from the Southwest Branch.

Sediment samples collected in July/August 2004 generally had lower concentrations of PCBs/PCTs than those detected during the RI sampling effort. Relatively high concentrations of PCBs/PCTs were again detected in the general vicinity of Outfall 4 (current Outfall 7). The highest concentration of total PCBs/PCTs (15.2 mg/kg) was detected adjacent to a jet fuel unloading facility north of Outfall 4. Samples from four locations along the Southwest Branch were also analyzed for an expanded list of 52 PCB/PCT congeners. It was noted that 9 out of 13 dioxin-like PCB congeners were detected in sediment from these locations. The sample results for total PCBs/PCTs are provided in Figures 2.7 and 2.8 and in Tables 2.2 and 2.3.

Aluminum, arsenic, chromium, and iron were the most prevalent inorganics exceeding human health criteria from sample locations along the Northwest Branch and Southwest Branch. The higher concentrations of aluminum and chromium were generally detected near Outfall 4 (current Outfall 7) at sample locations SD-10, SD-11, SD-12, TOX-05, TOX-06, and TOX-07. Arsenic concentrations were generally higher at sample locations SD-17 and TOX-09 located near Tide Mill Creek. Iron concentrations were generally higher at sample locations in the Southwest Branch than in the Northwest Branch.

#### 2.5.4.2 Benthic Macroinvertebrate Community Structure

The results of benthic invertebrate identification and enumeration are provided in Table 2.4. Information from this effort did not provide indications of stress due to chemicals in the sediment. Samples from some locations had somewhat lower richness and diversity than others, but these differences were moderate and appeared to be more closely associated with the physical characteristics of the sediment at the sample locations than with the sediment chemistry. Community structure in sediment from some of the more contaminated locations appeared to be healthy based on the community structure analysis, and there was no apparent correlation between sediment chemistry and benthic community structure. These findings were consistent with the results of similar analyses performed as part of the PA/SI for the Back River and indicate that the concentrations of chemicals in the sediment are not high enough to cause disruption of the structure of the benthic macroinvertebrate community.

#### 2.5.4.3 Sediment Toxicity Testing

Toxicity tests using sediment from the Back River and the benthic invertebrate *Leptocheirus plumulosus* did not provide any indication of sediment toxicity. Elutriate toxicity tests using *Mysodopsis bahia* (mysid shrimp) were performed using sediment from the same 10 locations. Results of the elutriate toxicity testing is provided in Table 2.5. One of the 10 samples had a survival rate that was statistically different (lower) than the rate observed in the laboratory control. This sample was not collected from a location where a release of chemicals is known to have occurred. For the endpoint of fecundity (reproductive potential), statistical analysis indicated that there were no differences between any of the Back River samples and the laboratory control. For the endpoint measuring growth, as determined by the weight of the mysid shrimp at the end of the test, statistical analysis indicated that growth of the shrimp was slightly repressed in several samples from the Southwest Branch of the Back River. The repressed growth indicated by these results did not correlate with sediment chemistry at these locations; therefore, a correlation analysis was not performed.

#### 2.5.4.4 Surface Water

Surface water sampling results are provided on Table 2.6. All surface water samples generally had low concentrations of pesticides and inorganics. The results for one or more pesticides exceeded ambient water quality criteria in several samples, including sample SW-04, which was collected near Plum Tree Island National Wildlife Refuge and used as a qualitative reference location. The widespread detection of low levels of pesticides may be due to the normal application of pesticides by base and off-base sources to control mosquitoes and other pests. Several inorganics also exceeded the screening criteria, and SW-04 had the most frequent detection of inorganics that exceeded these criteria.

#### 2.5.4.5 Sport Fish

Ten sport fish samples (i.e., croaker and spot) were collected from various locations in the Northwest Branch and Southwest Branch of the Back River. Results of analysis of these samples are provided in Table 2.7. All the samples contained pesticides and PCBs; PCTs were detected in one sample from the Northwest Branch and in five samples from the Southwest Branch. Sample BIO-05, located between ERP Site WP-02 and Outfall 4 (current Outfall 7), had the highest concentrations of PCBs and PCTs for all sport fish samples. Sample BIO-06, located near Outfall 4 (current Outfall 7), had the second highest PCB/PCT concentration. Arsenic was detected in all samples except for BIO-03, which was the reference location. While chemicals detected in some samples exceeded EPA Region 3 RBSLs (appropriate screening levels for this investigation), Food and Drug Administration (FDA) action levels were not exceeded in any sample.

Bioaccumulation of pesticides, PCBs, and PCTs is occurring in the sport fish. Because sport fish have a large territorial range extending well beyond the Back River, it is difficult to determine how much of the contamination is being contributed from sources other than the Back River and Langley AFB.

#### 2.5.4.6 Crab Sampling

Results of analysis of crab meat and tissue are provided in Table 2.8. The most prevalent elevated chemical concentrations in crabs were from pesticides, PCBs, and arsenic. PCBs were detected in only three samples, which were meat only, while pesticides and arsenic were detected in all meat and total tissue samples. PCTs were not detected in any of the samples. As with the fish samples, the crab samples indicate bioaccumulation of pesticides and PCBs based on higher levels detected in tissue compared to the levels in sediment and surface water samples. However, it is difficult to determine the level of contamination in crabs contributed by sources in the Back River because crabs can have a territorial range extending beyond the Back River estuary.

#### 2.5.4.7 Small Fish

*Fundulus* (i.e., killifish) were sampled due to their limited territory, and the results would reflect possible contamination from nearby sources. Analytical results for the killifish samples are provided in Table 2.9. Based on analytical results, PCBs, pesticides, and several inorganics are bioaccumulating within the fish tissue. Analytical results show PCB levels in the fish exceeding EPA Region 3 Fish RBSLs in all samples. The highest concentration of PCBs was detected in sample BIO-9, located near Site LF-05. The second highest PCB concentration was detected in sample BIO-6, which is located near Outfall 4 (current Outfall 7). The pesticides 4,4′-DDD and 4,4′-DDE were detected in all samples at levels exceeding fish RBSLs except for sample location BIO-03, which is the reference location. Several other organics exceeded fish RBSLs in the samples as well. For inorganics, arsenic was detected in all samples with maximum concentration at BIO-03, the reference location. None of the detected concentrations exceeded the FDA action levels for any chemical.

When chemical concentrations in the fish tissue are compared with sediment and surface water samples from their respective locations, the concentrations of pesticides and PCBs are higher in the fish tissue in most cases. Arsenic levels in fish are near that of sediment and higher than surface water levels.

#### 2.5.4.8 Bivalve

Samples from sessile (immobile) organisms, such as oysters and mussels, can reflect contamination levels that may be attributable to nearby sources. Results of analysis of bivalve samples are provided in Table 2.10. The bivalve samples collected from the Back River generally showed elevated levels of bioaccumulative chemicals, which include pesticides, PCBs, and arsenic. PCTs were detected at six locations in both branches of the river at approximately similar concentrations; the highest concentration was at BIO-06 near Outfall 4 (current Outfall 7). PAHs were detected at elevated levels from sample location BIO-04, which is located near a fuel dock that may be contributing to the elevated levels of PAHs.

## 2.6 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Land use in the Back River watershed (which includes ERP Site SS-63) is primarily a mixture of open space, woodlands, and residential and commercial development. The northern portion of the watershed, which drains into the Northwest Branch, is primarily woodlands, open space and residential. The southern portion of the watershed, which drains to the Southwest Branch, is developed with mostly residential and commercial land use. Portions of Langley AFB are highly developed and support industrial operations. Other portions of the drainage area are intensively developed for residential use. The Back River itself is routinely used for recreational fishing and recreational boating. A less frequent use is training by the Langley AFB Sea Rescue Team. The U.S. Air Force has no plan to change its use of the existing resource in the foreseeable future.

## 2.7 SITE RISKS

A HHRA and ERA were completed to identify and characterize the current and potential future risks associated with ERP Site SS-63 if no remediation is implemented. The risk assessments provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action.

A detailed discussion of potential risks is provided in the ERP Site SS-63 RI Report (URS, 2003). The RI included both an HHRA and an ERA. The HHRA identified the other worker (Sea Rescue Team trainer), other recreation person (jet ski user), child fisher, and adult fisher as individuals who may be exposed to chemicals in Back River surface water or sediment. A child or adult fisher may be exposed to chemicals in the surface water while catching sport fish, crabs, or bivalves from the Back River. The sport fish, crabs, or bivalves may accumulate in their tissues chemicals present in the surface water or sediment. By eating these tissues, the adult fisher and child fisher may be exposed to the chemicals. The other worker and other recreation person may be exposed to chemicals in the surface water through incidental ingestion of and dermal contact with the water. For all potential human receptors, no complete pathway for direct exposure to sediment was identified.

Exposure scenarios evaluated in the ERA focused on aquatic pathways. Site SS-63 consists of portions of the Northwest Branch and Southwest Branch of the Back River. The shoreline of these water bodies along Langley AFB is generally developed with heaviest shoreline development occurring along the Southwest Branch. Substrate characteristics vary by location, but the substrate tends to be predominantly composed of fine-grained material. Sediment migration patterns are complex and are driven by tidal fluctuations and large storm events which cause significant erosion along the shoreline. Large pieces of concrete rubble have been placed along many portions of the shoreline to prevent erosion during these storm events. The presence of this debris decreases the quality of the aquatic habitat along the shoreline in these areas. Aquatic receptors considered in the ERA include benthic invertebrates, fish (Atlantic croakers), fish-eating birds (belted kingfisher), and carnivorous mammals (mink). These receptors could be exposed to chemicals in the near-shore sediment through direct contact with, or incidental ingestion of, sediment or ingestion of organisms that have accumulated chemicals in their tissue.

If no further action is taken, there are potential unacceptable human health risks associated with the indirect exposure to chemicals in the sediment through consumption of fish, bivalves, and crabs (fish being the primary exposure route) that have accumulated sediment contaminants in their tissues. There are no unacceptable human health risks associated with direct exposure to surface water or sediment. In addition, the ERA concluded that chemicals in ERP Site SS-63 sediment and surface water were not adversely affecting ecological receptors.

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

### 2.7.1 Human Health Risk Summary

#### 2.7.1.1 <u>Chemicals of Potential Concern</u>

The initial screening of the data resulted in identification of a number COPCs for surface water, fish tissue, crab tissue, and bivalve tissue. The COPCs and their associated exposure point concentrations (EPCs) used to estimate the risk are provided in Appendix A.2 and A.3, respectively. Surface water and tissue COPCs included metals, PAHs, pesticides, PCBs and PCTs. Detailed information for the selection of COPCs at ERP Site SS-63 is provided in Section 6.0 of the RI and Section 4.1 of the Bivalve HHRA Addendum in Appendix L of the RI (URS, 2003).

#### 2.7.1.2 Exposure Assessment

The human health exposure assessment identifies and evaluates the contaminant sources, release mechanisms, exposure pathways, exposure routes, and receptors. The elements of the exposure assessment for ERP Site SS-63 are identified in the CSM (Figure 2.4). A detailed discussion of the exposure assessment for all the scenarios considered in the HHRA is provided in Section 6.2 of the RI Report and Section 4.2 of the Bivalve HHRA Addendum in Appendix L of the RI (URS, 2003). Estimates of risk were developed for ERP Site SS-63, evaluating exposure to surface water and animal tissue for the adult fisher, child fisher, other worker, and other recreational person:

- **Fisher** – Child and adult fishers could be exposed to chemicals in surface water while landing fish and crabs. These receptors would also be consumers of fish, crabs, and bivalves from the Back River who may be affected by chemicals present in the animal tissue originating from surface water or sediment.
- **Other Worker** – Sea team rescue trainer (chronic exposure to adult only). This individual is an adult who trains members of the sea rescue team, which practices maneuvers in the Back River. This receptor would be exposed directly to chemicals in the surface water.
- **Other Recreational Person –** Jet ski user (chronic exposure to adolescents [teens] only). This person would ride a jet ski in the Back River and be exposed to surface water. The other recreational person would most likely use the river only during the summer months.

#### 2.7.1.3 Toxicity Assessment

The toxicity assessment provides a numerical estimate of the relationship between the extent of exposure and possible severity of adverse effects, and consists of two steps: hazard identification and dose-response assessment. Most toxicity data used in the HHRA are the EPA toxicity values (noncarcinogenic reference doses [RfDs] and carcinogenic slope factors [CSFs]) published in the Integrated Risk Information System and the Health Effects Assessment Summary Tables databases, or from the EPA's Superfund Technical Support Center of the National Center for Environmental Assessment (NCEA). Toxicity data used in risk evaluations are provided in Appendix A.5 (non-cancer) and Appendix A.6 (cancer). A detailed discussion of the toxicity assessment is provided in Section 6.3 and in Appendix G of the RI Report and in Section 4.3 of the Bivalve HHRA Addendum in Appendix L of the RI (URS, 2003).

#### 2.7.1.4 Risk Characterization

For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime cancer risk is calculated using the following equation:

$$\text{Risk} = \text{CDI} \times \text{CSF}$$

where:

Risk = a unitless probability (e.g., $2 \times 10^{-6}$) of an individual's developing cancer

CDI = chronic daily intake averaged over 70 years (milligrams per kilogram of body weight per day [mg/kg-day])

CSF = carcinogenic slope factor, expressed as $(\text{mg/kg-day})^{-1}$

These risks are probabilities that usually are expressed in scientific notation (e.g., $1 \times 10^{-6}$). An excess lifetime cancer risk of $1 \times 10^{-6}$ indicates that an individual experiencing the reasonable maximum exposure (RME) estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. EPA's generally acceptable risk range for site-related exposures is $1 \times 10^{-6}$ to $1 \times 10^{-4}$.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (i.e., lifetime) with an RfD derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An $HQ < 1$ indicates that a receptor's dose of a single contaminant does not exceed the threshold dose, and that toxic non-carcinogenic effects from that chemical are unlikely. The hazard index (HI) is generated by adding the HQs for all COPCs that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An $HI < 1$ indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An $HI > 1$ indicates that site-related exposures may present a risk to human health. The HQ is calculated as follows:

$$\text{Non-cancer HQ} = \text{CDI/RfD}$$

Detailed risk characterization results are provided in Section 6.4 and in Appendix G of the RI Report and in Section 4.4 of the Bivalve HHRA Addendum in Appendix L of the RI (URS, 2003). Risk characterization summaries for total and site-related human health risks are presented in Tables 2.11 through 2.16 and discussed below:

- **Other Worker** – The RME cancer risk estimate for exposure (ingestion) to surface water was $2 \times 10^{-7}$ (for both total and site-related risk), which is less than the lower end of the target risk range ($1 \times 10^{-6}$ to $1 \times 10^{-4}$). The total non-cancer HI was 0.002 (for both total and site-related risk), which is less than the acceptable level of 1.

- **Other Recreational Person –** The RME cancer risk estimate for exposure (ingestion) to surface water as $2 \times 10^{-7}$ (for both total and site-related risk), which is less than the lower end of the target risk range ($1x10^{-6}$ to $1x10^{-4}$). The total non-cancer HI was 0.008 (for both total and site-related risk), which is less than the acceptable level of 1.
- **Adult Fisher** – RME risk estimates for exposure (dermal contact and ingestion) to surface water and animal tissue (fish and crabs) resulted in cancer risk estimates of $1 \times 10^{-8}$ and $8 \times 10^{-4}$, respectively. The RME risk estimate for exposure (ingestion) to bivalve tissue resulted in a cancer risk estimate of $3 \times 10^{-4}$. The risks associated with the ingestion pathway exceeded the acceptable risk levels. The total HIs for consumption of fish/crab tissue and exposure to surface water were 5 and 0.0001, respectively. The total HI for the consumption of bivalves was 2. The HIs for consumption exceed the acceptable level of 1. Based on site-related chemicals (i.e., not including background contributions), the adult fisher cancer risk ($2 \times 10^{-4}$) and non-cancer HI (2) exceeded target levels for consumption of fish and crabs. For consumption of bivalves, the adult fisher cancer risk ($6 \times 10^{-5}$) and non-cancer HI (1) did not exceed target levels. On a target organ basis, the HIs for the immune system, eyes, and nails exceeded 1. The risks and hazards were due almost entirely to PCBs and PCTs. The primary exposure route was consumption of fish tissue.
- **Child Fisher** – RME risk estimates for exposure (dermal contact and ingestion) to surface water and animal tissue (fish and crabs) resulted in cancer risk estimates of $4 \times 10^{-9}$ and $2 \times 10^{-4}$, respectively. The RME risk estimate for exposure (ingestion) to bivalve tissue resulted in a cancer risk estimate of $7 \times 10^{-5}$. The risks associated with the ingestion pathway (fish and crabs) exceeded the acceptable risk levels. The total HI for consumption of fish/crab tissue and exposure to surface water was 6 and 0.0002, respectively. The total HI for the consumption of bivalves was 3. The HIs for consumption exceed the acceptable level of 1. Based on site-related chemicals (i.e., not including background contributions), the child fisher cancer risk ($5 \times 10^{-5}$) was within the target risk range ($10^{-6}$ to $10^{-4}$), but the non-cancer HI (3) exceeded target levels for consumption of fish and crabs. For consumption of bivalves, the child fisher cancer risk ($2 \times 10^{-5}$) and non-cancer HI (1) did not exceed target levels. On a target organ basis, the HIs for the immune system, eyes, and nails exceeded 1. The hazards were due almost entirely to PCBs. The primary exposure route was consumption of fish tissue.

The risk estimates summarized above are also presented in tabular form in Appendices A.7 through A.10.

In summary, direct exposure to chemicals in the surface water resulted in acceptable risks. The only exposure pathway that resulted in unacceptable risk was indirect exposure to chemicals in sediment via accumulation in fish, bivalve, and crab tissue (fish being the primary exposure route) and subsequent consumption by humans.

#### 2.7.1.5 Uncertainty

The risk measures used in risk assessments are not fully probabilistic estimates of risk, but are conditional estimates given that a set of assumptions about exposure and toxicity are realized. Thus, it is important to specify the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective. A detailed discussion of the uncertainties associated with the risk assessment is included in Section 6.5 of the RI Report and Section 4.6 of the Bivalve HHRA Addendum in Appendix L of the RI (URS, 2003).

### 2.7.2 Ecological Risk Summary

#### 2.7.2.1 Chemicals of Potential Ecological Concern

To determine the COPEC for ERP Site SS-63, an ERA was performed using sediment data from both the PA/SI (Radian, 1999) and the RI (URS, 2003) as well as surface water and biota data obtained during the RI. Conservative input values were used during the ERA to calculate HQ values for detected chemicals for each of the receptors considered. The HQs were developed for ecological receptors by dividing maximum and average exposure levels by the No Observed Adverse Effects Levels (NOAELs) and the Lowest Observed Adverse Effects Levels (LOAELs). If the average concentration of a given chemical resulted in a LOAEL HQ greater than 1, then the chemical was identified as a COPEC and evaluated in greater detail. Otherwise, it was determined that the chemical did not pose a threat. The resulting COPECs that were retained for further evaluation are presented in Appendix A.11.

#### 2.7.2.2 Exposure and Ecological Effects Assessment

ERP Site SS-63 consists of areas of sediment along the shoreline of Langley AFB. The Back River supports a wide variety of aquatic organisms and provides important breeding and nursing habitat for many species. The assessment endpoints for SS-63 were chosen based on available habitat and include aquatic benthic invertebrates, estuarine fish, piscivorous birds, and carnivorous mammals. These ecological receptors would have a high level of exposure to sediment. Benthic invertebrates receive continual exposure to sediment, while other ecological receptors are exposed directly to sediment through incidental ingestion or are indirectly exposed through ingestion of prey that may have accumulated chemicals in their tissue through exposure to sediment. Table 2.17 presents the ecological exposure pathways of concern for ERP Site SS-63, including receptors, exposure routes, and assessment and measurement endpoints.

The ecological exposure assessment evaluated the potential exposure pathways associated with the Site and developed the following list of potential receptors: benthic invertebrates (bivalves), Atlantic croaker (fish), belted kingfisher (bird), and mink.

### 2.7.2.3 Ecological Risk Characterization

To characterize potential ecological risks, HQs were determined for the COPECs and receptors. HQs were calculated by comparing maximum and mean site concentrations to the associated NOAEL and LOAEL:

NOAEL/LOAEL HQ = (Mean or Maximum Total Daily Dose)/(NOAEL or LOAEL)

For each receptor, the ERA calculated a maximum NOAEL HQ, a mean NOAEL HQ, a maximum LOAEL HQ, and a mean LOAEL HQ for each COPEC. If one of these four HQ values was less than 1, then the risk assessment concluded that the chemical had minimal potential to pose a risk to that particular receptor. Because LOAEL HQs are less than NOAEL HQs, the LOAEL HQs dictated whether a chemical was identified as having the potential to pose a risk to a given receptor. If a chemical was identified as posing a potential risk, then the risk assessment considered additional lines of evidence in order to characterize the potential risk.

For benthic invertebrates exposed to sediment, the mean concentrations of two SVOCs (anthracene and dibenzo[a,h]anthracene), one PCT, one PCB, and six pesticides resulted in LOAEL HQs greater than 1. These analytical results, which indicated the potential for adverse effects to benthic invertebrates, were not supported by indicators of actual stress (community structure analysis) or direct measurement of stress (toxicity testing). At 20 locations, the structure of the benthic macroinvertebrate community was assessed through identification and enumeration of benthic organisms. This analysis indicated that differences in richness and diversity among the sample locations were related to the physical characteristics of the sediment, not the sediment chemistry. Sediment toxicity testing was performed with two different organisms: an amphipod (*Leptocheirus plumulosus*) and a mysid shrimp (*Mysidopsis bahia*). There was no evidence of decreased survival due to exposure of *Leptocheirus plumulosis* to the site sediment. The mysid shrimp were tested for fecundity and growth in addition to survival. No adverse effects on fecundity were observed. While one sample did showed reduced survival, it was collected from an area of no known release. Five samples exhibited decreased mysid shrimp growth. The repressed growth indicated by these results did not correlate with sediment chemistry at these locations; therefore, a correlation analysis was not performed. Based on these additional lines of evidence, it was determined that chemicals in the sediment near Langley AFB are not adversely affecting the benthic invertebrate community in the Back River.

For Atlantic Croakers exposed to surface water and sediment, concentrations of 13 metals, 16 SVOCs, 7 pesticides, and 7 PCBs/PCTs resulted in mean LOAEL HQs greater than 1.0. As with the benthic invertebrates, the Atlantic Croaker HQs were evaluated in light of other indicators of stress to the fish community. Tissue analysis of sport fish and small fish indicated that SVOCs were not accumulating in fish tissue. Samples of large fish from two locations characterized by high chemical concentrations in sediment and from one reference location (i.e., not contaminated), were examined for signs of stress. During examination, specific attention was given to the tissues and organs typically affected by the chemicals detected in the tissue of the fish samples. Results of these examinations indicated that the fish appeared to be healthy and did not exhibit any signs of stress or abnormalities. These additional lines of evidence indicate that fish are not adversely affected by chemicals in the site sediment or surface water.

For fish-eating birds (belted kingfisher), the mean concentrations of phenol and 2-(2-methyl-4-chlorophenoxy) propionic acid (MCPP) detected in fish tissue resulted in LOAEL HQs greater than 1. MCPP, which had the highest HQ value at 131, was detected in only one of the three dietary components (killifish) for the kingfisher. In addition, MCPP was detected in only one of the 12 samples of killifish tissue analyzed.

For semi-aquatic carnivorous mammals (mink), only dibenzofuran had a mean LOAEL HQ greater than 1. Dibenzofuran was detected in only one of 41 sediment samples.

These low frequencies of detection indicate that the HQs for MCPP and dibenzofuran may be overstating the actual risk to ecological receptors. In addition, calculation of the HQ values assumes that the kingfisher and the mink forage exclusively along the shoreline of Langley AFB. In reality, the actual foraging area may include areas that are not associated with Langley AFB or ERP Site SS-63. Based on these factors, it was determined that there was minimal potential for adverse effects to fish-eating birds and semi-aquatic carnivorous mammals exposed to surface water and sediment.

Additional ecological risk analysis was performed as part of the FS. To assess the potential for adverse effects to small fish (e.g., killifish, mummichogs), fish tissue concentrations of PCBs and PCTs were compared to a toxicity reference value (TRV) developed from data provided by EPA Region 3 Biological Technical Advisory Group. PCTs were not detected in the small fish tissue samples collected during the RI, and the maximum PCB concentration was less than the TRV. Based on this analysis, it was concluded that current concentrations of PCBs and PCTs in the Back River sediments do not pose an unacceptable threat to small fish.

#### 2.7.2.4 Uncertainty

The results of the ERA are influenced to some degree by variability and uncertainty, which need to be considered when interpreting results. Major sources of uncertainty include natural variability, and incomplete knowledge of site-specific biological processes and fate and transport mechanisms. A detailed discussion of the uncertainties associated with the ERA is included in Section 7.5 of the RI Report (URS, 2003).

## 2.8 REMEDIAL ACTION OBJECTIVES

It is the current judgment of the U.S. Air Force and EPA Region III, in consultation with VDEQ, that the Selected Remedy is warranted to protect public health, welfare, and the environment from actual or threatened releases of hazardous substances in sediment at ERP Site SS-63. Based on the anticipated future use for the area and the findings as documented in the RI and FS Reports, including the results of the HHRA and ERA, site-specific RAOs were developed to address the sediment contamination at ERP Site SS-63.

Based on the HHRA and ERA, there are no unacceptable risks associated with direct exposure to surface water or sediment. The only exposure pathway that posed an unacceptable risk was indirect exposure to chemicals in the sediment through consumption of fish, bivalves, and crabs (fish being the primary exposure route) that had accumulated sediment contaminants in their tissues. The way to decrease PCB and PCT concentrations in tissue is to decrease their concentrations in the sediment. Accordingly, RAOs were developed to reduce the levels of PCBs and PCTs observed in site sediment to levels that minimize bioaccumulation of those contaminants by fish, bivalves, and crabs, the consumption of which pose unacceptable risks to human health.

The ERP Site SS-63 RAOs include the following:

- Eliminate indirect exposure to sediment containing PCBs/PCTs at concentrations that pose an incremental cancer risk greater than $1x10^{-4}$.
- Eliminate indirect exposure to sediment containing PCBs/PCTs at concentrations that pose a target organ HI greater than 1.

To achieve the above RAOs, specific remedial goals were developed for PCBs and PCTs in sediment that would be protective of individuals consuming fish, bivalves, and crabs (fish being the primary exposure route) caught at the Site. Section 3.0 of the FS details how remedial goals were calculated. The sediment concentrations determined to be protective of the range of adult/child fisher exposure scenarios are summarized below.

- Recreational Freshwater Angler (fish consumption is 1/2 of total seafood ingested) = 1.7 mg/kg total PCBs/PCTs
- Recreational Freshwater Angler (fish consumption is 1/3 of total seafood ingested) = 2.8 mg/kg total PCBs/PCTs
- Recreational Marine Angler (fish consumption is 1/2 of total seafood ingested) = 2.6 mg/kg total PCBs/PCTs
- Recreational Marine Angler (fish consumption is 1/3 of total seafood ingested) = 4.0 mg/kg total PCBs/PCTs

The remedial goal selected was 1.7 mg/kg total PCBs/PCTs in sediment, the concentration protective of the most conservative exposure scenario.

## 2.9 DESCRIPTION OF ALTERNATIVES

### 2.9.1 Remedial Alternatives

Remedial alternatives to address sediment at ERP Site SS-63 are detailed in the FS. The alternatives evaluated are:

- Alternative No. 1 – No Action (Natural Recovery)
- Alternative No. 2 – Manage Waste in Place - Monitoring
- Alternative No. 3 – Mechanical Dredging with Off-Site Disposal
- Alternative No. 4 – Dry Excavation with Off-Site Disposal
- Alternative No. 5 – Capping

#### 2.9.1.1 Alternative No. 1 – No Action (Natural Recovery)

The No Action alternative is included in accordance with the NCP to serve as a baseline for comparison with other alternatives. Under the No Action alternative, ERP Site SS-63 would be left as is. There is no cost for this alternative, and the timeframe is unlimited.

#### 2.9.1.2 Alternative No. 2 - Manage Waste in Place - Monitoring

This is a risk management alternative that involves leaving the contaminated sediment in place and collecting additional information over time to evaluate whether natural processes may contain, destroy, or otherwise reduce bioavailability of the contaminants. For example, natural deposition of sediment may result in development of a "cap" over areas of elevated PCB/PCT concentrations, decreasing the levels to which aquatic organisms are exposed, and thus decreasing potential bioaccumulation.

A long-term monitoring (LTM) program would be included as part of this alternative, which addresses PCB/PCT concentrations in sediment and biota in portions of the Southwest Branch. Monitoring would include annual sampling of sediment, shellfish, and killifish for PCBs/PCTs. After 5 years of monitoring, an evaluation would be made regarding whether additional monitoring needs to be performed or if the monitoring program can be terminated (i.e., PCB/PCT concentrations in sediment below the remediation goal).

For this alternative, the estimated present worth cost is $353,000. It would take an estimated 3 months to implement this alternative.

#### 2.9.1.3 Alternative No. 3 - Mechanical Dredging with Off-Site Disposal

This alternative involves mechanical dredging and off-site disposal of sediment from portions of the Southwest Branch characterized by total PCB/PCT sediment concentrations above the remedial goal. With the remedial goal of 1.7 mg/kg total PCBs/PCTs and an assumed dredging depth of 1 foot, it is estimated that this alternative will remove 1,693 cubic yards of sediment from the Southwest Branch of the Back River. The proposed remediation areas are shown in Figure 2.9.

The mechanical dredging would be accomplished using an environmental clamshell dry dredge. This dredging technology is desirable because it does not require large volumes of water to transport sediment from the river bottom to the land. In addition, it has been shown to have high contaminant removal efficiencies, low sediment resuspension, and low overall cost when compared to other dredging techniques. The dry dredge uses a boom-mounted, sealed clamshell bucket to remove sediment from the river bottom. This procedure occurs at low speed, which minimizes sediment resuspension and water quality degradation. Although mechanical dredging will disrupt the benthic habitat, this technique's impact will be less severe than the habitat disruption caused by hydraulic dredging. Sediment resuspension will be contained by use of one or more silt curtains, which will be installed to isolate the work areas from the rest of the Back River during dredging activities. Although these silt curtains may not completely eliminate the release of suspended material to other parts of the river, they will significantly reduce the magnitude of such releases.

A resuspension monitoring program would be developed for dredging activities at the Site. A performance standard would be developed for local disturbance and downstream transport of PCBs/PCTs and other critical water quality parameters. Based on the characterization results, the water would be managed in accordance with the substantive requirements of the Clean Water Act and the Virginia Pollution Discharge Elimination System Permit regulation. This approach would ensure compliance with water quality standards and provide a means of notifying the public in the event of a release.

The sediment removed by the sealed clamshell would be deposited into an on-board hopper or barge for transfer to an on-shore staging area. The only water removed during the dredging process is water naturally present in the sediment's pore spaces. Water that separates from the sediment would be containerized on shore and managed in accordance with the substantive requirements of the Clean Water Act and the Virginia Pollutant Discharge Elimination System Permit regulation.

Dredged and dewatered sediment would be characterized and disposed of in accordance with the Virginia Solid Waste Management regulations. The Southwest Branch dredged areas would not be backfilled. Natural processes would in time fill in the excavation areas.

If this alternative is implemented, the primary source of PCBs/PCTs in the sediment would be removed. The dredging alternative includes construction and operational monitoring during implementation operations. Monitoring requirements would include water quality monitoring at the dredge site, monitoring of dredging residuals, monitoring of decant treatment effluent, and potential evaluation of air quality during dredging, transport and disposal. The effectiveness of containment structures used during dredge operations would be evaluated by assessing suspended solids both inside and outside of the structure.

During implementation of this alternative, there would be potential for fine particles to be suspended and released from the dredging areas; therefore, LTM of post-dredging conditions would be conducted to ensure that the areas are not re-contaminated by disturbance of any residuals that may remain above cleanup levels. Monitoring would include annual sampling of sediment, shellfish, and killifish for PCBs/PCTs. Sample locations would be strategically located to provide data that are representative of conditions within the remediation areas. After 5 years of monitoring, an evaluation would be made regarding whether additional monitoring is required or if the monitoring program can be terminated.

For this alternative, the estimated present worth cost is $952,000. Operation and maintenance (O&M) costs associated with this alternative are $206,000 and remedial action costs are $746,000. It would take an estimated 6 months to implement this alternative.

#### 2.9.1.4 Alternative No. 4 – Dry Excavation with Off-Site Disposal

This alternative involves dry excavation and disposal of sediment from portions of the Southwest Branch characterized as containing total PCB/PCT sediment concentrations above the remedial goal. With the remedial goal of 1.7 mg/kg total PCBs/PCTs, and an assumed dredging depth of 1 foot, it is estimated that this alternative would remove 1,693 cubic yards of sediment from the Southwest Branch of the Back River. The remediation areas are shown in Figure 2.9.

Dry excavation of the sediment would begin after the contaminated areas are isolated and dewatered (prior to dewatering, authorization from the VDEQ Tidewater Regional Office would be required). To accomplish this, temporary coffer dams would be constructed around the areas identified for remedial action. It is estimated that approximately 1,900 feet of dam would be required. The dams would be constructed with a minimum of 2 feet of freeboard to account for tidal fluctuations and storm events. Prior to installation of the coffer dams, pre-confirmation sediment samples would be collected and analyzed for PCBs/PCTs. These data would be used to confirm the lateral and vertical extent of the contamination above the remedial goal (1.7 mg/kg total PCBs/PCTs) and to assist in the placement of the dams.

After removal of standing water within the isolated areas, the sediment would be excavated using conventional earthmoving equipment (e.g., backhoe). The sediment would be deposited into a mobile hopper and transferred via conveyor belt to an on-shore staging area. The only water removed during the excavation process is water naturally present in the sediment's pore spaces. Water that separates from the sediment would be containerized on shore and managed in accordance with the substantive requirements of the Clean Water Act and the Virginia Pollutant Discharge Elimination System Permit regulation.

Excavated and dewatered sediment would be characterized and disposed of off-site in accordance with the Virginia Solid Waste Management regulations. The Southwest Branch dredged areas would not be backfilled. Natural processes would in time fill in the excavation areas.

If this alternative is implemented, PCBs/PCTs in Southwest Branch sediment above the remedial goal would be removed. Therefore, LTM of the post-excavation conditions would not be required because dry excavation of contaminated sediment is more complete and there are no contaminant losses through resuspension.

For this alternative, the estimated present worth capital cost is $821,000. There are no O&M costs. It would take an estimated 6 months to implement this alternative.

### 2.9.1.5 Alternative No. 5- Capping

This alternative involves installing a submerged cover system that creates a barrier to contaminant migration from the underlying sediments to the water column and to bioturbation. Capping would be performed across areas characterized by total PCB/PCT sediment concentrations greater than 1.7 mg/kg (Figure 2.9.). It is estimated that 45,700 square feet of sediment in the Southwest Branch would require capping.

Typical cap materials include soil, sand, gravel, cobbles, clay, geotextile fabrics, and combinations of these materials. Typical cap construction consists of a geotextile fabric overlying the contaminated sediment. A layer of sand, gravel, or similar material overlies the fabric. A second tier of geotextile fabric separates the sand or gravel from an overlying armor material, such as stone or cobble. The constructed thickness of a typical submerged cap is approximately two to three feet. If chosen as a final remedy, methods for cap construction and isolation of resuspended/displaced sediments would be designed and implemented consistent with current technology and standards such that secondary releases are minimized during and following construction.

Bathymetric survey maps and field observations indicate that the depth of the river bottom in near-shore portions of the Southwest Branch ranges from 0.5 feet (at the shore) to 4-5 feet (approximately 100 feet offshore). The shallow nature of the river in this area will restrict the vertical extent (i.e., thickness) of the submerged cap and would require that cap construction occur from the land. It is assumed that an installed cap must maintain some portion of the water column above it to encourage aquatic and benthic communities to reestablish themselves in the capped portion of the river. In order to facilitate this goal, the submerged cap in the Southwest Branch would consist of a geotextile fabric overlying the PCB/PCT-contaminated sediments. The geotextile fabric would be covered with 6 to 12 inches of cobble or quarried riprap stone to weigh down the fabric and armor the cap against storm events. Once in place, the geotextile portion of the cap would prevent sediment contaminated with PCBs/PCTs from reentering the water column and would prevent direct exposure of benthic organisms to the contaminated sediment. These measures would minimize the potential for accumulation of PCBs/PCTs in the tissues of bivalves, crabs, and receptors farther up the food chain (sport fish).

Land use controls (LUCs) would be implemented in the form of access restrictions to protect the cap integrity. A monitoring program would be implemented to annually inspect the submerged cap and verify its integrity. Monitoring would consist of physical inspection of the cap materials, in-place thickness, and sediment resuspension to verify that the stone armor material is remaining intact. Any detected damage would be promptly corrected to ensure continued protection. Additional LTM of cap integrity would include evaluation of recolonization, chemical and physical isolation, and possibly periodic integrity inspections following severe weather events. Cap maintenance needs would be evaluated based on periodic inspections.

In addition to the cap inspections, sediment and biota samples would be collected as part of the LTM program. Monitoring would include annual sampling of sediment, shellfish, and killifish for PCBs/PCTs. After 5 years of monitoring, an evaluation would be made regarding whether to continue or to terminate the monitoring program.

For this alternative, the estimated present worth cost is $1,183,000. O&M costs associated with this alternative are $264,000 and remedial action costs are $919,000. It would take an estimated 6 months to implement this alternative.

### 2.9.2 Common Elements and Distinguishing Features

Neither Alternative No. 1 nor Alternative No. 2 includes an engineered action to prevent exposure. However, unlike Alternative No. 1, Alternative No. 2 provides monitoring to evaluate whether conditions are changing or remaining constant. Over time, natural processes may contain, destroy, or otherwise reduce bioavailability of the contaminants.

Alternative Nos. 3 and 4 involve the physical removal and off-site disposal of the contaminated sediment. Alternative No. 4 relies on dry excavation of the sediment, while Alternative No. 3 uses dredging. During dredging, there is potential for fine particles to be suspended and released from the dredging area to the rest of the Back River. For this reason, LTM of dredged sites is required. With the dry excavation, there is no potential for the fine particles to be suspended and migrate away from the Site during remedial activities. Therefore, LTM is not required for dry excavated areas. In summary, Alternative No. 3 would require LTM, while Alternative No. 4 would not.

Alternative No. 5 is the only remedial alternative to use a cap to minimize exposure of ecological receptors to the PCB and PCT contamination. Because the integrity of the cover could degrade with time, LTM is required for this alternative.

Alternative Nos. 3, 4, and 5 have similar implementation times, estimated to be approximately 6 months.

### 2.9.3 Expected Outcomes of Each Alternative

The U.S. Air Force currently has no planned alternate use for ERP Site SS-63 regardless of whether the contaminants are contained or removed. If Alternative No. 2 was implemented, no reduction in exposure to humans would result. If Alternative Nos. 3 and 4 were implemented, exposure would be controlled through off-site disposal of impacted sediment. If Alternative No. 5 were implemented, exposure would be controlled through containment; however, LUCs (e.g., monitoring of cap) would be required in the absence of additional action.

## 2.10 COMPARATIVE ANALYSIS OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. A comparative analysis of the alternatives against the nine evaluation criteria is discussed below and presented in Table 2.18.

### 2.10.1 Threshold Criteria

#### 2.10.1.1 Overall Protection of Human Health and the Environment

Alternative No. 3 (Mechanical Dredging and Off-Site Disposal) and Alternative No. 4 (Dry Excavation with Off-Site Disposal) are the most protective of human health. Both alternatives effectively eliminate the primary source of PCBs/PCTs in the sediment in the Southwest Branch. Alternative No. 5 (Capping) protects human health by establishing a physical barrier to PCB/PCT contaminant bioaccumulation. Under Alternative No. 5, the sources of PCBs/PCTs are not removed, but are covered to minimize bioaccumulation by aquatic organisms.

Alternative No. 2 (Manage Waste in Place – Monitoring) is less protective than Alternative Nos. 3, 4, and 5 because it neither removes the source of PCBs/PCTs nor eliminates the exposure pathway. However, Alternative No. 2 manages the potential risk to human receptors from fish consumption by assessing reduction of PCB/PCT bioavailability through natural processes. Although this alternative provides no reduction of volume, mobility, or toxicity of the contaminants, it would allow an evaluation to be made of whether PCBs/PCTs are moving up the food chain to higher trophic levels.

Alternative No. 1 (No Action) is not protective of human health or the environment and does not manage the potential risk for bioaccumulation. Alternative No. 1 is not considered further.

#### 2.10.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternative Nos. 2, 3, 4, and 5 would comply with Applicable or Relevant and Appropriate Requirements (ARARs). During implementation of Alternative Nos. 3, 4, and 5, control measures would be implemented to minimize the potential for short-term water quality degradation attributable to resuspension of affected sediments. Wetland and floodplain issues would be considered and mitigated, as needed, in accordance with the conditions of the Clean Water Act 404 permit and Clean Water Act 401 certification programs. The Virginia Board of Game and Inland Fisheries and the National Fish and Wildlife Service would be consulted, as needed, to ensure that impacts to listed and protected species are minimized.

### 2.10.2 Primary Balancing Criteria

#### 2.10.2.1 Long-Term Effectiveness and Performance

Alternative Nos. 3 and 4 would effectively and permanently eliminate the potential for bioaccumulation by eliminating sediment with PCBs/PCTs above cleanup goals. Alternative No. 4 would ensure the most complete removal of contaminated sediments and no contaminant losses through re-suspension; therefore, no LTM of post-excavation conditions would be required, while Alternative No. 3 would require LTM of sediment to ensure that the area is not re-contaminated by re-suspension of any residuals that may remain above cleanup levels.

Alternative No. 5 would prevent contaminant bioaccumulation by providing a physical barrier between the contamination and the aquatic organisms. However, Alternative 5 provides less long-term effectiveness than Alternative Nos. 3 and 4 because sediment containing PCB/PCT remains in place. A physical monitoring program would need to be implemented to inspect the submerged cap and verify its integrity. Any detected damage would need to be corrected promptly to ensure continued protection.

Alternative No. 2 would not address bioaccumulation in a direct or permanent manner but would allow the extent of bioaccumulation to be monitored. Alternative No. 2 would not be as effective as Alternative Nos. 3, 4, and 5.

#### 2.10.2.2 Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative Nos. 3 and 4 provide the greatest reduction in mobility, toxicity, and volume of PCBs/PCTs in sediment at the site through removal. Alternative No. 5 would reduce the mobility of contaminated sediments in the Southwest Branch. However, this alternative would not reduce contaminant toxicity or volume and would therefore rank lower than Alternative Nos. 3 and 4 with respect to these criteria.

Alternative No. 2 would not provide any reduction in contaminant toxicity, mobility, or volume.

#### 2.10.2.3 Short-Term Effectiveness

Alternative No. 2 could be implemented immediately and would not result in any risk to the local community or the environment. A very low potential exists for exposure of workers involved in annual sediment and biota sampling events. This exposure potential is very limited and could be controlled by using approved methods for sample collection and analysis including implementation of a health and safety plan and use of appropriate personal protective equipment.

Alternative Nos. 3, 4, and 5 could be completed within a reasonable period of time. For these alternatives, any potential short-term risk to workers involved in implementation can be minimized if workers utilize appropriate personal protective equipment and adhere to health and safety protocols. There would be some degree of disruption to the local community, as transportation of materials would require additional heavy vehicle traffic, and portions of Back River would be temporarily closed to boating and fishing. The aquatic habitat in the areas being remediated would be affected during implementation; however, the effects are expected to be temporary.

#### 2.10.2.4 Implementability

Alternative No. 2 could be readily implemented because the only action required would be annual monitoring at a limited number of locations.

Alternative Nos. 3 and 4 could be implemented using readily available equipment and contractors; however, shallow water may increase the difficulty of execution of clamshell dredging in Alternative No. 3.

Alternative No. 5 could be implemented using readily available equipment and contractors; however, shallow water would restrict the vertical extent (i.e., thickness) of the submerged cap in Alternative No. 5, requiring that cap construction occur from the land. Implementation of the access restrictions associated with Alternative No. 5 may be difficult because the restricted area is not under the control of Langley AFB.

All of the active remedial alternatives would require staging of personnel and equipment in portions of Langley AFB along the Back River shoreline. The technologies to be used to perform the action are well proven and could be successfully implemented with relative ease.

#### 2.10.2.5 Cost

The estimated cost of Alternative No. 2 is $353,000. Of the remaining alternatives, which entail active remedial actions, Alternative No. 4 is the least expensive option on an estimated present-worth basis ($821,000). Alternative No. 3 is the next estimated least costly option ($952,000), and Alternative No. 5 is estimated as the most expensive option ($1,183,000) on a present-worth basis.

### 2.10.3 Modifying Criteria

#### 2.10.3.1 State Acceptance

State involvement has been solicited throughout the CERCLA process and remedy selection. The VDEQ as the designated state support agency in Virginia has reviewed this ROD and concurs with the Selected Remedy.

#### 2.10.3.2 Community Acceptance

A public meeting was held on January 8, 2008, to present the Proposed Plan for ERP Site SS-63 and answer any questions on the Proposed Plan and on the documents in the information repository. There were no questions or concerns raised at the meeting. No written comments, concerns, or questions were received by the U.S. Air Force, the EPA, or the Commonwealth of Virginia during the public comment period for the Proposed Plan from December 16, 2007 through January 15, 2008.

## 2.11 PRINCIPAL THREAT WASTES

The NCP establishes an expectation that USEPA will use treatment to address the principal threats posed by a site whenever practicable. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Historic data for Site ERP Site SS-63 indicated that the site received point and non-point source discharges from LAFB, but no principle threat wastes were identified during previous investigations. Once the remedial action is complete, all site-related COCs in sediment would be removed to a concentration that would allow for unlimited use and unrestricted exposure at the Site under this CERCLA action. The use of the term unlimited use and unrestricted exposure in this ROD does not supersede the existing Virginia Department of Health condemnations or advisories pertaining to shellfishing, fishing, or recreation in the Back River and several of its tributaries including the Northwest Branch and Southwest Branch.

## 2.12 SELECTED REMEDY

This section presents the basis for the selection of the remedy, a description of the remedy, and the expected outcome of the remedy.

### 2.12.1 Selected Remedy

The Selected Remedy for the ERP Site SS-63 LTA Cove is dry excavation with off-site disposal. This remedy was identified as Alternative No. 4 in the FS (HGL, 2006).

#### 2.12.1.1 Summary of the Rationale for the Selected Remedy

Based on the evaluation of the balancing criteria, the Selected Remedy for closure of ERP Site SS-63 is Alternative No. 4 - Dry Excavation with Off-Site Disposal. This remedy was selected over the other alternatives because it provides the best balance in order to achieve protection of human health and the environment and compliance with ARARs. The Selected Remedy provides a long-term effective and permanent solution for protection of human health and the environment at a reasonable cost. Implementation of the Selected Remedy will meet the RAOs listed in Section 2.8 of this ROD.

Based on current information, the U.S. Air Force, EPA, and VDEQ believe the Selected Remedy for ERP Site SS-63 is protective of human health and the environment, complies with ARARs, is a permanent, cost-effective remedy, and provides the best balance with respect to the nine evaluation criteria.

#### 2.12.1.2 Description of the Selected Remedy

The Selected Remedy addresses the medium of concern (sediment in the Southwest Branch) and comprises the final CERCLA remedial action for the Site. ERP Site SS-63 surface water poses no risk to human health or the environment; therefore, no action is required. The U.S. Air Force is responsible for and shall implement, operate, maintain, monitor, review, and enforce the Selected Remedy in accordance with CERCLA and the NCP to ensure protection of human health and the environment for the duration of the remedy. Once the remedial action is complete, all site-related COCs in sediment would be removed to levels that would no longer present an unacceptable risk to human health or the environment.

*2.12.1.2.1 Remedy Objectives*

The objectives of the remedy are as follows:

- Eliminate indirect exposure to sediment containing PCBs/PCTs at concentrations that pose an incremental cancer risk greater than $1x10^{-4}$.
- Eliminate indirect exposure to sediment containing PCBs/PCTs at concentrations that pose a target organ HI greater than 1.

*2.12.1.2.2 Remedy Implementation*

Dry excavation of the sediment would begin after the contaminated areas shown on Figure 2.9 are isolated and dewatered (prior to dewatering, authorization from the VDEQ Tidewater Regional Office would be required). To accomplish this, temporary dams would be constructed around the areas identified for remedial action. It is estimated that approximately 1,900 feet of dam would be required. The dams would be constructed with a minimum of 2 feet of freeboard to account for tidal fluctuations and storm events. Based on a remedial goal of 1.7 mg/kg total PCBs/PCTs, the amount of sediment that would require removal is estimated to be 1,693 cubic yards.

After removal of standing water within the isolated areas, the sediment would be excavated using conventional earthmoving equipment (e.g., backhoe). The sediment would be deposited into a mobile hopper and transferred via conveyor belt to an on-shore staging area. The only water removed during the excavation process is water naturally present in the sediment's pore spaces. Water that separates from the sediment would be managed in accordance with the substantive requirements of the Clean Water Act and the Virginia Pollutant Discharge Elimination System Permit regulation. The decant water would be containerized on shore and, at a minimum, sampled for PCBs/PCTs, dissolved oxygen, pH, temperature, and total suspended solids. Based on the characterization results, the water would be treated as necessary and discharged back into the river.

Excavated and dewatered sediment would be characterized and disposed of off-site in accordance with the Virginia Solid Waste Management regulations. The Southwest Branch dredged areas would not be backfilled. Natural processes would in time fill in the excavation areas.

No LTM would be required subsequent to the removal action. The use of dry excavation would ensure that the remediated areas would not become re-contaminated due to suspension and deposition of contaminated particles. Once removal is complete, sediments remaining at the Site would no longer be contaminated at levels that pose an unacceptable risk to human health. Because the source of risk will have been eliminated by the removal action, LUCs under this ROD would not be required, although any existing Virginia Department of Health condemnations or advisories pertaining to shellfishing, fishing, or recreation in the Back River and several of its tributaries including the Northwest Branch and Southwest Branch would remain in effect.

#### 2.12.1.3 Summary of the Estimated Selected Remedy Costs

The information in the attached cost estimates are based on the best available information regarding the anticipated scope of the Selected Remedy. Changes in the cost estimate may occur as a result of new information and data collected during development of the remedial design of the Selected Remedy. Major changes will be documented in the form of a memorandum in the Administrative Record file. This is an order of magnitude engineering cost estimate that is expected to be within +50 percent to -30 percent of the actual project costs.

The total present-worth costs are $821,000 for the Selected Remedy. The estimated costs for the Selected Remedy are detailed in Table 2.19. It would take an estimated 6 months to implement the Selected Remedy.

#### 2.12.1.4 Expected Outcomes of the Selected Remedy

The Selected Remedy will meet the RAOs and site related contamination would be reduced to levels that would no longer present an unacceptable risk to human health or the environment. Because the source of risk will have been eliminated by the removal action, LTM and LUCs would not be required, although any existing Virginia Department of Health condemnations or advisories pertaining to shellfishing, fishing, or recreation in the Back River and several of its tributaries including the Northwest Branch and Southwest Branch would remain in effect. Attainment of RAOs at ERP Site SS-63 is expected to require 6 months.

## 2.13 STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the Selected Remedy must be protective of human health and the environment, comply with ARARs, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The following discussion summarizes the statutory requirements that are met by the Selected Remedy for sediment in the ERP Site SS-63 Southwest Branch.

### 2.13.1 Protection of Human Health and the Environment

The Selected Remedy is protective of human health and the environment by preventing exposure through removal and off-site disposal of PCB/PCT contaminated sediment. The Selected Remedy does not pose unacceptable short-term risk.

### 2.13.2 Compliance with Applicable or Relevant and Appropriate Requirements and To-Be-Considered Criteria

The Selected Remedy will meet the Federal and State ARARs presented herein. There are no ARARs that the remedy will not meet. Federal and state ARARs are summarized by classification (chemical-specific, location-specific, and action-specific) in Appendix B.

### 2.13.3 Cost-Effectiveness

The Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness (40 CFR Section 300.430(f)(1)(ii)(D))." This determination was accomplished by evaluating the overall effectiveness of the alternatives that satisfied the threshold criteria. Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to represent a reasonable value for the money to be spent. The estimated present-worth cost of the Selected Remedy is $821,000. The Selected Remedy is cost-effective because it provides protection of human health and the environment in the shortest timeframe and at the lowest cost of those remedies that satisfy ARARs and RAOs.

### 2.13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The U.S. Air Force and EPA determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a practicable manner at ERP Site SS-63. VDEQ concurred with this determination. No principal threat wastes have been identified at the Site, and treatment of the contaminated sediment is not practicable in a cost-effective manner because of the large volume of waste. Since long-term effectiveness and permanence are achieved in the shortest timeframe with the Selected Remedy, the U.S. Air Force, EPA, and VDEQ determined that the Selected Remedy provides the best balance of tradeoffs in terms of the balancing criteria, while also considering the statutory preference.

### 2.13.5 Preference for Treatment as a Principle Element

The statutory preference for remedies that employ treatment as a principal element will not be satisfied at ERP Site SS-63. However, no principal threat wastes have been identified at ERP Site SS-63; therefore, the requirement for treatment as a principal element of the remedy is not applicable.

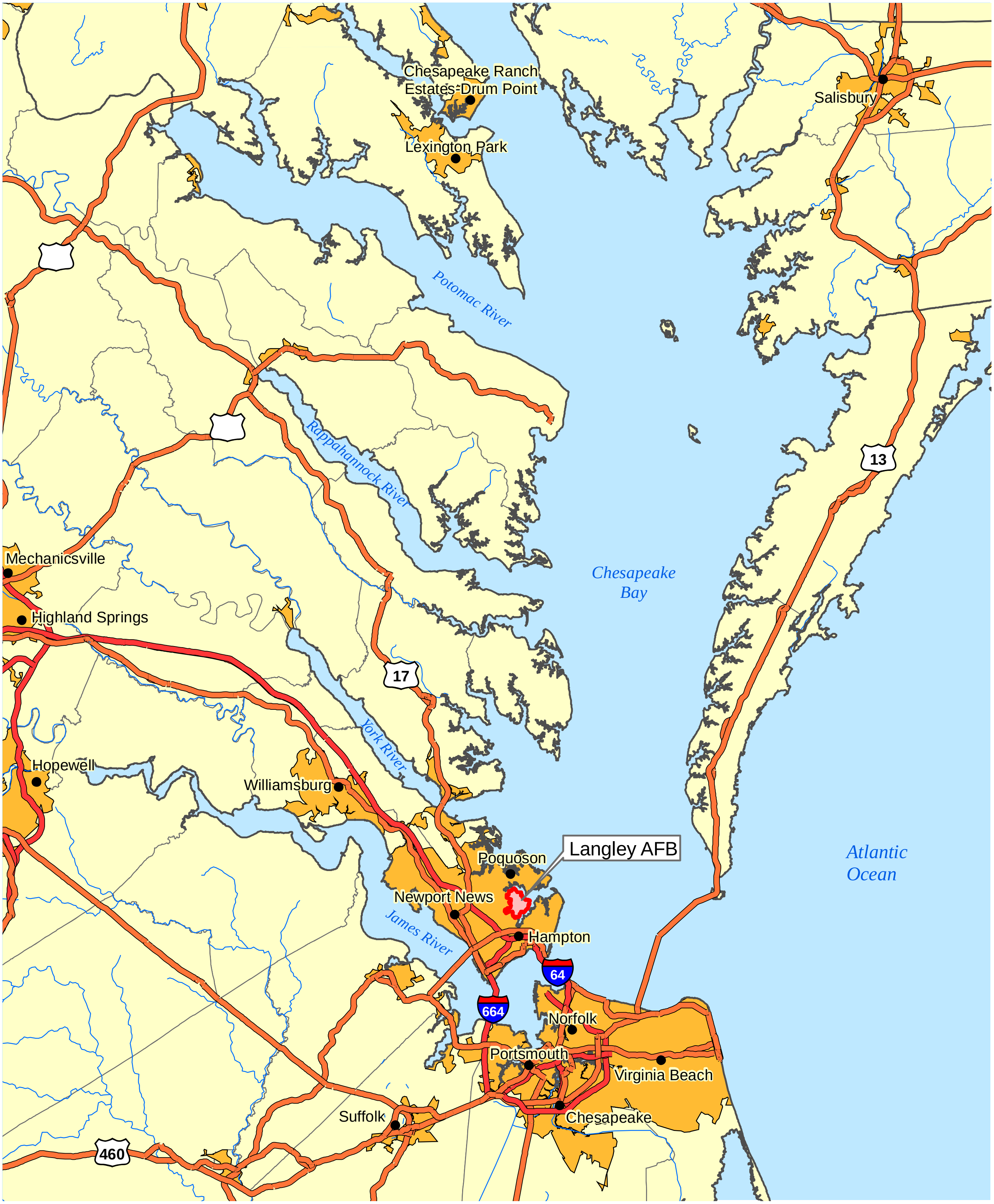
### 2.13.6 Five Year Review Requirements

Because the Selected Remedy will not result in site-related pollutants or contaminants remaining on-site above levels that would present an unacceptable risk to human health or the environment, a 5-year review will not be required for this remedial action.

## 2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for Operable Unit 51, ERP Site SS-63, at Langley AFB, Virginia, was released for public comment in December 2007. The Proposed Plan identified dry excavation with off-site disposal of sediment as the Preferred Alternative for remediation. No comments were received during the public comment period.

# FIGURES




*Map Source:*
*HydroGeoLogic, Inc.*
*GIS Database, 2006*

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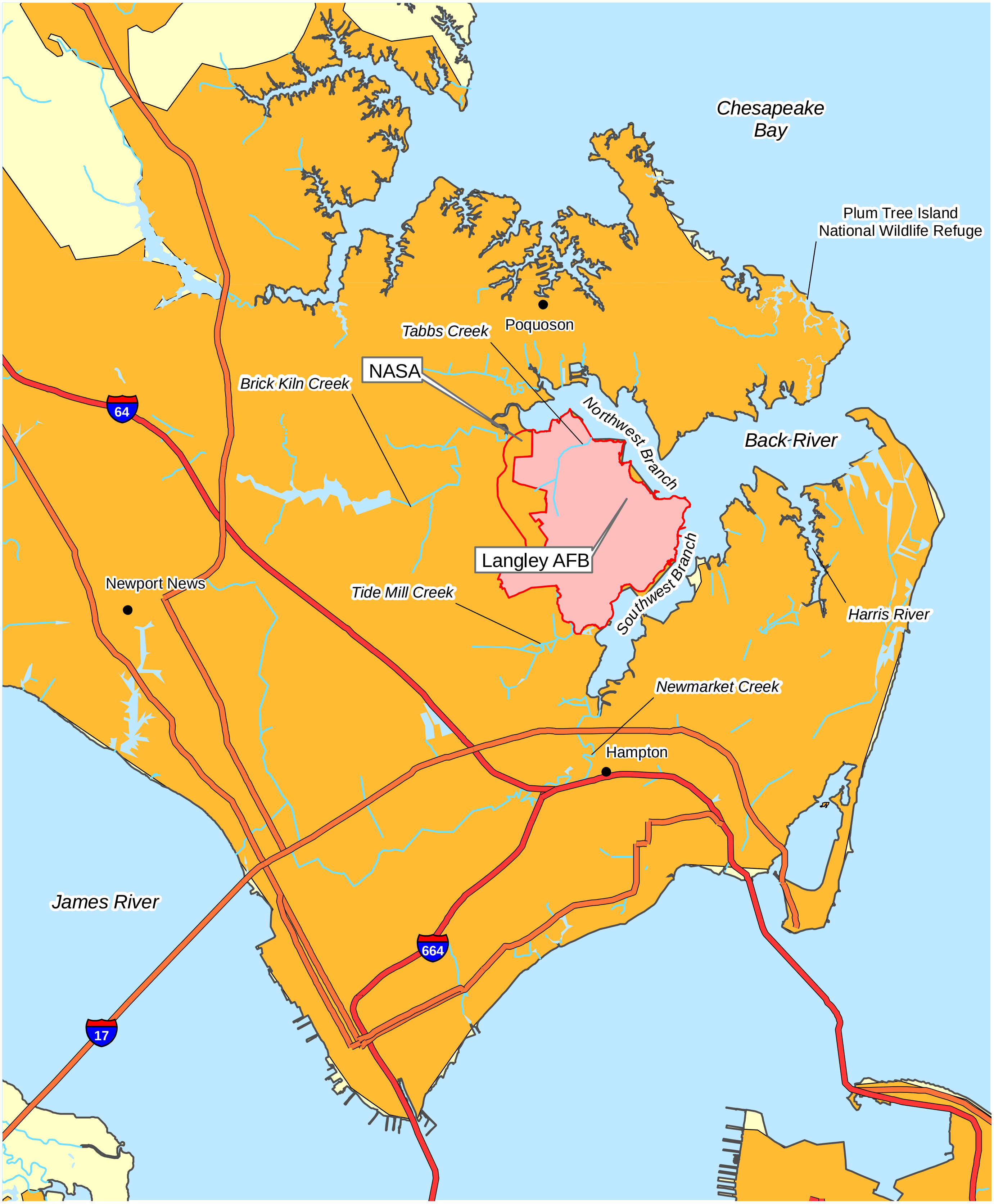
**Figure 2.1**
**Location Map**
**Langley AFB**




*Map Source:*
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*GIS Database, 2006*

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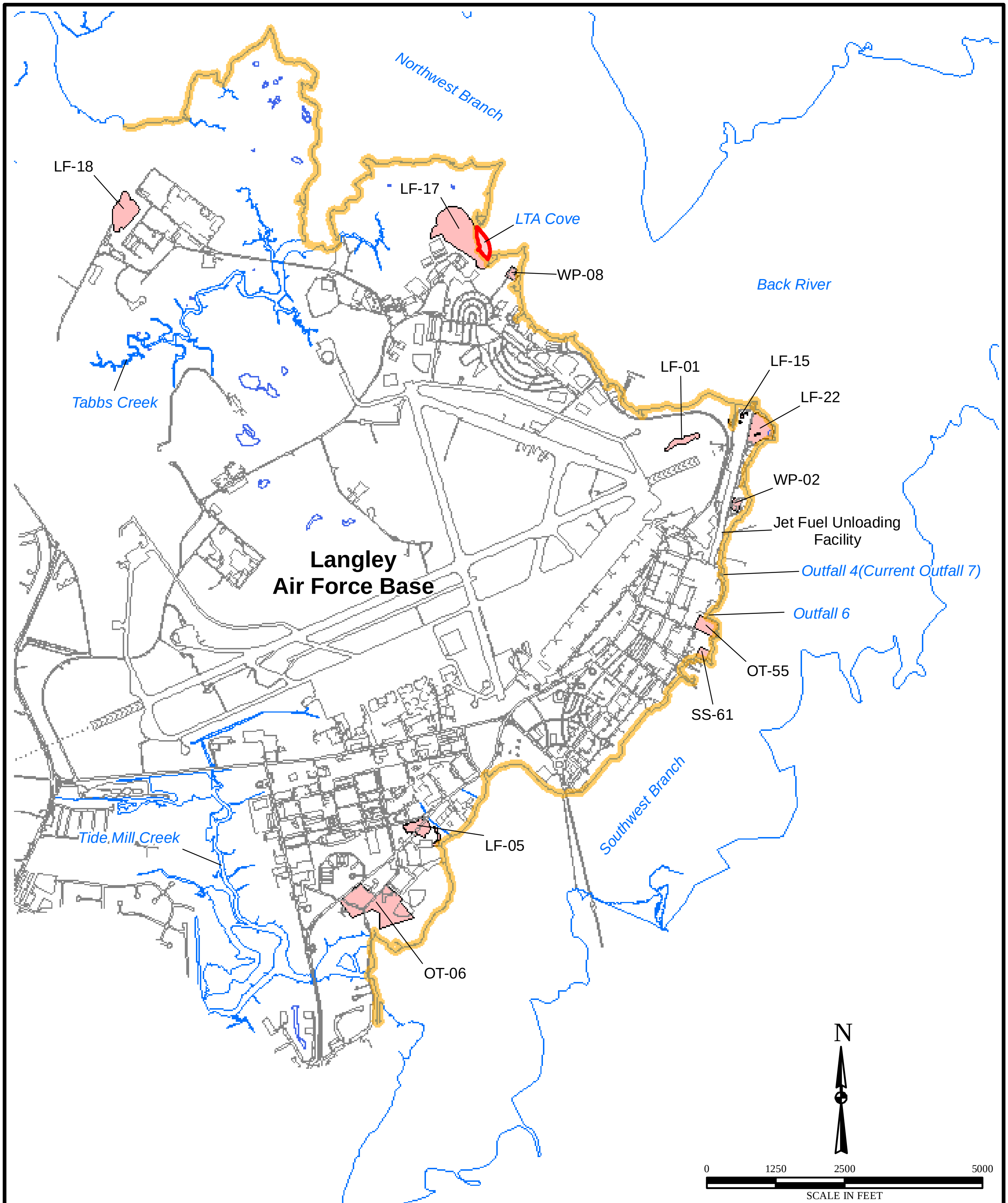
**Figure 2.2**
**Back River and Tributaries**




*Map Source:*
*URS Corporation, 2004*

**Legend**

Langley AFB Shoreline
ERP Site

Note: ERP Site SS-63 encompasses sediment adjacent to Langley AFB shoreline

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**Figure 2.3**
**Back River at**
**Langley Air Force Base**

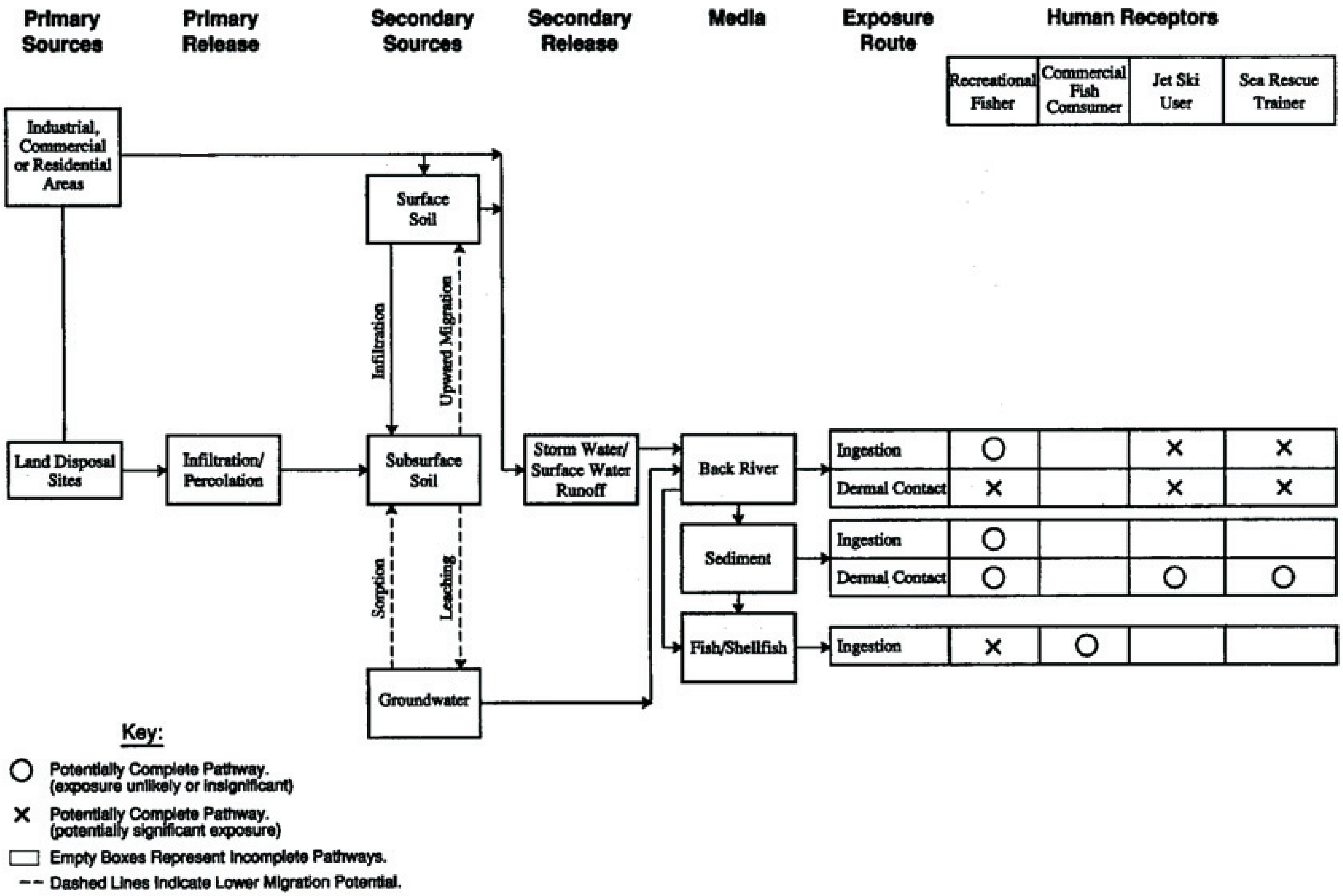


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**Figure 2.4**
**ERP Site SS-63 Human Health Conceptual Site Model**

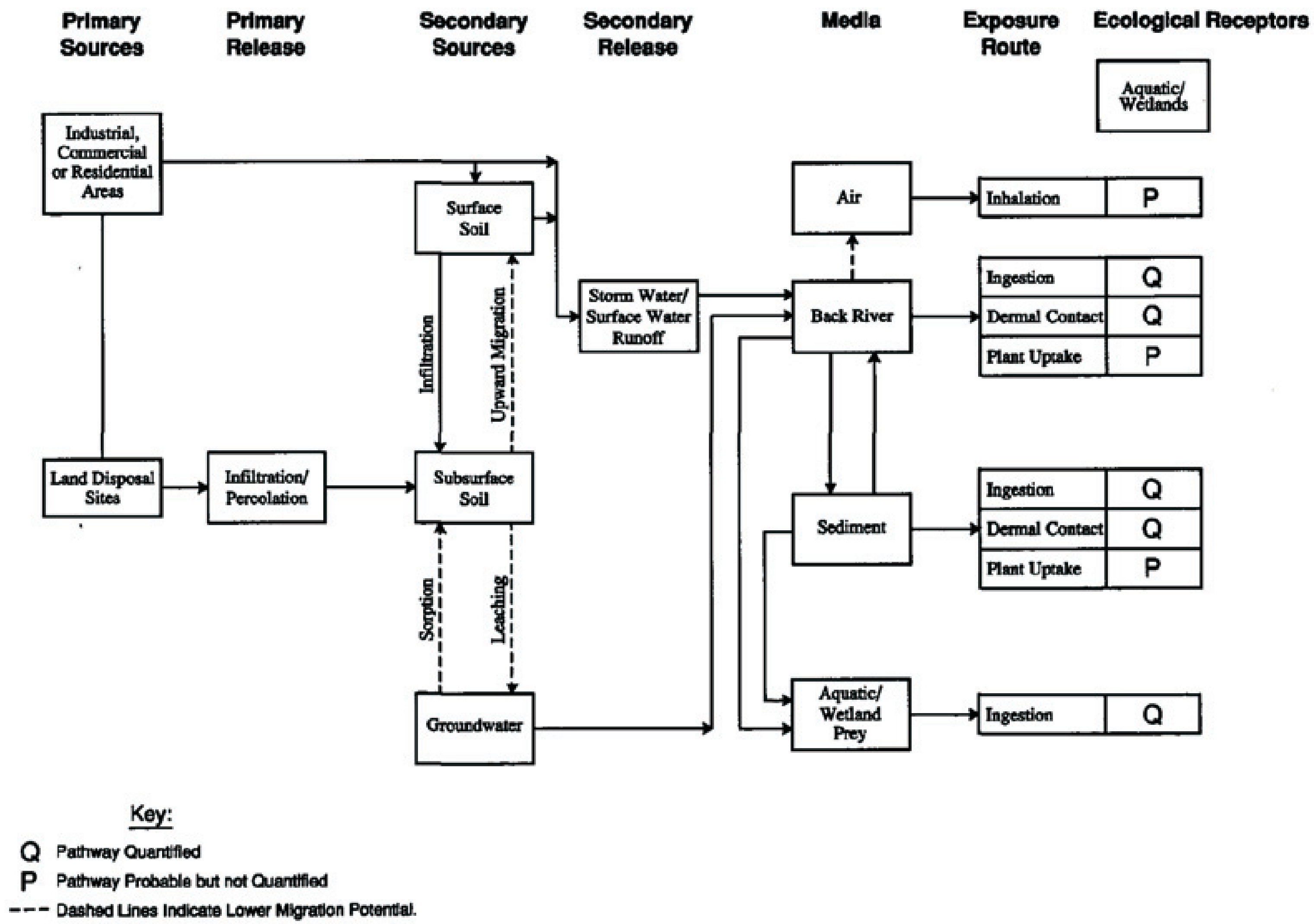


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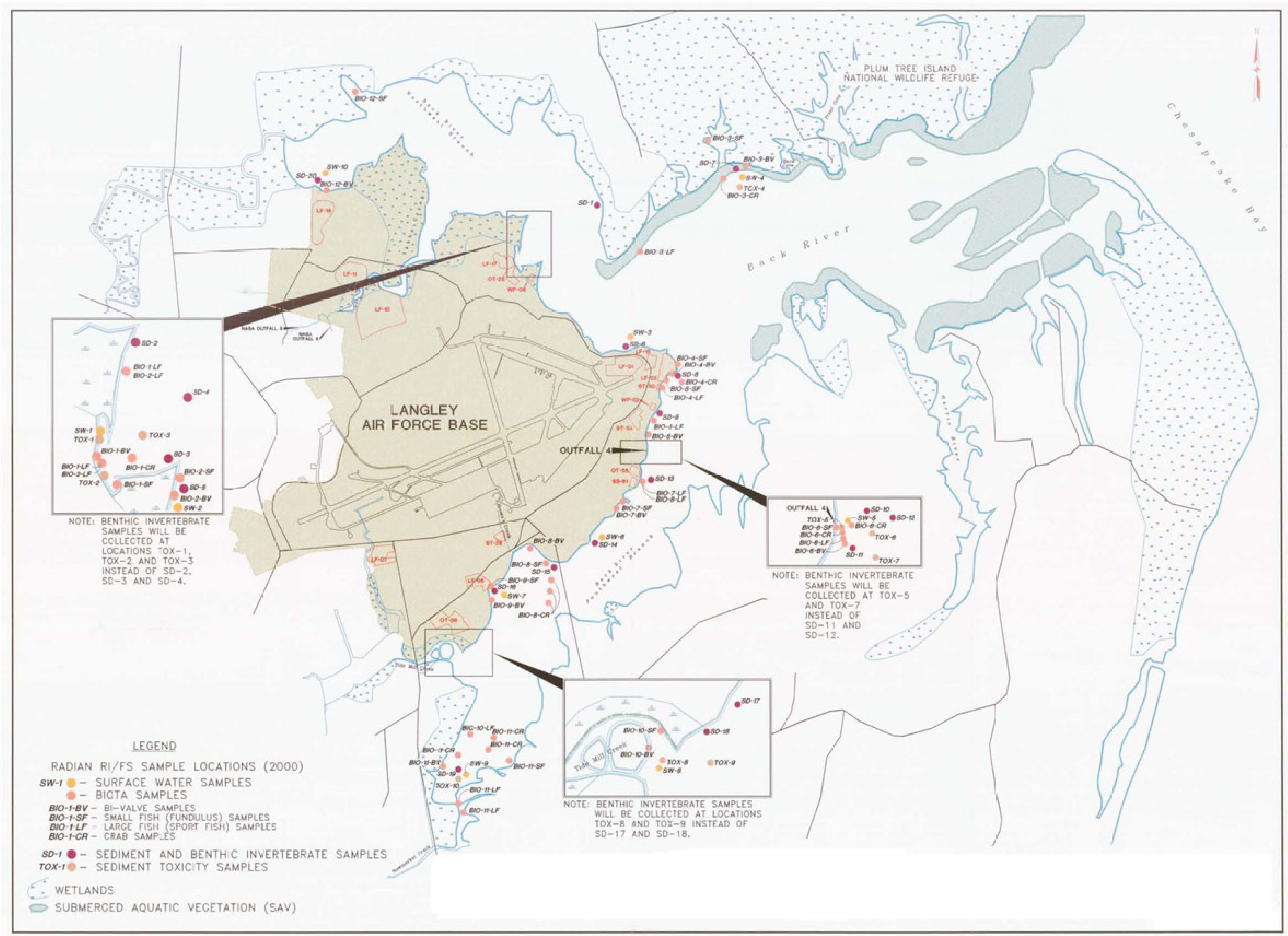
**Figure 2.5**
**ERP Site SS-63 Ecological Conceptual Site Model**

**Figure 2.6**
**SS-63 RI Sample Locations**

Air Force Center for Engineering and the Environment

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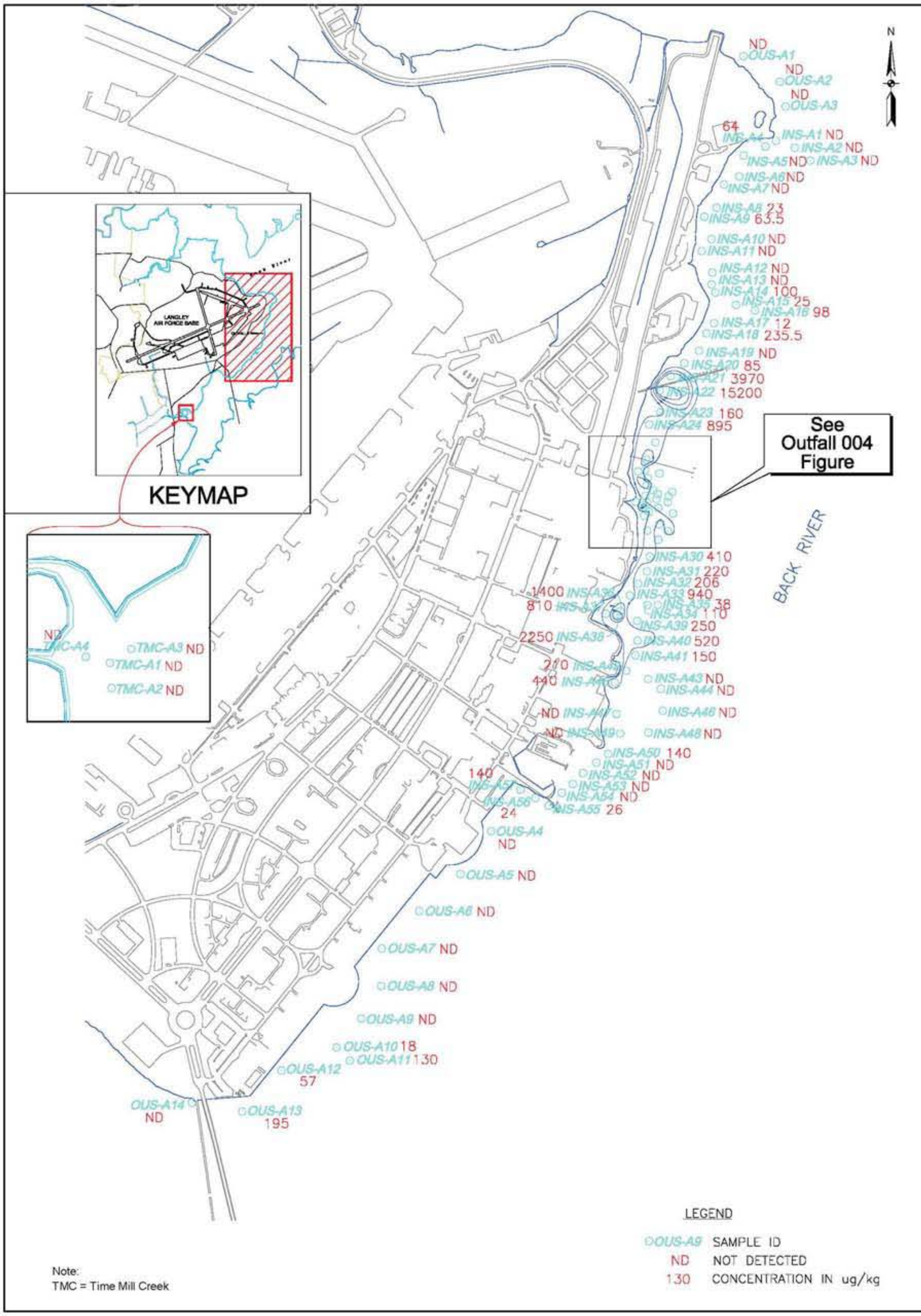
HGL HydroGeoLogic, Inc

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*Source: URS 2004*

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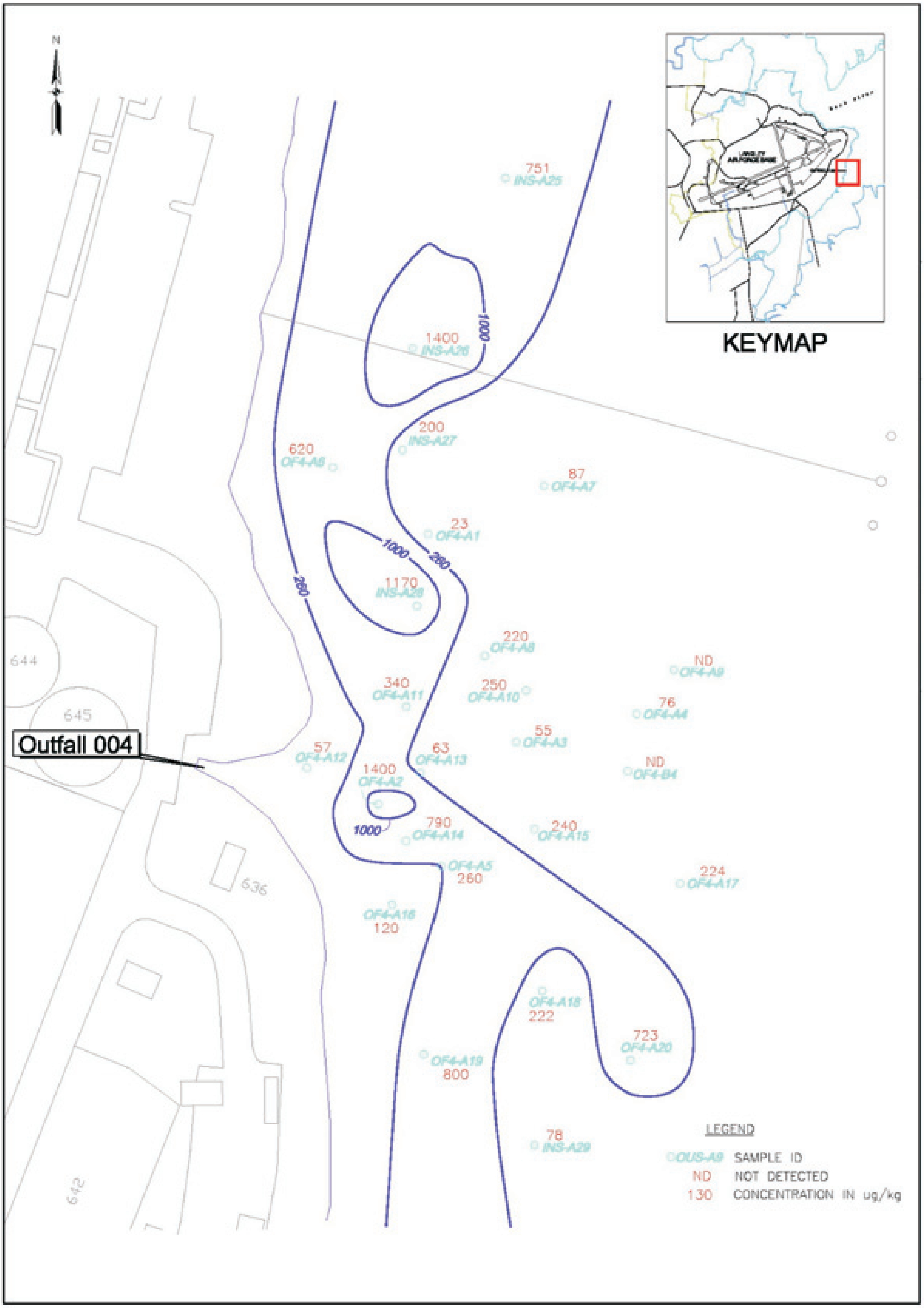
**Figure 2.7**
**July/August 2004**
**Sediment Sampling Locations**

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*Source: URS 2004*

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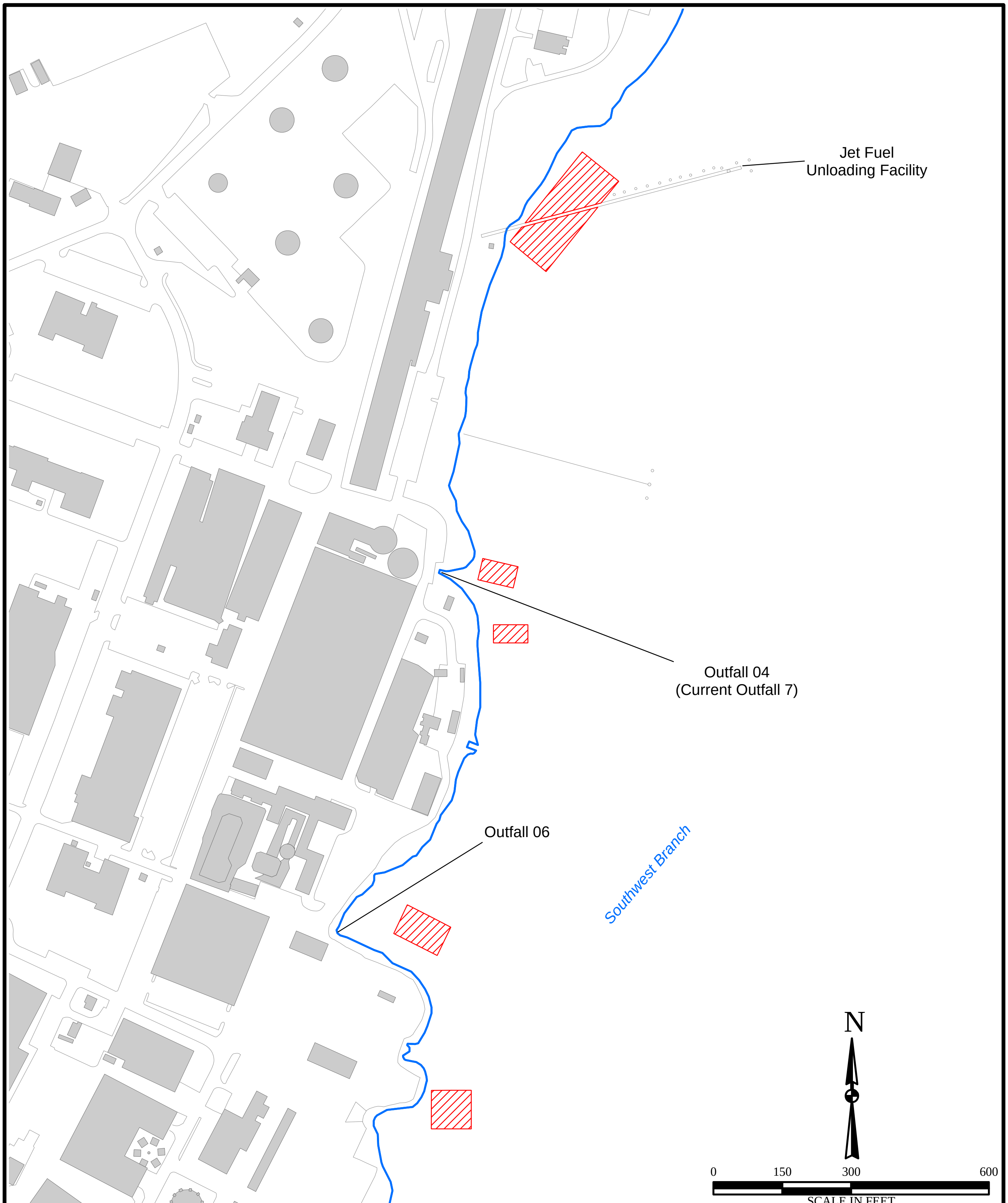
**Figure 2.8**
**July/August 2004**
**Sediment Sampling Locations**
**Outfall 4 Area**




*Map Source:*
*AFCEE, HGL GIS Database*

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**Legend**

- Proposed Remedial Action Area
- Building

**Figure 2.9**
**Areas Proposed for Remedial Action**

# TABLES

**Table 2.1. Results of Analyses for Sediment Sampling at Site SS-63, Langley AFB, Virginia**

| Parameter | EPA Region III Res. Soil RBSLs | Ecological Criteria | Ecological Criteria Reference | SD-01 | SD-01 Duplicate | SD-02 | SD-03 | SD-04 | SD-05 | SD-06 | SD-07 | SD-08 | SD-09 | SD-10 | SD-10 Duplicate | SD-11 | SD-12 | SD-13 | SD-14 | SD-15 | SD-16 | SD-17 | SD-18 | SD-19 | SD-20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Moisture (%)** | - | - | - | 24.8 | 24.4 | 28.1 | 28.0 | 37.9 | 24.7 | 21.8 | 25.8 | 22.2 | 24.3 | 43.4 | 46.3 | 57.1 | 59.0 | 60.5 | 39.9 | 49.3 | 27.2 | 55.4 | 56.3 | 52.4 | 63.8 |
| **TOC (mg/kg)** | - | - | - | 4550 | 4830 | 21400 | 11200 | 7200 | 37300 |  | 3420 | 3960 | 5700 | 14700 | 15200 | 18000 | 17900 | 8880 | 9750 | 16600 | 13700 | 16400 | 16700 | 17100 | 25200 |
| **Total Cyanide (mg/kg)** | 160 | - | - |  | 0.193 J |  |  |  |  | 0.528 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **VOCs (ug/kg)** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Acetone | 780000 | - | - | 20.6 | 30.7 | 18.0 | 20.0 | 61.2 | 13.7 J |  |  | 8.85 | 8.48 | 135 | 159 | 1030 | 140 | 49.5 | 445 J | 22.7 | 125 | 119 |  |  | 240 |
| 2-Butanone (MEK) | 4700000 | - | - | 3.51 | 5.76 |  | 4.06 | 10.7 |  |  |  |  |  | 16.3 J | 6.35 J | 20.8 | 25.8 |  | 3.42 | 6.59 | 23.0 | 18.8 | 5.67 |  | 55.8 |
| Carbon disulfide | 780000 | - | - | 4.35 J | 10.2 J | 17.5 J | 13.8 J | 33.6 J | 7.12 J |  |  | 8.28 J | 8.12 J |  |  | 31.6 | 23.2 | 80.2 J |  | 15.1 | 32.6 | 36.3 | 19.1 | 22.7 | 43.3 |
| Methylene chloride | 85000 | - | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Toluene | 1600000 | - | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **SVOCs (mg/kg)** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Acenaphthene | 470 | 0.5 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  | 0.200 |  | 0.120 J |  |  |  | 0.0251 |  | 0.0324 |  |  |  |  |
| Acenaphthylene | 470 | 0.64 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.0390 |  |  |  |  |
| Anthracene | 2300 | 1.1 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  | 0.396 |  | 0.397 J |  |  |  | 0.0599 | 0.0454 | 0.129 |  |  |  |  |
| Benz(a)anthracene | 0.87 | 1.6 | NOAA ER-M Marine |  |  |  |  | 0.0370 |  |  |  |  | 0.713 | 0.351 J | 0.828 J | 0.382 |  |  | 0.235 | 0.277 | 0.498 | 0.0956 | 0.0816 |  |  |
| Benz(a)pyrene | 0.087 | 1.6 | NOAA ER-M Marine |  |  |  |  | 0.0355 |  |  |  |  | **0.643** | **0.381 J** | **0.819 J** |  |  |  | **0.264** | **0.382** | **0.651** | **0.131** | **0.116** |  |  |
| Benzo(b)fluoranthene | 0.87 | 1.8 | NOAA AET Marine |  |  |  |  | 0.0353 |  |  |  |  | 0.563 | 0.336 | 0.746 | 0.364 |  |  | 0.232 | 0.331 | 0.659 | 0.138 | 0.138 |  |  |
| Benzo(g,h,i)perylene | 230 | 0.3 | NOAA UET Fresh |  |  |  |  |  |  |  |  |  | **0.344** |  |  |  |  |  | 0.155 | 0.268 | **0.570** | 0.0951 | 0.0930 |  |  |
| Benzo(k)fluoranthene | 8.7 | 0.0272 | NOAA Lowest TEL Fresh |  |  |  |  | **0.0372** |  |  |  |  | **0.587** | **0.391** | **0.677** | **0.545** |  |  | **0.236** | **0.360** | **0.711** | **0.135** | **0.115** |  |  |
| Butylbenzylphthalate | 1600 | 0.063 | NOAA AET Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.0503 |  | 0.0584 |  |  |  |  |
| Carbazole | 32 | 0.4 | Relative Risk ER-L Marine |  |  |  |  |  |  |  |  |  | 0.181 |  | 0.183 J |  |  |  | 0.0298 | 0.0374 | 0.106 |  |  |  |  |
| 4-Chloro-3-methylphenol | 160 | - | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Chrysene | 87 | 2.8 | NOAA ER-M Marine |  |  |  | 0.0154 | 0.0423 |  |  |  |  | 0.726 | 0.401 J | 0.858 J | 0.446 |  |  | 0.261 | 0.367 | 0.631 | 0.141 | 0.117 |  |  |
| Dibenzo(a,h)anthracene | 0.087 | 1.6 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dibenzofuran | 31 | 0.11 | NOAA AET Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.0214 |  |  |  |  |
| Di-n-butylphthalate | 780 | 0.058 | NOAA AET Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| bis(2-Ethylhexyl)phthalate | 46 | 0.18216 | NOAA TEL Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **0.221** | **1.25** |  |  |  |
| Fluoranthene | 310 | 5.1 | NOAA ER-M Marine |  |  |  | 0.0278 | 0.0810 |  |  |  |  | 1.70 | 0.703 J | 1.88 J | 0.718 |  |  | 0.472 | 0.524 | 0.982 | 0.208 | 0.190 |  |  |
| Fluorene | 310 | 0.54 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  | 0.233 |  |  |  |  |  |  |  | 0.0342 |  |  |  |  |
| Indeno(1,2,3-cd)pyrene | 0.87 | 0.01732 | NOAA Lowest TEL Fresh |  |  |  |  |  |  |  |  |  | **0.327** |  | **0.464 J** |  |  |  | **0.151** | **0.240** | **0.521** | **0.0868** | **0.0859** |  |  |
| 2-Methylnaphthalene | 160 | 0.67 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.0157 |  | 0.0329 |  |  |  |  |
| Naphthalene | 160 | 2.1 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  | 0.191 |  |  |  |  |  |  |  | 0.0383 |  |  |  |  |
| Phenanthrene | 230 | 1.5 | NOAA ER-M Marine |  |  |  |  | 0.0463 |  |  |  |  | 1.37 | 0.292 J | 1.40 J | 0.310 |  |  | 0.251 | 0.197 | 0.481 | 0.0607 | 0.0536 |  |  |
| Pyrene | 230 | 2.6 | NOAA ER-M Marine |  |  |  | 0.0247 | 0.0650 |  |  |  |  | 1.14 | 0.583 J | 1.39 J | 0.625 |  |  | 0.403 | 0.465 | 0.874 | 0.194 | 0.178 |  |  |
| **Chlorinated Pesticides & PCBs (ug/kg)** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Aldrin | 38 | 9.5 | NOAA AET Marine |  |  |  |  |  |  |  |  |  |  | 6.21 | **10.5** | 9.10 | **12.9** |  |  |  |  |  |  |  |  |
| alpha-BHC | 100 | 100 | NOAA UET Fresh |  |  |  |  |  |  |  |  |  |  |  | 9.01 |  |  |  |  |  |  |  |  |  |  |
| beta-BHC | 350 | 100 | NOAA UET Fresh |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 17.7 |  |  |  |  |
| gamma-BHC | 490 | 100 | NOAA UET Fresh |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| alpha-Chlordane | 1800 | 6 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 3.08 |  |  |  |  |
| gamma-Chlordane | 1800 | 6 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  | **46.1** |  |  |  |  | **12.6** | 4.99 |  |  |  |  | 1.96 | 0.583 |
| 4,4'-DDD | 2700 | 20 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  | 19.4 | **29.0** | **39.3** | **21.6** | 13.0 |  | 9.67 | 9.92 | 10.6 | 10.8 |  | 5.56 |
| 4,4'-DDE | 1900 | 27 | NOAA ER-M Marine |  |  |  | 4.01 | 3.52 |  |  |  | 2.30 | 24.8 | 12.7 | 10.0 | 21.1 | 17.3 | 9.83 | 5.01 |  |  | 7.52 | 8.71 | 7.43 | 8.08 |
| 4,4'-DDT | 1900 | 7 | NOAA ER-M Marine |  |  |  | 3.69 |  |  |  |  |  |  | **82.9 J** |  | **37.0** |  |  |  | 4.64 | 4.07 |  | 5.91 |  |  |
| Dieldrin | 40 | 8 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  |  |  |  | 6.91 |  |  |  |  |  |  | 1.81 | 1.99 |
| Endosulfan I | 47000 | - | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Endosulfan II | 47000 | - | - |  |  |  |  |  |  |  |  |  |  |  | 12.1 J | 14.8 |  |  |  |  |  |  |  |  |  |
| Endosulfan sulfate | 47000 | - | - |  |  | 0.618 |  |  |  |  |  | 2.41 | 37.7 | 12.4 | 7.56 | 13.2 | 7.38 | 10.0 | 6.35 |  |  |  |  | 2.01 | 1.60 |
| Endrin | 2300 | 0.02 | Relative Risk ER-L Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Endrin aldehyde[1] | 2300 | 0.02 | Relative Risk ER-L Marine |  |  |  |  |  |  |  |  |  | **31.6** | **12.5** | **7.52** | **27.8** |  | **4.76** | **3.74** |  |  |  |  |  |  |
| Endrin ketone[1] | 2300 | 0.02 | Relative Risk ER-L Marine | **0.214 J** |  |  |  |  |  |  |  |  |  | **16.3 J** | **45.3 J** | **49.0** |  |  |  |  |  |  |  |  |  |
| Heptachlor | 140 | 0.3 | NOAA AET Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Heptachlor epoxide | 70 | 0.6 | NOAA TEL Fresh |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Methoxychlor | 39000 | - | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PCB-1254 | 320 | 180 | NOAA ER-M Marine |  |  |  |  |  | 15.1 |  |  | 27.2 | **1210** |  |  |  |  | 146 | 146 |  |  |  |  |  |  |
| PCB-1260 | 320 | 180 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Chlorinated Herbicides (ug/kg)** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dichloroprop | 63000 | - | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MCPA | 3900 | - | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2,4-D | 78000 | - | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2,4,5-T | 78000 | - | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Metals (mg/kg)** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Aluminum | 7800 | - | - | 2560 | 2610 | 3840 | 4130 | **9620** | 2760 J | 1800 | 1320 | 2380 | 3660 | 6000 J | **9880 J** | **11900** | **16400** | **19400** | 5870 | **9210** | 3620 | **13600** | **13900** | **14000** | **17200** |
| Antimony | 3.1 | 2 | Relative Risk ER-L Marine |  |  |  |  |  |  |  |  |  |  |  | 0.405 J |  |  |  |  |  |  |  |  |  |  |
| Arsenic | 0.43 | 70 | NOAA ER-M Marine | **1.72** | **1.54** | **2.16** | **2.39** | **4.69** | **1.83** | **1.43** | **0.920** | **2.10** | **2.12** | **3.42 J** | **5.99 J** | **7.59** | **8.78** | **9.66** | **5.79** | **6.13** | **4.34** | **10.5** | **10.7** | **8.01** | **8.65** |
| Barium | 550 | 48 | NOAA AET Marine | 8.53 | 7.84 | 12.1 | 9.08 | 20.5 | 5.65 | 4.39 | 3.42 | 11.2 | 9.09 | 19.6 J | 29.1 J | 34.0 | 36.7 | 43.6 | 12.8 | 19.6 | 9.91 | 27.1 | 28.1 | 25.7 | 31.6 |
| Beryllium | 16 | - | - | 0.118 | 0.101 | 0.139 | 0.152 | 0.374 | 0.130 | 0.116 |  | 0.131 | 0.158 | 0.296 J | 0.464 J | 0.562 | 0.727 | 0.821 | 0.340 | 0.513 | 0.261 | 0.805 | 0.805 | 0.776 | 0.773 |
| Cadmium | 3.9 | 9.6 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  | 0.0798 J | 0.140 J | 0.240 |  |  | 0.0861 |  |  |  | 0.139 |  |  |
| Calcium | - | - | - | 342 | 301.0 | 548 | 643 | 1170 | 605 | 352 | 148 | 476 | 529 | 895 J | 1490 J | 1470 | 2090 | 2560 | 1220 | 2050 | 26500 | 1640 | 1700 | 1360 | 1690 |
| Chromium | 23 | 370 | NOAA ER-M Marine | 6.24 | 5.99 | 11.5 | 12.4 | **28.3** | 9.27 J | 6.54 | 2.83 | 8.41 | 9.91 | 22.8 J | **35.3 J** | **42.9** | **42.3** | **44.9** | 15.9 | **23.5** | 11.9 | **34.6** | **34.1** | **28.8** | **48.3** |
| Cobalt | 160 | 10 | NOAA AET Marine | 1.12 | 0.784 | 1.25 | 1.43 | 3.08 | 1.28 | 1.07 | 0.322 | 1.03 | 1.47 | 2.41 J | 3.85 J | 4.81 | 5.97 | 6.73 | 3.59 | 4.50 | 2.25 | 6.96 | 6.96 | 7.02 | 5.01 |
| Copper | 310 | 270 | NOAA ER-M Marine | 2.47 | 2.31 | 4.48 | 5.18 | 10.7 | 2.88 | 2.04 | 1.47 | 3.91 | 4.66 | 20.1 | 21.5 | 21.9 | 21.8 | 24.5 | 10.3 | 12.8 | 6.29 | 17.6 | 17.8 | 13.8 | 27.7 |
| Iron | 2300 | - | - | **3820** | **3530** | **5050** | **5400** | **12700** | **4400 J** | **3170** | 1300 | **4790** | **5000** | **8480 J** | **13600 J** | **16600** | **21600** | **25100** | **10900** | **14400** | **8460** | **22400** | **22400** | **18400** | **20700** |
| Mercury | 0.78 | 0.71 | NOAA ER-M Marine | 0.0174 | 0.0154 | 0.0218 | 0.0309 | 0.0429 | 0.0139 | 0.0116 | 0.0100 | 0.0160 | 0.0304 | 0.2170 | 0.190 | 0.233 | 0.148 | 0.0952 | 0.0489 | 0.0742 | 0.0381 | 0.0743 | 0.0859 | 0.0868 | 0.107 |
| Lead |  | 218 | NOAA ER-M Marine | 4.76 | 4.50 | 9.51 | 17.0 | 18.3 | 5.83 | 3.93 | 3.37 | 8.21 | 10.0 | 26.9 J | 39.2 J | 51.7 | 38.5 | 39.0 | 17.6 | 24.2 | 13.4 | 35.5 | 34.9 | 29.8 | 28.9 |
| Magnesium | - | - | - | 706 | 719 | 1120 | 1200 | 2790 | 951 | 730 | 376 | 853 | 1120 | 1950 J | 3080 J | 3620 | 4950 | 5730 | 2770 | 3010 | 1660 | 4300 | 4270 | 3700 | 4970 |
| Manganese | 160 | 260 | NOAA AET Marine | 24.0 | 22.7 | 30.9 | 26.4 | 74.3 | 23.5 | 15.5 | 6.68 | 26.1 | 29.4 | 48.5 J | 76.3 J | 119 | 139 | **163** | 91.3 | 94.2 | 57.7 | 118 | 116 | 94.5 | 107 |
| Nickel | 160 | 51.6 | NOAA ER-M Marine | 2.00 | 1.91 | 3.14 | 3.53 | 8.23 | 2.71 | 1.85 | 0.969 | 2.24 | 3.17 | 6.15 J | 10.3 J | 13.2 | 15.3 | 17.0 | 6.13 | 9.03 | 4.07 | 13.9 | 14.0 | 12.8 | 13.7 |
| Potassium | - | - | - | 382 | 393 | 655 | 712 | 1670 | 535 | 431 | 212 | 572 | 652 | 1160 J | 1970 J | 2210 | 3080 | 3380 | 1110 | 1730 | 606 | 2580 | 2570 | 2590 | 3480 |
| Selenium | 39 | - | - |  |  | 0.458 | 0.374 |  | 0.432 |  |  |  | 0.360 |  | 0.584 J | 0.728 | 0.642 | 0.625 |  | 0.635 |  |  | 0.572 |  |  |
| Silver | 39 | 3.7 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  | 0.246 J | 0.478 J | 1.30 | 0.619 |  | 0.295 | 0.276 | 0.151 | 0.474 | 0.519 | 0.161 | 0.534 |
| Sodium | - | - | - | 1710 | 1980 | 2350 | 2300 | 4420 | 2000 | 1740 | 1520 | 1730 | 1990 | 3280 J | 5020 J | 5790 | 8650 | 8810 | 3600 | 5450 | 2150 | 6730 | 6850 | 5450 | 9420 |
| Thallium | 0.55 | - | - |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.531 |  |  |  |  |  |  |  |  |
| Vanadium | 55 | 57 | NOAA AET Marine | 6.78 | 6.63 | 9.48 | 10.3 | 22.8 | 7.37 J | 5.51 | 3.21 | 8.78 | 9.33 | 17.2 J | 27.9 J | 34.0 | 41.0 | 46.8 | 16.6 | 24.1 | 14.2 | 36.2 | 35.6 | 32.6 | 40.3 |
| Zinc | 2300 | 410.0 | NOAA ER-M Marine | 15.2 | 14.1 | 22.8 | 27.6 | 56.9 | 22.5 | 14.6 | 8.74 | 18.9 | 25.0 | 53.9 J | 81.9 J | 94.4 | 112 | 125 | 56.8 | 79.3 | 40.2 | 120 | 116 | 102 | 88.8 |
| **PCTs (ug/kg)** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Aroclor 5432 | 140 | 180 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  | **1400** | **2200** | **3500** | **500** |  |  |  |  |  |  |  | 64.0 |
| Aroclor 6040 | 140 | 180 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  | 120 | **320** | **270** | **150** | 90.0 |  |  |  |  |  |  |  |
| Aroclor 6062 | 140 | 180 | NOAA ER-M Marine | 110 J |  |  |  |  |  |  |  | **760** | 120 |  |  |  |  |  | 86.0 | 62.0 |  |  |  |  |  |
| Aroclor 6070 | 140 | 180 | NOAA ER-M Marine |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Acid Volatile Sulfides (um/g)** | NV | - | - | 3.40 | 2.40 | 2.10 | 4.00 | 10.2 | 1.60 | 0.890 | 3.10 | 1.00 | 2.50 | 5.70 | 7.40 | 8.80 | 17.9 | 32.1 | 2.90 | 12.6 | 7.40 | 20.1 | 18.7 | 15.3 | 21.9 |

-Screening criteria unavailable
Blank cell - Analyte was not detected in any of the samples from the indicated investigation.
B - Concentration similar to low-level concentrations found in associated blanks.
J - Estimated value.
[1] Endrin used as surrogate

Indicates result exceeds Human Health Criteria (yellow)
Indicates result exceeds Ecological Health Criteria (cyan)
Indicates result exceeds Ecological and Human Health Criteria (green)

## Table 2.1. Results of Analyses for Sediment Sampling at Site SS-63, Langley AFB, Virginia

| Parameter | EPA Region III Res. Soil RBSLs | Ecological Criteria | Ecological Criteria Reference | TOX-01 | TOX-02 | TOX-03 | TOX-04 | TOX-05 | TOX-05 Duplicate | TOX-06 | TOX-07 | TOX-08 | TOX-09 | TOX-10 | R-1 | R-2 | R-3 | R-4 | R-5 | R-5 Duplicate | R-6 | R-7 | R-8 | R-9 | R-10 | R-11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Moisture (%)** | - | - | - | 28.1 | 48.0 | 28.3 | 24.3 | 26.4 | 25.7 | 51.9 | 55.6 | 60.9 | 61.6 | 57.6 | | | | | | | | | | | | |
| **TOC (mg/kg)** | - | - | - | 7670 | 8220 | 8460 | 2910 | 11100 | 13300 | 16700 | 17600 | 8370 | 8170 | 7780 | | | | | | | | | | | | |
| **Total Cyanide (mg/kg)** | 160 | - | - | | | | | | | | | 0.349 | | | | | | | | | | | | | | |
| **VOCs (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acetone | 780000 | - | - | 8.03 | 67.2 | 15.0 | 223 | 21.2 B | 96.2 J | 143 | 407 | 109 | 86.2 | 80.3 | | | | | | | | | | | | |
| 2-Butanone (MEK) | 4700000 | - | - | | 5.45 | | 8.35 | 7.05 J | 21.1 J | 18.2 | 91.5 | 14.2 | 7.59 | 7.29 | | | | | | | 3.13 | | | | | |
| Carbon disulfide | 780000 | - | - | 4.87 | 12.9 | 14.2 | 7.39 | 16.2 | 31.6 | 24.7 | 50.6 | 10.8 | 19.7 | 37.6 | | | | | 2.35J | 3.55 J | 2.89 | 3.40 | | | 3.29 | 4.15 |
| Methylene chloride | 85000 | - | - | 1.14 | | 1.64 | 1.52 | 1.54 | 1.77 | | 3.67 | 2.23 | 2.33 | 1.95 | 4.35 | 4.76 | | 2.09 | 3.49 | 4.21 | 5.23 | | | | 9.52 | 10.2 |
| Toluene | 1600000 | - | - | | | | | | 1.18 J | | | | | | | | | | | | | | | | | |
| **SVOCs (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Acenaphthene | 470 | 0.5 | NOAA ER-M Marine | | | | | | 1.45 J | | | | | | | | | | 0.371J | | | | | | | |
| Acenaphthylene | 470 | 0.64 | NOAA ER-M Marine | | | | | | | | | | | | | | | | | | | | | | | |
| Anthracene | 2300 | 1.1 | NOAA ER-M Marine | | | | | | 7.99 J | | | | | | | | | | 1.02J | | 0.585 | 0.427 | | | | |
| Benz(a)anthracene | 0.87 | 1.6 | NOAA ER-M Marine | | | | | | 25.7 J | 0.374 | 0.404 | | | | | | | | 3.78J | 2.06 J | 3.39 | 1.80 | 0.218 | 0.294 | 0.747 | |
| Benz(a)pyrene | 0.087 | 1.6 | NOAA ER-M Marine | | | | | | 27.4 J | 0.448 | 0.464 | | | | | | | | 3.85 | 2.55 | 4.42 | 2.11 | | 0.333 | 1.12 | |
| Benzo(b)fluoranthene | 0.87 | 1.8 | NOAA AET Marine | | | | | | 19.9 J | 0.382 | 0.474 | | | | | | | 0.246 J | 3.43J | 2.26 J | 3.95 | 2.20 | 0.491 | 0.623 | 1.28 | |
| Benzo(g,h,i)perylene | 230 | 0.3 | NOAA UET Fresh | | | | | | 15.9 J | | | | | | | | | | 2.35J | 1.73 J | 2.78 | 1.33 | | | 0.848 | |
| Benzo(k)fluoranthene | 8.7 | 0.0272 | NOAA Lowest TEL Fresh | | | | | | 23.8 J | 0.400 | 0.425 | | | | | | | 0.246 J | 3.44 | 2.57 | 3.65 | 1.58 | 0.491 | 0.623 | 1.01 | |
| Butylbenzylphthalate | 1600 | 0.063 | NOAA AET Marine | | | | | | | | | | | | | | | | | | | | | | | |
| Carbazole | 32 | 0.4 | Relative Risk ER-L Marine | | | | | | | | | | | | | | | | | | | | | | | |
| 4-Chloro-3-methylphenol | 160 | - | - | | | | | | | | | | | | | | | | 0.681 | | | | | | | |
| Chrysene | 87 | 2.8 | NOAA ER-M Marine | | | | | | 27.4 J | 0.471 | 0.581 | | | | | | | | 4.96 J | 2.70 J | 4.32 | 2.44 | 0.324 | 0.335 | 1.26 | |
| Dibenzo(a,h)anthracene | 0.087 | 1.6 | NOAA ER-M Marine | | | | | | | | | | | | | | | | 1.03 | | | | | | | |
| Dibenzofuran | 31 | 0.11 | NOAA AET Marine | | | | | | | | | | | | | | | | 0.208 | | | | | | | |
| Di-n-butylphthalate | 780 | 0.058 | NOAA AET Marine | | | | | | | | | | | | | | | | | | | | | | | |
| bis(2-Ethylhexyl)phthalate | 46 | 0.18216 | NOAA TEL Marine | | | | | | | | | | | | | | | | 3.35 | | 2.84 | | | | 0.485 | |
| Fluoranthene | 310 | 5.1 | NOAA ER-M Marine | | | | | | 63.0 J | 0.800 | 0.894 | | | | | | | | 8.69 J | 4.90 J | 5.99 | 3.78 | 0.620 | 0.518 | 1.93 | |
| Fluorene | 310 | 0.54 | NOAA ER-M Marine | | | | | | | | | | | | | | | | 0.481 | | | | | | | |
| Indeno(1,2,3-cd)pyrene | 0.87 | 0.01732 | NOAA Lowest TEL Fresh | | | | | | 14.5 J | | | | | | | | | | 2.37 | 1.73 | 2.73 | 1.30 | | | 0.829 | |
| 2-Methylnaphthalene | 160 | 0.67 | NOAA ER-M Marine | | | | | | | | | | | | | | | | | | | | | | | |
| Naphthalene | 160 | 2.1 | NOAA ER-M Marine | | | | | | | | | | | | | | | | | | | | | | | |
| Phenanthrene | 230 | 1.5 | NOAA ER-M Marine | | | | | | 24.2 J | | 0.357 | | | | | | | | 4.73 J | 1.73 J | 1.73 | 1.73 | 0.281 | | 0.601 | |
| Pyrene | 230 | 2.6 | NOAA ER-M Marine | | | | | | 48.8 J | 0.686 | 0.767 | | | | | | 0.0916 | 0.123 | 7.13 J | 3.99 J | 5.24 | 3.42 | 0.468 | 0.450 | 1.67 | 0.214 |
| **Chlorinated Pesticides & PCBs (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aldrin | 38 | 9.5 | NOAA AET Marine | | | | | | | 6.79 | | | | | | | | | | | | | | 3.49 J | | |
| alpha-BHC | 100 | 100 | NOAA UET Fresh | | | | | | | 9.21 | | | | | | | | | | | | | | | | |
| beta-BHC | 350 | 100 | NOAA UET Fresh | | | | | | | | | | | | | | | | | | | | | | | |
| gamma-BHC | 490 | 100 | NOAA UET Fresh | | | | | | | | | | | | | | | | | | | | | | | |
| alpha-Chlordane | 1800 | 6 | NOAA ER-M Marine | | | | | 6.00 | 4.33 | | | | | 1.59 | | | | | | | | | | | | 5.43 |
| gamma-Chlordane | 1800 | 6 | NOAA ER-M Marine | | | | | | | 15.7 | | | | | | | | | 66.9 J | 27.3 J | 284 | 33.6 | | 15 | 1.58 | 1.48 |
| 4,4'-DDD | 2700 | 20 | NOAA ER-M Marine | | 9.07 | 7.00 | | 37.0 | 28.4 | 63.7 | 29.8 | 11.9 | 12.1 | 10.0 | 2.43 | | | | 117 | 122 | 141 | 56.0 | | 5.56 | 9.63 | 4.6 |
| 4,4'-DDE | 1900 | 27 | NOAA ER-M Marine | 3.99 | 9.55 | 4.70 | | 26.5 | 18.1 | 23.1 | 13.4 | 8.12 | 8.07 | 6.41 | 1.25 | | | | 52.8 J | 33.8 J | | | | | 9.86 | 5.44 |
| 4,4'-DDT | 1900 | 7 | NOAA ER-M Marine | | 6.11 | 12.9 | | | | | 155 | | | | 2.25 | | | | | 11.0 J | 159 J | 56.3 | 54.2 | 10.2 J | 6.56 | |
| Dieldrin | 40 | 8 | NOAA ER-M Marine | 1.16 | | | | | 6.64 J | | 7.70 | | | | | | | | | | | | | | | |
| Endosulfan I | 47000 | - | - | | 3.48 | | | | | | | | | | | | | | | | | | | | | |
| Endosulfan II | 47000 | - | - | | | | | | 6.24 J | 31.9 | 7.33 | | | | | | | | | | | | | | | |
| Endosulfan sulfate | 47000 | - | - | | 3.53 | | | 15.0 | 11.4 | 23.0 | 8.24 | 3.75 | 3.86 | | | | | | | | | | | | | |
| Endrin | 2300 | 0.02 | Relative Risk ER-L Marine | | | | | | | | | | | | | | | | | | 564 J | | | 6.11 J | 5.83 | |
| Endrin aldehyde[1] | 2300 | 0.02 | Relative Risk ER-L Marine | | | | | 11.9 | 7.50 | 73.4 | 10.4 | | | | | | | | 8.02 J | | 204 J | | | 11.1 J | | |
| Endrin ketone[1] | 2300 | 0.02 | Relative Risk ER-L Marine | | | | | 20.3 | 11.1 | 118 | 18.4 | | | | | | | | 18.4J | | | | | | 6.40 | |
| Heptachlor | 140 | 0.3 | NOAA AET Marine | | | | | | | | | | | | | | | | | 1.68 J | | | | | | |
| Heptachlor epoxide | 70 | 0.6 | NOAA TEL Fresh | | | | | | 2.64 J | 3.50 | 3.20 | | | | | 0.722 | | | | | | | | | | |
| Methoxychlor | 39000 | - | - | | | | | | | | | | | | | | | | | | 418 J | | | 24.9 J | | |
| PCB-1254 | 320 | 180 | NOAA ER-M Marine | | | | | | | | | | | | | | | | | | 4180 | | | 736 | | |
| PCB-1260 | 320 | 180 | NOAA ER-M Marine | | 108 | | | | | | | | | | | | | | | | | | | | | |
| **Chlorinated Herbicides (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dichloroprop | 63000 | - | - | | | | | | | | | | | | | | | | | | | | | | | |
| MCPA | 3900 | - | - | 13000 | | 10100 | | | | 16300 | | 14500 | 13700 | | | | | | | | | | | | | |
| 2,4-D | 78000 | - | - | | | | | | | | | | | | | | | | | | 12.9 | | | | | 17.9 |
| 2,4,5-T | 78000 | - | - | | | | | 2.52 J | | | | | | | 3.51 | | | | 3.58 J | | 4.27 | | | 5.72 | 6.88 | 6.94 |
| **Metals (mg/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aluminum | 7800 | - | - | 3150 | 10700 K | 6580 | 1790 | 3910 | 3990 | 10900 | 11300 | 13900 | 14700 | 13700 | 3000 | 1540 | 1670 | 4890 | 2440 | 2930 | 3310 | 15,100 | 14800 H | 14,700 | 17,300 | 22,000 |
| Antimony | 3.1 | 2 | Relative Risk ER-L Marine | 0.314 | 0.416 J | | 0.247 | 2.14 J | | | 0.620 | 0.438 | | | 0.170 | | | | 0.268 J | 1.20 J | 0.295 | 0.341 | | | 0.335 | |
| Arsenic | 0.43 | 70 | NOAA ER-M Marine | 1.87 | 6.47 | 3.47 | 0.830 | 3.30 | 3.39 | 6.52 | 6.41 | 10.0 | 10.4 | 9.49 | 1.85 | 0.744 | 1.49 | 4.74 | 3.87 | 2.54 | 3.50 | 8.11 | 7.77 | 8.94 | 10.2 | 12.1 |
| Barium | 550 | 48 | NOAA AET Marine | 9.25 | 31.3 | 14.3 | 6.58 | 18.6 | 19.2 | 34.8 | 30.1 | 26.2 | 27.7 | 25.6 | 6.82 | 4.75 | 5.12 | 9.64 | 33.2 | 30.5 | 39.7 | 51.0 | 30.9 | 30.2 | 37.7 | 41.5 |
| Beryllium | 16 | - | - | 0.128 | 0.466 | 0.287 | 0.0664 | 0.205 | 0.200 | 0.508 | 0.522 | 0.825 | 0.826 | 0.867 | 0.195 | 0.316 | 0.105 | 0.321 | | 0.251 | 0.218 | 0.727 | 0.736 | 0.810 | 0.842 | 1.42 |
| Cadmium | 3.9 | 9.6 | NOAA ER-M Marine | | 0.226 | | | 0.107 | 0.156 | | | | | | 0.179 | 0.105 | | | 0.898 | 0.880 | 0.967 | 0.238 | 0.142 | 0.210 | 1.38 | 1.46 |
| Calcium | - | - | - | 447 | 1230 | 787 | 212 | 1220 | 1460 | 1930 | 2320 | 1590 | 1680 | 1500 | 411 | 219 | 1000 | 833 | 14,300 | 10,300 | 1390 | 2850 | 1470 | 1900 | 1730 | 2080 |
| Chromium | 23 | 370 | NOAA ER-M Marine | 9.28 | 33.1 | 19.4 | 3.84 | 71.9 | 61.0 | 63.3 | 36.4 | 34.4 | 35.5 | 31.5 | 12.0 | 4.43 | 5.28 | 14.8 | 28.3 J | 50.8 J | 54.6 | 42.2 | 32.9 | 44.0 | 39.7 | 48.2 |
| Cobalt | 160 | 10 | NOAA AET Marine | 0.978 | 3.36 | 2.20 | 0.389 | 2.05 | 2.10 | 4.46 | 4.28 | 6.85 | 6.96 | 7.94 | 0.953 | 0.716 | 0.833 | 2.00 | 1.73 | 1.68 | 1.98 | 5.76 | 5.47 | 6.07 | 6.54 | 9.84 |
| Copper | 310 | 270 | NOAA ER-M Marine | 4.73 | 23.4 | 7.72 | 2.78 | 19.2 | 14.8 | 26.7 | 22.8 | 17.3 | 18.1 | 14.8 | 3.80 | 1.55 | 1.52 | 4.68 | 38.6 J | 81.1 J | 59.9 | 27.0 | 21.6 | 19.4 | 21.4 | 25.0 |
| Iron | 2300 | - | - | 3920 | 13900 | 8180 | 1740 | 6840 | 6490 | 16100 | 16500 | 22900 | 23600 | 21900 | 3740 | 1830 | 2600 | 9800 | 5120 | 5950 | 5870 | 18,400 | 18,000 | 19,900 | 23,600 | 29,200 |
| Mercury | 0.78 | 0.71 | NOAA ER-M Marine | 0.0199 | 0.0957 | 0.0672 | 0.0122 | 0.207 | 0.236 | 0.269 | 0.149 | 0.101 | 0.136 | 0.0683 | 0.0169 | 0.0126 | | 0.0459 | 0.128 J | 0.217 J | 0.120 J | 0.161 | 0.121 | 0.106 | 0.0830 | 0.123 |
| Lead | | 218 | NOAA ER-M Marine | 45.3 | 164 L | 15.7 | 4.87 | 32.2 | 25.0 | 46.1 | 32.2 | 33.8 | 34.3 | 35.3 | 6.51 | 3.66 | 3.74 | 7.61 | 54.9 J | 186 J | 147 | 75.7 | 31.8 | 84.0 | 42.7 | 47.3 |
| Magnesium | - | - | - | 937 | 3120 | 1840 | 561 | 2340 | 2370 | 3930 | 4250 | 4420 | 4570 | 4070 | 805 | 467 | 654 | 1530 | 1940 | 2260 | 1960 | 5230 | 4060 | 4180 | 4430 | 5790 |
| Manganese | 160 | 260 | NOAA AET Marine | 24.0 | 81.0 | 54.7 | 9.72 | 63.0 | 60.8 | 109 | 108 | 121 | 131 | 109 | 22.1 | 13.2 | 16.4 | 39.2 | 60.1 | 58.1 | 50.1 | 125 | 111 | 116 | 122 | 158 |
| Nickel | 160 | 51.6 | NOAA ER-M Marine | 2.71 | 9.46 | 5.49 | 1.37 | 5.44 | 5.21 | 11.9 | 10.9 | 13.7 | 14.3 | 14.5 | 2.37 | 1.23 | 1.40 | 4.03 | 3.69 | 3.80 | 4.45 | 13.5 | 12.2 | 12.8 | 15.7 | 19.5 |
| Potassium | - | - | - | 541 | 1860 | 1200 | 298 | 727 | 737 | 2120 | 2240 | 2480 | 2490 | 2230 | 541 | 305 | 354 | 1150 | 492 | 570 | 568 | 2260 | 2200 | 2200 | 2860 | 3790 |
| Selenium | 39 | - | - | 0.355 | | 0.335 | | | | | | | | | | | | | | | | | | | | |
| Silver | 39 | 3.7 | NOAA ER-M Marine | 0.275 | 1.34 | 0.302 | | | | 0.482 | 0.421 | 0.454 | 0.440 | | 0.267 | | | 0.0430 | 0.718 J | 0.293 J | 0.349 | 0.419 | 0.558 | 0.479 | 0.460 | 0.621 |
| Sodium | - | - | - | 2620 | 5800 | 3750 | 2120 | 2580 | 2210 | 6390 | 7720 | 7180 | 7520 | 5210 | 1750 | 1460 | 1560 | 1910 | 2360 | 2110 | 2370 | 6040 | 5660 | 5360 | 6390 | 8460 |
| Thallium | 0.55 | - | - | | 0.572 | 0.352 | | | | | | | | | | | | | | | | | | | | |
| Vanadium | 55 | 57 | NOAA AET Marine | 8.03 | 26.6 | 16.0 | 4.17 | 14.5 | 13.8 | 31.9 | 29.5 | 35.1 | 37.0 | 34.0 | 7.83 | 4.25 | 5.52 | 19.3 | 10.2 | 11.50 | 12.6 | 39.7 | 36.1 | 36.0 | 43.9 | 53.1 |
| Zinc | 2300 | 410.0 | NOAA ER-M Marine | 21.0 | 84.4 | 37.8 | 11.9 | 65.9 | 68.1 | 115 | 101 | 120 | 123 | 121 | 18.4 | 9.95 | 10.8 | 30.0 | 73.4 | 68.3 | 96.8 | 134 | 96.5 | 108 | 124 | 157 |
| **PCTs (ug/kg)** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aroclor 5432 | 140 | 180 | NOAA ER-M Marine | | | | | 490 | 840 | 1800 | 1300 | | | | | | | | 6100 J | 2200 J | | 7200 J | | | | 2800 J |
| Aroclor 6040 | 140 | 180 | NOAA ER-M Marine | | 100 | | | | 100 J | 380 | | | | | | | | | | | | | | | | |
| Aroclor 6062 | 140 | 180 | NOAA ER-M Marine | | | | | | | | | | | | | | | | | | | | | | | |
| Aroclor 6070 | 140 | 180 | NOAA ER-M Marine | | | | | 89 J | | | 150 | | | | | | | | | | | | | | | |
| **Acid Volatile Sulfides (um/g)** | NV | - | - | 2.00 | 11.1 | 4.80 | 1.17 | 6.60 | 7.40 | 19.0 | 13.4 | 8.80 | 9.30 | 9.80 | | | | | | | | | | | | |

-Screening criteria unavailable
Blank cell - Analyte was not detected in any of the samples from the indicated investigation.
B - Concentration similar to low-level concentrations found in associated blanks.
J - Estimated value.
[1] Endrin used as surrogate

Indicates result exceeds Human Health Criteria
Indicates result exceeds Ecological Health Criteria
Indicates result exceeds Ecological and Human Health Criteria

## Table 2.2. Summary of PCB/PCT Arochlors, Back River, Langley Air Force Base, Virginia

*(Page 1 of 5)*

| Sample ID Number | PCB/PCT Arochlors (µg/kg) | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCB 1016 | Q | PCB 1221 | Q | PCB 1232 | Q | PCB 1242 | Q | PCB 1248 | Q | PCB 1254 | Q | PCB 1260 | Q | PCT 5432 | Q | PCT 5460 | Q | PCT 6040 | Q | PCT 6062 | Q | PCT 6070 | Q | Total |
| INS-A1-01 | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 88 | U | 88 | U | 88 | U | 88 | U | 88 | U | 0 |
| INS-A2-01 | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 87 | U | 87 | U | 87 | U | 87 | U | 87 | U | 0 |
| INS-A3-01 | 58 | U | 58 | U | 58 | U | 58 | U | 58 | U | 58 | U | 58 | U | 120 | U | 120 | U | 120 | U | 120 | U | 120 | U | 0 |
| INS-A4-01 | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | **64** | | 46 | U | 92 | U | 92 | U | 92 | U | 92 | U | 92 | U | 64 |
| INS-A5-01 | 59 | U | 59 | U | 59 | U | 59 | U | 59 | U | 59 | U | 59 | U | 120 | U | 120 | U | 120 | U | 120 | U | 120 | U | 0 |
| INS-A6-01 | 53 | U | 53 | U | 53 | U | 53 | U | 53 | U | 53 | U | 53 | U | 110 | U | 110 | U | 110 | U | 110 | U | 110 | U | 0 |
| INS-A7-01 | 260 | U | 260 | U | 260 | U | 260 | U | 260 | U | 260 | U | 260 | U | 510 | U | 510 | U | 510 | U | 510 | U | 510 | U | 0 |
| INS-A8-01 | 47 | U | 47 | U | 47 | U | 47 | U | 47 | U | **23** | **J** | 47 | U | 94 | U | 94 | U | 94 | U | 94 | U | 94 | U | 23 |
| INS-A9-01 | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | **25** | **J** | 44 | U | 88 | U | 88 | U | 88 | U | 88 | U | 88 | U | 25 |
| INS-A9-31 | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | **79** | | 45 | U | 90 | U | **23** | **JP** | 90 | U | 90 | U | 90 | U | 102 |
| INS-A10-01 | 49 | U | 49 | U | 49 | U | 49 | U | 49 | U | 49 | U | 49 | U | 98 | U | 98 | U | 98 | U | 98 | U | 98 | U | 0 |
| INS-A11-01 | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 91 | U | 91 | U | 91 | U | 91 | U | 91 | U | 0 |
| INS-A12-01 | 54 | U | 54 | U | 54 | U | 54 | U | 54 | U | 54 | U | 54 | U | 110 | U | 110 | U | 110 | U | 110 | U | 110 | U | 0 |
| INS-A13-01 | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 89 | U | 89 | U | 89 | U | 89 | U | 89 | U | 0 |
| INS-A14-01 | 55 | U | 55 | U | 55 | U | 55 | U | 55 | U | **100** | | 55 | U | 110 | U | 110 | U | 110 | U | 110 | U | 110 | U | 100 |
| INS-A15-01 | 49 | U | 49 | U | 49 | U | 49 | U | 49 | U | 49 | U | **25** | **J** | 98 | U | 98 | U | 98 | U | 98 | U | 98 | U | 25 |
| INS-A16-01 | 63 | U | 63 | U | 63 | U | 63 | U | 63 | U | **98** | | 63 | U | 130 | U | 130 | U | 130 | U | 130 | U | 130 | U | 98 |
| INS-A17-01 | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | **12** | **J** | 44 | U | 88 | U | 88 | U | 88 | U | 88 | U | 88 | U | 12 |
| INS-A18-01 | 47 | U | 47 | U | 47 | U | 47 | U | 47 | U | **340** | | 47 | U | 93 | U | **45** | **J** | 93 | U | 93 | U | 93 | U | 385 |
| INS-A18-31 | 47 | U | 47 | U | 47 | U | 47 | U | 47 | U | **86** | | 47 | U | 93 | U | 93 | U | 93 | U | 93 | U | 93 | U | 86 |
| INS-A19-01 | 96 | U | 96 | U | 96 | U | 96 | U | 96 | U | 96 | U | 96 | U | 190 | U | 190 | U | 190 | U | 190 | U | 190 | U | 0 |
| INS-A20-01 | 72 | U | 72 | U | 72 | U | 72 | U | 72 | U | 72 | U | **85** | ***** | 150 | U | 150 | U | 150 | U | 150 | U | 150 | U | 85 |
| INS-A21-01 | 2200 | U | 2200 | U | 2200 | U | 2200 | U | 2200 | U | **3600** | | 2200 | U | 4400 | U | **370** | **J** | 4400 | U | 4400 | U | 4400 | U | 3970 |
| INS-A21-51 | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 0 |
| INS-A22-01 | 2300 | U | 2300 | U | 2300 | U | 2300 | U | 2300 | U | **14000** | | 2300 | U | 4700 | U | **1200** | **J** | 4700 | U | 4700 | U | 4700 | U | 15200 |
| INS-A23-01 | 61 | U | 61 | U | 61 | U | 61 | U | 61 | U | **160** | | 61 | U | 120 | U | 120 | U | 120 | U | 120 | U | 120 | U | 160 |
| INS-A24-01 | 110 | U | 110 | U | 110 | U | 110 | U | 110 | U | **790** | | 110 | U | 210 | U | **79** | **J** | 210 | U | 210 | U | 210 | U | 869 |
| INS-A24-31 | 260 | U | 260 | U | 260 | U | 260 | U | 260 | U | **850** | | 260 | U | 520 | U | **71** | **J** | 520 | U | 520 | U | 520 | U | 921 |
| INS-A25-01 | 95 | U | 95 | U | 95 | U | 95 | U | 95 | U | **700** | | | U | 190 | U | **51** | **J** | 190 | U | 190 | U | 190 | U | 751 |

## Table 2.2. Summary of PCB/PCT Arochlors, Back River, Langley Air Force Base, Virginia

*(Page 2 of 5)*

| Sample ID Number | PCB/PCT Arochlors (µg/kg) | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PCB 1016** | **Q** | **PCB 1221** | **Q** | **PCB 1232** | **Q** | **PCB 1242** | **Q** | **PCB 1248** | **Q** | **PCB 1254** | **Q** | **PCB 1260** | **Q** | **PCT 5432** | **Q** | **PCT 5460** | **Q** | **PCT 6040** | **Q** | **PCT 6062** | **Q** | **PCT 6070** | **Q** | **Total** |
| INS-A26-01 | 450 | U | 450 | U | 450 | U | 450 | U | 450 | U | **1300** | | | U | 890 | U | **100** | **J** | 890 | U | 890 | U | 890 | U | 1400 |
| INS-A27-01 | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | **200** | | 45 | U | 89 | U | 89 | U | 89 | U | 89 | U | 89 | U | 200 |
| INS-A28-01 | 100 | U | 100 | U | 100 | U | 100 | U | 100 | U | **710** | 450 **P** | 100 | U | 200 | U | **460** | | 200 | U | 200 | U | 200 | U | 1170 |
| INS-A29-01 | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | **78** | | 44 | U | 88 | U | 88 | U | 88 | U | 88 | U | 88 | U | 78 |
| INS-A30-01 | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | **410** | | 87 | U | 87 | U | 87 | U | 87 | U | 410 |
| INS-A31-01 | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | **220** | | 87 | U | 87 | U | 87 | U | 87 | U | 220 |
| INS-A32-01 | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | **96** | | | U | 90 | U | **110** | | 90 | U | 90 | U | 90 | U | 206 |
| INS-A33-01 | 50 | U | 50 | U | 50 | U | 50 | U | 50 | U | 50 | U | 50 | U | **940** | | 99 | U | 99 | U | 99 | U | 99 | U | 940 |
| INS-A34-01 | 71 | U | 71 | U | 71 | U | 71 | U | 71 | U | **110** | 45 ***P** | 71 | U | 140 | U | 140 | U | 140 | U | 140 | U | 140 | U | 110 |
| INS-A35-01 | 82 | U | 82 | U | 82 | U | 82 | U | 82 | U | 82 | U | **38** | **JP** | 160 | U | 160 | U | 160 | U | 160 | U | 160 | U | 38 |
| INS-A36-01 | 61 | U | 61 | U | 61 | U | 61 | U | 61 | U | 61 | U | 61 | U | **1400** | | 120 | U | 120 | U | 120 | U | 120 | U | 1400 |
| INS-A37-01 | 42 | U | 42 | U | 42 | U | 42 | U | 42 | U | **100** | | | U | **710** | | 84 | U | 84 | U | 84 | U | 84 | U | 810 |
| INS-A37-31 | 41 | U | 41 | U | 41 | U | 41 | U | 41 | U | **110** | | | U | **490** | | 83 | U | 83 | U | 83 | U | 83 | U | 600 |
| INS-A38-01 | 60 | U | 60 | U | 60 | U | 60 | U | 60 | U | **250** | 42 **P** | 60 | U | **2000** | | 120 | U | 120 | U | 120 | U | 120 | U | 2250 |
| INS-A39-01 | 66 | U | 66 | U | 66 | U | 66 | U | 66 | U | **50** | 41 **J** | 66 | U | **200** | **P** | 130 | U | 130 | U | 130 | U | 130 | U | 250 |
| INS-A40-01 | 78 | U | 78 | U | 78 | U | 78 | U | 78 | U | **90** | | | U | **430** | **P** | 160 | U | 160 | U | 160 | U | 160 | U | 520 |
| INS-A41-01 | 76 | U | 76 | U | 76 | U | 76 | U | 76 | U | **150** | **P** | 76 | U | 150 | U | 150 | U | 150 | U | 150 | U | 150 | U | 150 |
| INS-A42-01 | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | 43 | 78 U | **210** | **P** | 85 | U | 85 | U | 85 | U | 85 | U | 85 | U | 210 |
| INS-A43-01 | 88 | U | 88 | U | 88 | U | 88 | U | 88 | U | 88 | U | 88 | U | 180 | U | 180 | U | 180 | U | 180 | U | 180 | U | 0 |
| INS-A44-01 | 86 | U | 86 | U | 86 | U | 86 | U | 86 | U | 86 | U | 86 | U | 170 | U | 170 | U | 170 | U | 170 | U | 170 | U | 0 |
| INS-A45-01 | 69 | U | 69 | U | 69 | U | 69 | U | 69 | U | **140** | **P** | 69 | U | **300** | **P** | 140 | U | 140 | U | 140 | U | 140 | U | 440 |
| INS-A46-01 | 88 | U | 88 | U | 88 | U | 88 | U | 88 | U | **95** | | 88 | U | 180 | U | 180 | U | 180 | U | 180 | U | 180 | U | 95 |
| INS-A46-51 | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 0 |
| INS-A47-01 | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | **69** | **P** | 46 | U | 91 | U | 91 | U | 91 | U | 91 | U | 91 | U | 69 |
| INS-A48-01 | 80 | U | 80 | U | 80 | U | 80 | U | 80 | U | 80 | U | 80 | U | 160 | U | 160 | U | 160 | U | 160 | U | 160 | U | 0 |
| INS-A48-31 | 82 | U | 82 | U | 82 | U | 82 | U | 82 | U | 82 | U | 82 | U | 160 | U | 160 | U | 160 | U | 160 | U | 160 | U | 0 |
| INS-A49-01 | 85 | U | 85 | U | 85 | U | 85 | U | 85 | U | 85 | U | 85 | U | 170 | U | 170 | U | 170 | U | 170 | U | 170 | U | 0 |
| INS-A50-01 | 79 | U | 79 | U | 79 | U | 79 | U | 79 | U | **140** | | 79 | U | 160 | U | 160 | U | 160 | U | 160 | U | 160 | U | 140 |
| INS-A51-01 | 86 | U | 86 | U | 86 | U | 86 | U | 86 | U | 86 | U | 86 | U | 170 | U | 170 | U | 170 | U | 170 | U | 170 | U | 0 |

# Table 2.2. Summary of PCB/PCT Arochlors, Back River, Langley Air Force Base, Virginia

*(Page 3 of 5)*

| Sample ID Number | PCB/PCT Arochlors (µg/kg) | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PCB 1016** | **Q** | **PCB 1221** | **Q** | **PCB 1232** | **Q** | **PCB 1242** | **Q** | **PCB 1248** | **Q** | **PCB 1254** | **Q** | **PCB 1260** | **Q** | **PCT 5432** | **Q** | **PCT 5460** | **Q** | **PCT 6040** | **Q** | **PCT 6062** | **Q** | **PCT 6070** | **Q** | **Total** |
| INS-A52-01 | 78 | U | 78 | U | 78 | U | 78 | U | 78 | U | 78 | U | 78 | U | 160 | U | 160 | U | 160 | U | 160 | U | 160 | U | 0 |
| INS-A52-31 | 76 | U | 76 | U | 76 | U | 76 | U | 76 | U | 76 | U | 76 | U | 150 | U | 150 | U | 150 | U | 150 | U | 150 | U | 0 |
| INS-A53-01 | 81 | U | 81 | U | 81 | U | 81 | U | 81 | U | 81 | U | 81 | U | 160 | U | 160 | U | 160 | U | 160 | U | 160 | U | 0 |
| INS-A54-01 | 69 | U | 69 | U | 69 | U | 69 | U | 69 | U | 69 | U | 69 | U | 140 | U | 140 | U | 140 | U | 140 | U | 140 | U | 0 |
| INS-A55-01 | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | **26** | **J** | 46 | U | 92 | U | 92 | U | 92 | U | 92 | U | 92 | U | 26 |
| INS-A56-01 | 56 | U | 56 | U | 56 | U | 56 | U | 56 | U | 56 | U | **24** | **J*** | 110 | U | 110 | U | 110 | U | 110 | U | 110 | U | 24 |
| INS-A57-01 | 59 | U | 59 | U | 59 | U | 59 | U | 59 | U | 59 | U | 59 | U | 120 | U | **140** | **P** | 120 | U | 120 | U | 120 | U | 140 |
| INS-B1-01 | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 92 | U | 92 | U | 92 | U | 92 | U | 92 | U | 0 |
| INS-B14-01 | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 89 | U | 89 | U | 89 | U | 89 | U | 89 | U | 0 |
| INS-B33-01 | 58 | U | 58 | U | 58 | U | 58 | U | 58 | U | 58 | U | 58 | U | 120 | U | 120 | U | 120 | U | 120 | U | 120 | U | 0 |
| INS-B42-01 | 78 | U | 78 | U | 78 | U | 78 | U | 78 | U | 78 | U | 78 | U | 160 | U | 160 | U | 160 | U | 160 | U | 160 | U | 0 |
| INS-C1-01 | 48 | U | 48 | U | 48 | U | 48 | U | 48 | U | 48 | U | 48 | U | 97 | U | 97 | U | 97 | U | 97 | U | 97 | U | 0 |
| INS-C14-01 | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 91 | U | 91 | U | 91 | U | 91 | U | 91 | U | 0 |
| INS-C33-01 | 61 | U | 61 | U | 61 | U | 61 | U | 61 | U | 61 | U | 61 | U | 120 | U | 120 | U | 120 | U | 120 | U | 120 | U | 0 |
| INS-C42-01 | 74 | U | 74 | U | 74 | U | 74 | U | 74 | U | 74 | U | 74 | U | 150 | U | 150 | U | 150 | U | 150 | U | 150 | U | 0 |
| OF4-A1-01 | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | **23** | **J** | 45 | U | 90 | U | 90 | U | 90 | U | 90 | U | 90 | U | 23 |
| OF4-A2-01 | 200 | U | 200 | U | 200 | U | 200 | U | **1400** | **P** | 200 | U | 200 | U | 410 | U | 410 | U | 410 | U | 410 | U | 410 | U | 1400 |
| OF4-A3-01 | 55 | U | 55 | U | 55 | U | 55 | U | 55 | U | 250 | U | **55** | | 110 | U | 110 | U | 110 | U | 110 | U | 110 | U | 55 |
| OF4-A4-01 | 76 | U | 76 | U | 76 | U | 610 | U | 76 | U | **76** | | 76 | U | 150 | U | 150 | U | 150 | U | 150 | U | 150 | U | 76 |
| OF4-A5-01 | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | **260** | | 46 | U | 92 | U | 92 | U | 92 | U | 92 | U | 92 | U | 260 |
| OF4-A6-01 | 59 | U | 59 | U | 59 | U | 59 | U | 59 | U | **520** | | | U | 120 | U | **100** | **J** | 120 | U | 120 | U | 120 | U | 620 |
| OF4-A7-01 | 51 | U | 51 | U | 51 | U | 51 | U | 51 | U | **70** | **P** | 51 | U | 100 | U | **17** | **J** | 100 | U | 100 | U | 100 | U | 87 |
| OF4-A8-01 | 52 | U | 52 | U | 52 | U | 52 | U | 52 | U | **220** | **P** | 52 | U | 100 | U | 100 | U | 100 | U | 100 | U | 100 | U | 220 |
| OF4-A9-01 | 62 | U | 62 | U | 62 | U | 62 | U | 62 | U | 62 | U | 62 | U | 130 | U | 130 | U | 130 | U | 130 | U | 130 | U | 0 |
| OF4-A10-01 | 58 | U | 58 | U | 58 | U | 58 | U | 58 | U | **110** | **P** | 58 | U | 120 | U | **140** | | 120 | U | 120 | U | 120 | U | 250 |
| OF4-A10-51 | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 0 |
| OF4-A11-01 | 48 | U | 48 | U | 48 | U | 48 | U | 48 | U | 48 | U | **110** | ***** | 96 | U | **230** | | 96 | U | 96 | U | 96 | U | 340 |
| OF4-A12-01 | 57 | U | 57 | U | 57 | U | 57 | U | 57 | U | **57** | | 150 | U | 110 | U | 110 | U | 110 | U | 110 | U | 110 | U | 57 |
| OF4-A13-01 | 63 | U | 63 | U | 63 | U | **63** | | 63 | U | 320 | U | 63 | U | 130 | U | 130 | U | 130 | U | 130 | U | 130 | U | 63 |

# Table 2.2. Summary of PCB/PCT Arochlors, Back River, Langley Air Force Base, Virginia

*(Page 4 of 5)*

| Sample ID Number | PCB/PCT Arochlors (µg/kg) | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PCB 1016 | Q | PCB 1221 | Q | PCB 1232 | Q | PCB 1242 | Q | PCB 1248 | Q | PCB 1254 | Q | PCB 1260 | Q | PCT 5432 | Q | PCT 5460 | Q | PCT 6040 | Q | PCT 6062 | Q | PCT 6070 | Q | Total |
| OF4-A14-01 | **420** | ***P** | 92 | U | 92 | U | 92 | U | 92 | U | **470** | | 92 | U | 180 | U | 180 | U | 180 | U | 180 | U | 180 | U | 890 |
| OF4-A14-31 | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | **330** | | | U | 88 | U | **360** | | 88 | U | 88 | U | 88 | U | 690 |
| OF4-A15-01 | 39 | U | 39 | U | 39 | U | 39 | U | 39 | U | **120** | | | U | 78 | U | **120** | | 78 | U | 78 | U | 78 | U | 240 |
| OF4-A16-01 | 42 | U | 42 | U | 42 | U | 42 | U | 42 | U | **120** | 44 | 42 | U | 84 | U | 84 | U | 84 | U | 84 | U | 84 | U | 120 |
| OF4-A17-01 | 65 | U | 65 | U | 65 | U | 65 | U | 65 | U | **34** | **JP** 39 | 65 | U | 130 | U | **190** | **P** | 130 | U | 130 | U | 130 | U | 224 |
| OF4-A18-01 | 57 | U | 57 | U | 57 | U | 57 | U | 57 | U | **160** | **P** | 57 | U | 110 | U | **62** | **J** | 110 | U | 110 | U | 110 | U | 222 |
| OF4-A19-01 | 60 | U | 60 | U | 60 | U | 60 | U | 60 | U | **210** | **P** | 60 | U | **590** | **P** | 120 | U | 120 | U | 120 | U | 120 | U | 800 |
| OF4-A20-01 | 330 | U | 330 | U | 330 | U | 330 | U | 330 | U | **1100** | **P** | 330 | U | 660 | U | **270** | **J** | 660 | U | 660 | U | 660 | U | 1370 |
| OF4-A20-31 | 66 | U | 66 | U | 66 | U | 66 | U | 66 | U | **76** | ***** | 66 | U | 130 | U | 130 | U | 130 | U | 130 | U | 130 | U | 76 |
| OF4-B1-01 | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 90 | U | 90 | U | 90 | U | 90 | U | 90 | U | 0 |
| OF4-B2-01 | 240 | U | 240 | U | 240 | U | 240 | U | 240 | U | 240 | U | **400** | | | U | **130** | **J*** | 480 | U | 480 | U | 480 | U | 530 |
| OF4-B3-01 | 49 | U | 49 | U | 49 | U | 49 | U | 49 | U | **32** | **JP** | 49 | U 480 | 98 | U | 98 | U | 98 | U | 98 | U | 98 | U | 32 |
| OF4-B4-01 | 66 | U | 66 | U | 66 | U | 66 | U | 66 | U | 66 | U | 66 | U | 130 | U | 130 | U | 130 | U | 130 | U | 130 | U | 0 |
| OF4-B5-01 | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 91 | U | 91 | U | 91 | U | 91 | U | 91 | U | 0 |
| OF4-C1-01 | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 45 | U | 91 | U | 91 | U | 91 | U | 91 | U | 91 | U | 0 |
| OF4-C2-01 | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | **18** | **J** | 91 | U | **11** | **J*** | 91 | U | 91 | U | 91 | U | 29 |
| OF4-C3-01 | 48 | U | 48 | U | 48 | U | 48 | U | 48 | U | 48 | U | 48 | U | 96 | U | 96 | U | 96 | U | 96 | U | 96 | U | 0 |
| OF4-C4-01 | 62 | U | 62 | U | 62 | U | 62 | U | 62 | U | 62 | U | 62 | U | 130 | U | 130 | U | 130 | U | 130 | U | 130 | U | 0 |
| OF4-C5-01 | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 89 | U | 89 | U | 89 | U | 89 | U | 89 | U | 0 |
| OF4-D5-01 | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 44 | U | 87 | U | 87 | U | 87 | U | 87 | U | 87 | U | 0 |
| OUS-A1-01 | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | 86 | U | 86 | U | 86 | U | 86 | U | 86 | U | 0 |
| OUS-A1-01-2 | 33 | U | 33 | U | 33 | U | 33 | U | 33 | U | 33 | U | 33 | U | 67 | U | 67 | U | 67 | U | 67 | U | 67 | U | 0 |
| OUS-A2-01 | 42 | U | 42 | U | 42 | U | 42 | U | 42 | U | 42 | U | 42 | U | 85 | U | 85 | U | 85 | U | 85 | U | 85 | U | 0 |
| OUS-A2-51 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 0 |
| OUS-A3-01 | 210 | U | 210 | U | 210 | U | 210 | U | 210 | U | 210 | U | 210 | U | 420 | U | 420 | U | 420 | U | 420 | U | 420 | U | 0 |
| OUS-A3-31 | 210 | U | 210 | U | 210 | U | 210 | U | 210 | U | 210 | U | 210 | U | 420 | U | 420 | U | 420 | U | 420 | U | 420 | U | 0 |
| OUS-A4-01 | 47 | U | 47 | U | 47 | U | 47 | U | 47 | U | 47 | U | 47 | U | 94 | U | 94 | U | 94 | U | 94 | U | 94 | U | 0 |
| OUS-A5-01 | 63 | U | 63 | U | 63 | U | 63 | U | 63 | U | 63 | U | 63 | U | 130 | U | 130 | U | 130 | U | 130 | U | 130 | U | 0 |
| OUS-A5-31 | 63 | U | 63 | U | 63 | U | 63 | U | 63 | U | 63 | U | 63 | U | 130 | U | 130 | U | 130 | U | 130 | U | 130 | U | 0 |

# Table 2.2. Summary of PCB/PCT Arochlors, Back River, Langley Air Force Base, Virginia

*(Page 5 of 5)*

| Sample ID Number | PCB/PCT Arochlors (µg/kg) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PCB 1016** | **Q** | **PCB 1221** | **Q** | **PCB 1232** | **Q** | **PCB 1242** | **Q** | **PCB 1248** | **Q** | **PCB 1254** | **Q** | **PCB 1260** | **Q** | **PCT 5432** | **Q** | **PCT 5460** | **Q** | **PCT 6040** | **Q** | **PCT 6062** | **Q** | **PCT 6070** | **Q** | **Total** |
| OUS-A6-01 | 60 | U | 60 | U | 60 | U | 60 | U | 60 | U | 60 | U | 60 | U | 120 | U | 120 | U | 120 | U | 120 | U | 120 | U | 0 |
| OUS-A7-01 | 60 | U | 60 | U | 60 | U | 60 | U | 60 | U | 60 | U | 60 | U | 120 | U | 120 | U | 120 | U | 120 | U | 120 | U | 0 |
| OUS-A8-01 | 57 | U | 57 | U | 57 | U | 57 | U | 57 | U | 57 | U | 57 | U | 110 | U | 110 | U | 110 | U | 110 | U | 110 | U | 0 |
| OUS-A9-01 | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | 91 | U | 91 | U | 91 | U | 91 | U | 91 | U | 0 |
| OUS-A10-01 | 55 | U | 55 | U | 55 | U | 55 | U | 55 | U | 55 | U | **18** | **J** | 110 | U | 110 | U | 110 | U | 110 | U | 110 | U | 18 |
| OUS-A11-01 | 72 | U | 72 | U | 72 | U | 72 | U | 72 | U | **130** | **P** | 72 | U | 140 | U | 140 | U | 140 | U | 140 | U | 140 | U | 130 |
| OUS-A12-01 | 52 | U | 52 | U | 52 | U | 52 | U | 52 | U | **57** | | 52 | U | 100 | U | 100 | U | 100 | U | 100 | U | 100 | U | 57 |
| OUS-A12-51 | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 1 | U | 2 | U | 2 | U | 2 | U | 2 | U | 2 | U | 0 |
| OUS-A13-01 | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | **160** | | | U | 92 | U | **110** | | 92 | U | 92 | U | 92 | U | 270 |
| OUS-A13-31 | 46 | U | 46 | U | 46 | U | 46 | U | 46 | U | **120** | | 46 | U | 92 | U | 92 | U | 92 | U | 92 | U | 92 | U | 120 |
| OUS-A14-01 | 47 | U | 47 | U | 47 | U | 47 | U | 47 | U | 47 | U 46 | 47 | U | 94 | U | 94 | U | 94 | U | 94 | U | 94 | U | 0 |
| OUS-B9-01 | 42 | U | 42 | U | 42 | U | 42 | U | 42 | U | 42 | U | 42 | U | 84 | U | 84 | U | 84 | U | 84 | U | 84 | U | 0 |
| OUS-C9-01 | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | 43 | U | 86 | U | 86 | U | 86 | U | 86 | U | 86 | U | 0 |
| TMC-A1-01 | 62 | U | 62 | U | 62 | U | 62 | U | 62 | U | 62 | U | 62 | U | 130 | U | 130 | U | 130 | U | 130 | U | 130 | U | 0 |
| TMC-A2-01 | 66 | U | 66 | U | 66 | U | 66 | U | 66 | U | 66 | U | 66 | U | 130 | U | 130 | U | 130 | U | 130 | U | 130 | U | 0 |
| TMC-A3-01 | 68 | U | 68 | U | 68 | U | 68 | U | 68 | U | 68 | U | 68 | U | 140 | U | 140 | U | 140 | U | 140 | U | 140 | U | 0 |
| TMC-A3-31 | 70 | U | 70 | U | 70 | U | 70 | U | 70 | U | 70 | U | 70 | U | 140 | U | 140 | U | 140 | U | 140 | U | 140 | U | 0 |
| TMC-A4-01 | 69 | U | 69 | U | 69 | U | 69 | U | 69 | U | 69 | U | 69 | U | 140 | U | 140 | U | 140 | U | 140 | U | 140 | U | 0 |
| TMC-A4-51 | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 1.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 2.1 | U | 0 |
| TMC-B1-01 | 53 | U | 53 | U | 53 | U | 53 | U | 53 | U | 53 | U | 53 | U | 110 | U | 110 | U | 110 | U | 110 | U | 110 | U | 0 |
| TMC-C1-01 | 64 | U | 64 | U | 64 | U | 64 | U | 64 | U | 64 | U | 64 | U | 130 | U | 130 | U | 130 | U | 130 | U | 130 | U | 0 |

Qualifier Definitions:
U – Indicates that the compound was analyzed for but not detected.
J – Indicates that the value is less than the reporting limit but greater than the Method Detection Limit (MDL).
P – Indicates that there is greater than 25% difference for detected Arochlor results between the two GC columns.
* – Indicates that the duplicate analysis was not within control limits.

## Table 2.3. PCB Congener Analysis for Two Sample Locations, Back River, Langley Air Force Base, Virginia

*(Page 1 of 3)*

| Congener Number | PCB Species Name | Inner Shoreline ID Number and Concentration (µg/kg) | | Outfall 004 ID Number and Concentration (µg/kg) | | |
|---|---|---|---|---|---|---|
| | | INS-A10-01 | INS-A47-01 | OF4-A2-01 | OF4-A3-01 | OF4-A3-31 |
| 1 | 2-Chlorobiphenyl | ND | ND | ND | ND | ND |
| 3 | 4-Chlorobiphenyl | ND | ND | ND | ND | ND |
| 5 | 2,3-Dichlorobiphenyl | ND | ND | B | ND | ND |
| 7 | 2,4’-Dichlorobiphenyl | ND | ND | 1.2 J,COL | 2.4 | 1.6 J |
| 15 | 4,4’-Dichlorobiphenyl | ND | ND | ND | ND | ND |
| 18 | 2,2’,5-Trichlorobiphenyl | ND | ND | 4.3 | 5.2 | 3.1 |
| 28 | 2,4,4’-Trichlorobiphenyl | ND | 2.8 J | 5.4 J | 5.0 J | 3.3 J |
| 29 | 2,4’,5-Trichlorobiphenyl | ND | 2.1 J | 4.5 J | 4.2 J | 2.6 J |
| 37 | 3,4’,4’-Trichlorobiphenyl | ND | ND | ND | 1.5 J,COL | ND |
| 43 | 2,2’,3,5’-Tetrachlorobiphenyl | ND | 4.5 | 8.3 | 12 | 7.1 |
| 48 | 2,2’,4,5’-Tetrachlorobiphenyl | 0.27 J | 3.5 | 6.5 | 7.3 | 4.5 |
| 52 | 2,2’,5,5’-Tetrachlorobiphenyl | 0.47 J | 9.1 | 13 | 27 | 15 |
| 60 | 2,3’,4,4’-Tetrachlorobiphenyl | 0.17 J,COL | 3.3 COL | 7.6 COL | 6.7 COL | 4.0 COL |
| 61 | 2,3’,4’,5’-Tetrachlorobiphenyl | ND | 7.2 | 12 | 20 | 11 |
| 74 | 2,4,4’,5’-Tetrachlorobiphenyl | ND | 1.9 | 4.5 | 4.5 | 2.6 |
| 77 | 3,3’,4,4’-Tetrachlorobiphenyl | ND | ND | ND | ND | ND |
| 81 | 3,4,4’,5-Tetrachlorobiphenyl | ND | ND | ND | ND | ND |
| 87 | 2,2’,3,4,5’-Pentachlorobiphenyl | 0.31 J,COL | 8.2 COL | 7.3 COL | 22 COL | 13 COL |
| 86 | 2,2’,3,4,5-Pentachlorobiphenyl | ND | ND | ND | ND | ND |
| 99 | 2,2’,4,4’,5-Pentachlorobiphenyl | 0.50 J | 8.0 | 8.1 | 19.0 | 10 |
| 101 | 2,2’,4,5,5’-Pentachlorobiphenyl | 1.0 | 14 COL | 37 | 43 | 25 |
| 105 | 2,3,3’,4,4’-Pentachlorobiphenyl | 0.27 J | 6.4 | 6.2 | 17 | 9.6 |
| 108 | 2,3,3’,4’,5-Pentachlorobiphenyl | 0.86 J | 20 | 18 COL | 50 | 29 |
| 114 | 2,3,4,4’,5-Pentachlorobiphenyl | ND | 0.53 J,COL | 1.8 J,COL | 1.2 J,COL | 0.71 J,COL |
| 115 | 2,3,4,4’,6-Pentachlorobiphenyl | ND | 0.19 J,COL | ND | 1.0 J,COL | 0.52 J,COL |
| 118 | 2,3’,4,4’,5-Pentachlorobiphenyl | 0.70 J,COL | 16 | 14 | 41 | 22 |
| 119 | 2,3’,4,4’,6-Pentachlorobiphenyl | ND | ND | ND | 0.82 J | 0.52 J,COL |

## Table 2.3. PCB Congener Analysis for Two Sample Locations, Back River, Langley Air Force Base, Virginia

*(Page 2 of 3)*

| Congener Number | PCB Species Name | Inner Shoreline ID Number and Concentration (µg/kg) | | Outfall 004 ID Number and Concentration (µg/kg) | | |
|---|---|---|---|---|---|---|
| | | INS-A10-01 | INS-A47-01 | OF4-A2-01 | OF4-A3-01 | OF4-A3-31 |
| 118 | 2,3',4,4',5'-Pentachlorobiphenyl | ND | ND I | 1.3 J | ND | ND |
| 126 | 3,3',4,4',5'-Pentachlorobiphenyl | ND | ND | ND | ND | ND |
| 128 | 2,2',3,3',4,4'-Hexachlorobiphenyl | 0.22 J | 4.1 | 3.2 | 11 | 5.9 |
| 137 | 2,2',3,4,4',5'-Hexachlorobiphenyl | 0.81 J | 17 | 14 | 41 | 24 |
| 138 | 2,2',3,4,5,5'-Hexachlorobiphenyl | ND | 3.1 | 2.8 | 8.2 | 4.7 |
| 149 | 2,2',3,4',5',6-Hexachlorobiphenyl | 0.75 J | 12 COL | 9.5 | 29 | 17 |
| 151 | 2,2',3,5,5',6-Hexachlorobiphenyl | ND | 2.6 | 2.3 | 6.5 | 3.7 |
| 153 | 2,2',4,4',5,5'-Hexachlorobiphenyl | 0.89 J | 14 | 11 | 33 | 19 |
| 156 | 2,3,3',4,4',5-Hexachlorobiphenyl | ND | 1.9 | 1.6 J | 5.1 | 2.9 |
| 157 | 2,3,3',4,4',5'-Hexachlorobiphenyl | ND | ND | ND | 1.4 J, COL | 0.84 J,COL |
| 158 | 2,3,3',4,4',6-Hexachlorobiphenyl | ND | 3.2 | 2.6 | 8.1 | 4.6 |
| 167 | 2,3',4,4',5,5'-Hexachlorobiphenyl | ND | 1.1 | 0.81 J,COL | 2.3 | 1.3 J |
| 168 | 2,3',4,4',5',6-Hexachlorobiphenyl | ND | ND | ND | ND | ND |
| 169 | 3,3',4,4',5,5'-Hexachlorobiphenyl | ND | ND | ND | ND | ND |
| 170 | 2,2',3,3',4,4',5-Heptachlorobiphenyl | ND | 4.1 | 3.4 | 8.7 | 5.2 |
| 174 | 2,2',3,3',4,5',6'-Heptachlorobiphenyl | ND | 1.6 COL | 1.5 J | 3.3 | 2.2 |
| 180 | 2,2',3,4,4',5,5'-Heptachlorobiphenyl | ND | 5.1 | 6.3 | 14 | 8.2 |
| 183 | 2,2',3,4,4',5',6-Heptachlorobiphenyl | ND | 1.6 | 1.9 | 4.0 | 2.5 |
| 184 | 2,2',3,4,4',6,6'-Heptachlorobiphenyl | ND | ND | ND | ND | ND |
| 185 | 2,2',3,4',5,5',6-Heptachlorobiphenyl | 0.20 J | 3.0 | 3.4 | 6.8 | 4.5 |
| 189 | 2,3,3',4,4',5,5'-Heptachlorobiphenyl | ND | ND | ND | 0.44 J,COL | ND |
| 194 | 2,2',3,3',4,4',5,5'-Octachlorobiphenyl | ND | ND G | 2.0 | 3.9 | 2.7 |
| 195 | 2,2',3,3',4,4',5,6-Octachlorobiphenyl | ND | 0.38 J,COL | 0.71 J | 1.1 J,COL | 0.71 J,COL |
| 201 | 2,2',3,3',4,5',6,6'-Octachlorobiphenyl | ND | ND | ND | ND | ND |
| 203 | 2,2',3,3',4,5,5',6'-Octachlorobiphenyl | ND | ND G | 3.0 | 7.3 | ND G |
| 202 | 2,2',3,3',5,5',6,6'-Octachlorobiphenyl | ND | 3.3 | ND | 8.6 | 4.2 |

## Table 2.3. PCB Congener Analysis for Two Sample Locations, Back River, Langley Air Force Base, Virginia



| Congener Number | Congeners of Polychlorinated Biphenyls | Inner Shoreline ID Number and Concentration (µg/kg) | | Outfall 004 ID Number and Concentration (µg/kg) | | |
|---|---|---|---|---|---|---|
| | | INS-A10-01 | INS-A47-01 | OF4-A2-01 | OF4-A3-01 | OF4-A3-31 |
| 205 | 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl | ND | 0.82 J,B | 2.1 | 2.3 | 1.6 J |
| 207 | 2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl | ND | ND | ND | ND | ND |
| 208 | 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl | ND | 1.2 | 1.1 J,COL | 0.68 J | ND |

J - Estimated result. Result is less than reporting limit.
COL - More than 40% reported between primary and confirmation column results. Lower of the two results is reported.
I - Matrix interference.
G - Elevated reporting limit. The reporting limit is elevated due to matrix interference.
B - Method blank contamination. The associated method blank contains the target analyte at a reportable level.

## Table 2.4. Results of Back River Benthic Macroinvertebrate Sampling at Site SS-63, Langley AFB, Virginia

*(Page 1 of 2)*

| | SD-01 | SD-02 | SD-03 | SD-04 | SD-05 | SD-06 | SD-07 | SD-08 | SD-09 | SD-10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Depth** | 4.00 | 4.50 | 5.00 | 6.00 | 6.00 | 5.00 | 3.00 | 3.50 | 4.00 | 4.50 |
| **Temperature ($^o$C)** | NA | 27.40 | 26.30 | 26.20 | 27.00 | 24.60 | 23.90 | NA | NA | 24.30 |
| **Salinity (%)** | NA | 1.58 | 1.62 | 1.61 | 1.62 | 1.58 | 1.96 | NA | NA | 1.86 |
| **Conductivity (ms/cm)** | NA | 25.70 | 26.30 | 26.10 | 26.20 | 26.80 | 31.20 | NA | NA | 29.60 |
| **pH** | NA | 8.10 | 8.17 | 8.15 | 8.23 | 8.10 | 8.11 | NA | NA | 8.14 |
| **Total Taxa** | 19.00 | 6.00 | 15.00 | 15.00 | 17.00 | 24.00 | 28.00 | 25.00 | 21.00 | 21.00 |
| **Mean Number of individuals** | 132.70 | 13.70 | 38.70 | 23.30 | 50.30 | 92.00 | 164.00 | 85.30 | 50.70 | 50.00 |
| **Shannon-Weiner Diversity** | 1.60 | 1.19 | 2.05 | 2.23 | 2.10 | 1.79 | 2.01 | 1.68 | 2.44 | 2.45 |
| **Simpson's Dominance Index** | 0.30 | 0.42 | 0.18 | 0.16 | 0.18 | 0.31 | 0.22 | 0.40 | 0.13 | 0.12 |
| **Species Richness** | 3.01 | 1.35 | 2.95 | 3.30 | 3.19 | 4.09 | 4.36 | 4.33 | 3.98 | 3.99 |
| **Species Evenness** | 0.54 | 0.66 | 0.76 | 0.82 | 0.74 | 0.56 | 0.60 | 0.52 | 0.80 | 0.81 |
| **Ash Free Dry Weight (AFDW) (grams)** | 0.018 | 0.001 | 0.013 | 0.025 | 0.013 | 0.013 | 0.021 | 0.013 | 0.026 | 0.067 |
| **Number of Intolerant (Sensitive) Species** | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |

## Table 2.4. Results of Back River Benthic Macroinvertebrate Sampling at Site SS-63, Langley AFB, Virginia

*(Page 2 of 2)*

| | SD-11 | SD-12 | SD-13 | SD-14 | SD-15 | SD-16 | SD-17 | SD-18 | SD-19 | SD-20 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Depth** | 5.00 | 7.00 | 5.00 | 4.00 | 4.00 | 3.00 | 3.50 | 3.00 | 2.00 | 2.50 |
| **Temperature ($^oC$)** | 23.70 | 23.90 | NA | 25.40 | 24.80 | 25.30 | 25.50 | 25.10 | 27.10 | 24.40 |
| **Dissolved Oxygen (DO) (mg/L)** | 7.76 | 7.72 | NA | 6.55 | 5.47 | 6.09 | 6.27 | 5.79 | 7.39 | 8.26 |
| **Salinity (%)** | 1.83 | 1.82 | NA | 1.60 | 1.43 | 1.49 | 1.39 | 1.37 | 1.01 | 1.01 |
| **Conductivity (ms/cm)** | 29.50 | 29.30 | NA | 26.10 | 23.20 | 25.00 | 22.90 | 22.50 | 17.10 | 17.10 |
| **pH** | 8.07 | 8.07 | NA | 7.87 | 7.74 | 7.86 | 7.78 | 7.74 | 7.86 | 6.52 |
| **Total Taxa** | 20.00 | 13.00 | 15.00 | 17.00 | 17.00 | 21.00 | 18.00 | 14.00 | 10.00 | 14.00 |
| **Mean Number of individuals** | 31.30 | 10.30 | 13.00 | 74.50 | 25.00 | 81.70 | 151.70 | 133.70 | 105.00 | 76.70 |
| **Shannon-Weiner Diversity** | 2.40 | 2.15 | 2.43 | 2.23 | 2.64 | 2.28 | 1.28 | 0.95 | 1.31 | 0.98 |
| **Simpson's Dominance Index** | 0.14 | 0.17 | 0.12 | 0.15 | 0.08 | 0.15 | 0.46 | 0.62 | 0.42 | 0.63 |
| **Species Richness** | 4.18 | 3.49 | 3.82 | 3.20 | 3.71 | 3.64 | 2.78 | 2.17 | 1.56 | 2.39 |
| **Species Evenness** | 0.80 | 0.84 | 0.90 | 0.79 | 0.93 | 0.75 | 0.44 | 0.36 | 0.57 | 0.37 |
| **Ash Free Dry Weight (AFDW) (grams)** | 0.018 | 0.010 | 0.014 | 0.019 | 0.022 | 0.064 | 0.076 | 0.041 | 0.049 | 0.029 |
| **Number of Intolerant (Sensitive) Species** | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

**NA – Not Available**
**$^oC$ – degrees Celsius**
**mg/L – milligrams per liter**
**% - percent**
**ms/cm – millisiemens per centimeter**

## Table 2.5. Results of Mysid Shrimp Toxicity Data with Statistical Comparison at SS-63, Langley AFB, Virginia

| Sample Location | Mean % Survival (SD) | Mean % Female with Eggs (SD) | Mean Mysid Dry Weight (mg) per Mysid (SD) |
|---|---|---|---|
| Lab Control | 98(7) | 83(36) | 0.211(0.026) |
| TOX-01 | 95(9) | 84(35) | 0.233(0.037) |
| TOX-02 | 95(9) | 81(35) | 0.192(0.035) |
| TOX-03 | 98(7) | 93(14) | 0.174(0.022) |
| TOX-04 | 88(10)[c] | 83(22) | 0.187(0.022) |
| TOX-05 | 93(15) | 92(15) | 0.188(0.034) |
| TOX-06 | 94(10) | 93(19) | 0.152(0.039)[a] |
| TOX-07 | 100(0) | 87(14) | 0.150(0.032)[a] |
| TOX-08 | 85(14)[a,c] | 89(16) | 0.137(0.029)[a,b] |
| TOX-09 | 98(7) | 80(19) | 0.144(0.051)[a,b] |
| TOX-10 | 100(0) | 94(18) | 0.144(0.028)[a,b] |

Notes:
[a] Statistically different compared to the lab control data.
[b] Statistically different compared to the TOX-04 (background control) data.
[c] Statistically different compared to the TOX-10 (upstream control) data.
**%** - percent
mg - milligrams

## Table 2.6. Results of Analyses for Surface Water Sampling at Site SS-63, Langley AFB, Virginia

| Parameter | EPA Region III Surface Water RBSLs[5] | Ambient Water Quality Criteria | AWQC Reference | SW-01 Total | SW-01 Dissolved | SW-02 Total | SW-02 Dissolved | SW-03 Total | SW-03 Dissolved | SW-04 Total | SW-04 Dissolved | SW-05 Total | SW-05 Dissolved | SW-06 Total | SW-06 Dissolved |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Temperature (°C)** | NA | NA | NA | 25.60 | 25.60 | 24.90 | 24.90 | 24.30 | 24.30 | 24.00 | 24.00 | 24.60 | 24.60 | 25.60 | 25.60 |
| **Salinity (%)** | NA | NA | NA | 1.58 | 1.58 | 1.62 | 1.62 | 1.61 | 1.61 | 1.63 | 1.63 | 1.58 | 1.58 | 1.51 | 1.51 |
| **Conductivity (ms/cm)** | NA | NA | NA | 25.70 | 25.70 | 26.30 | 26.30 | 27.00 | 27.00 | 26.40 | 26.40 | 25.90 | 25.90 | 24.60 | 24.60 |
| **pH** | NA | NA | NA | 8.22 | 8.22 | 8.22 | 8.22 | 8.06 | 8.06 | 8.01 | 8.01 | 7.99 | 7.99 | 7.95 | 7.95 |
| **Total Cyanide (mg/L)** | 0.73 | 0.001 | NOAA Marine | | | | | | | | | | | | |
| **VOCs (ug/L)** | | | | | | | | | | | | | | | |
| Acetone | 610 | - | - | | | | | | | | 1.72 | | | 1.86 | 1.82 |
| Carbon disulfide | 1000 | - | - | | | | | | | | | | 0.0533 | | |
| Chloromethane | 21 | - | - | | | | | | | | | | | | |
| Toluene | 750 | 5000 | NOAA Marine | | 0.514 | | 0.815 | | 0.650 | | 0.203 | | 0.108 | | 0.129 |
| m&p-Xylenes | 12000 | - | - | | | | | | | | | | | | |
| **SVOCs (ug/L)** | | | | | | | | | | | | | | | |
| 4-Chloro-3-methylphenol | 120 | - | - | | | | | | | | | | 6.26 | | |
| Di-n-butylphthalate | 3700 | 3.4 | NOAA Marine | | | | | | | | | | 1.20 | | |
| bis(2-Ethylhexyl)phthalate | 48 | 59 | Virginia Water Quality Standard | | | | 2.67 | | | | **121** | | | | |
| **Chlorinated Pesticides & PCBs (ug/L)** | | | | | | | | | | | | | | | |
| Aldrin | 0.039 | 0.0014 | Virginia Water Quality Standard | | | | | | | | | | | | |
| beta-BHC[1] | 0.37 | 0.34[1] | NOAA Marine | | 0.00447 | | 0.00536 | | | 0.00521 | | | | | 0.0141 |
| delta-BHC[1] | 0.37[1] | 0.34[1] | NOAA Marine | | 0.0165 | 0.0170 | | 0.0147 | | 0.00890 | | | | 0.0161 | 0.00794 |
| gamma-BHC[1] | 0.52 | 0.34[1] | NOAA Marine | 0.0179 | 0.00829 | | | | | 0.00627 | 0.0187 | 0.00450 | | | |
| alpha-Chlordane | 1.9 | 0.002 | NOAA Marine | | | | | | | | | | | | |
| 4,4'-DDD | 2.8 | 0.0084 | Virginia Water Quality Standard | | | | **0.0107** | | **0.0108** | **0.0147** | **0.0132** | | | | **0.0119** |
| 4,4'-DDE | 2 | 0.0059 | Virginia Water Quality Standard | | | | | | | | | | | **0.00786** | |
| Endosulfan I[2] | 220 | 0.00435 | NOAA Marine | | | | | | | | | | | | |
| Endosulfan II[2] | 220 | 0.00435 | NOAA Marine | | 0.00387 | | | | | | | | | | 0.00413 |
| Endrin | 11 | 0.00115 | NOAA Marine | | **0.0103** | | **0.0109** | | **0.0105** | | **0.00974** | | | | **0.0112** |
| Endrin ketone[3] | 11 | 0.00115 | NOAA Marine | **0.00205** | **0.00223** | | **0.00188** | | | | | | | | |
| Heptachlor | 0.15 | 0.0018 | NOAA Marine | | | | | | | | | | | | |
| Heptachlor epoxide | 0.074 | 0.0018 | NOAA Marine | | **0.00472** | **0.00463** | **0.00538** | | **0.00458** | | **0.00407** | | | | **0.00511** |
| **Chlorinated Herbicides (ug/L)** | | | | | | | | | | | | | | | |
| Dicamba | 1100 | - | - | | | | | | | | | | | | |
| Dichloroprop | 290 | - | - | | 0.127 | | | | 0.0556 | | 0.146 | | | | |
| 2,4,5-T | 370 | - | - | | | | | | | 0.0337 | 0.0180 | | | | |
| MCPA | 18 | - | - | | | | | | | **63.7** | | | | | |
| **Metals (mg/L)** | | | | | | | | | | | | | | | |
| Aluminum | 37 | 0.087 | NOAA Fresh | **0.701** | | **0.743** | | **0.777** | | **1.19** | | **0.246** | | **1.48** | |
| Antimony | 0.015 | 0.5 | NOAA Marine | 0.00452 | | 0.00681 | | | | 0.0108 | | 0.00501 | | | |
| Arsenic[4] | 0.00045 | 0.036[4] | NOAA Marine | | | | | | | | | | | **0.00374** | |
| Barium | 2.6 | - | - | 0.0272 | 0.0256 | 0.0269 | 0.0253 | 0.0279 | 0.0248 | 0.0542 | 0.0241 | 0.0261 | | 0.0306 | 0.0552 |
| Beryllium | 0.073 | 0.0053 | NOAA Fresh | | | | | | | | | | | | |
| Cadmium | 0.018 | 0.0093 | NOAA Marine | | | | | | | | | | | | |
| Calcium | - | - | - | 207 | 209 | 205 | 207 | 193 | 195 | 409 | 192 | 210 | 0.0633 | 189 | 369 |
| Chromium | 0.11 | 0.05 | NOAA Marine | 0.00139 | | 0.00139 | | 0.000980 | 0.00109 | 0.00660 | | 0.00106 | | 0.00365 | |
| Cobalt | 0.73 | - | - | | | | | | | | | | | | |
| Copper | 1.5 | 0.0031 | NOAA Marine | | | | | | | | | | | | |
| Iron | 11 | 1 | NOAA Fresh | 0.620 | 0.0863 | 0.624 | | 0.713 | | **1.09** | | 0.402 | | **1.33** | 0.200 |
| Mercury | 0.011 | 0.00094 | NOAA Marine | | | | | | | | | | | | |
| Lead | | 0.0081 | NOAA Marine | | | | | | | | | | | | |
| Magnesium | - | - | - | 698 | 687 | 691 | 712 | 707 J | 695 J | 718 J | 675 J | 668 J | 0.0818 | 641 J | 649 J |
| Manganese | 0.73 | - | - | 0.0238 | | 0.0197 | | 0.0214 | | 0.0554 | 0.0145 | 0.0256 | | 0.0547 | 0.0439 |
| Nickel | 0.73 | 0.0082 | NOAA Marine | | | | | | | | | | | | |
| Potassium | - | - | - | 219 J | 215 | 217 | 220 | 205 J | 203 J | 215 J | 208 J | 203 J | | 187 J | 188 J |
| Selenium | 0.18 | 0.071 | NOAA Marine | 0.0130 | 0.0144 | 0.0136 | 0.0161 | 0.0135 | 0.0183 | 0.0333 | 0.0159 | 0.0156 | | 0.0126 | 0.0277 |
| Silver | 0.18 | 0.00095 | NOAA Marine | | | | | | | | | | | | |
| Sodium | - | - | - | 5590 | 5500 | 5550 | 5630 | 5720 J | 5630 J | 5920 J | 5710 J | 5630 J | 0.556 | 5300 J | 5340 J |
| Thallium | 0.0026 | 2.13 | NOAA Marine | | | | | | **0.00323** | **0.00686** | | | | | |
| Vanadium | 0.26 | - | - | | | | | | | | | | | 0.00216 | |
| Zinc | 11 | 0.081 | NOAA Marine | | | | | | | | | | | | |

NA - Not applicable

-Screening criteria unavailable

Blank cell - Analyte was not detected in any of the samples from the indicated investigation.

B - Concentration similar to low-level concentrations found in associated blanks.

J - Estimated value.

[1] BHC used as surrogate

[2] Endosulfan used as surrogate

[3] Endrin used as surrogate

[4] Total Arsenic used as surrogate

[5] Surface water RBSLs were determined by multiplying tap water RBSLs by 10

(yellow) Indicates result exceeds Human Health Criteria

(cyan) Indicates result exceeds Ecological Health Criteria

(green) Indicates result exceeds Ecological and Human Health Criteria

## Table 2.6. Results of Analyses for Surface Water Sampling at Site SS-63, Langley AFB, Virginia

| Parameter | EPA Region III Surface Water RBSLs[5] | Ambient Water Quality Criteria | AWQC Reference | SW-07 Total | SW-07 Total-Dup | SW-07 Dissolved | SW-07 Dissolved-Dup | SW-08 Total | SW-08 Dissolved | SW-09 Total | SW-09 Dissolved | SW-10 Total | SW-10 Dissolved |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Temperature (°C)** | NA | NA | NA | 24.70 | 24.70 | 24.70 | 24.70 | 26.60 | 26.60 | 27.10 | 27.10 | 24.40 | 24.40 |
| **Salinity (%)** | NA | NA | NA | 1.48 | 1.48 | 1.48 | 1.48 | 1.27 | 1.27 | 1.01 | 1.01 | 1.01 | 1.01 |
| **Conductivity (ms/cm)** | NA | NA | NA | 24.40 | 24.40 | 24.40 | 24.40 | 21.10 | 21.10 | 17.10 | 17.10 | 17.10 | 17.10 |
| **pH** | NA | NA | NA | 7.86 | 7.86 | 7.86 | 7.86 | 7.86 | 7.86 | 7.86 | 7.86 | 6.52 | 6.52 |
| **Total Cyanide (mg/L)** | 0.73 | 0.001 | NOAA Marine | | | | | | | | | | |
| **VOCs (ug/L)** | | | | | | | | | | | | | |
| Acetone | 610 | - | - | 1.13 | 1.58 | | | | 2.47 | 2.17 | 2.28 | | |
| Carbon disulfide | 1000 | - | - | | | | | | | | | | |
| Chloromethane | 21 | - | - | | | 0.291 | 0.320 | | | | | | |
| Toluene | 750 | 5000 | NOAA Marine | | | | 0.0942 | | 0.132 | 0.0916 | 0.168 | | 2.06 |
| m&p-Xylenes | 12000 | - | - | | | | | | | | 0.142 | | |
| **SVOCs (ug/L)** | | | | | | | | | | | | | |
| 4-Chloro-3-methylphenol | 120 | - | - | | | | | | | | | | |
| Di-n-butylphthalate | 3700 | 3.4 | NOAA Marine | | | | | | | | | | |
| bis(2-Ethylhexyl)phthalate | 48 | 59 | Virginia Water Quality Standard | | | | | | | | | | |
| **Chlorinated Pesticides & PCBs (ug/L)** | | | | | | | | | | | | | |
| Aldrin | 0.039 | 0.0014 | Virginia Water Quality Standard | **0.00965** | | **0.0127** | **0.0120** | | | | | | |
| beta-BHC[1] | 0.37 | 0.34[1] | NOAA Marine | | 0.00776 J | | | | | | | | |
| delta-BHC[1] | 0.37[1] | 0.34[1] | NOAA Marine | | 0.00387 J | 0.0102 | 0.0109 | 0.00447 | | | 0.0178 | 0.0134 | |
| gamma-BHC[1] | 0.52 | 0.34[1] | NOAA Marine | | 0.00463 J | 0.00450 | 0.00382 | 0.00510 | | 0.0121 | 0.0151 | 0.0111 | |
| alpha-Chlordane | 1.9 | 0.002 | NOAA Marine | | | | | | | | | 0.00135 | |
| 4,4'-DDD | 2.8 | 0.0084 | Virginia Water Quality Standard | | | | | | | | | **0.0144** | **0.0129** |
| 4,4'-DDE | 2 | 0.0059 | Virginia Water Quality Standard | | | | | | 0.00482 | | | | |
| Endosulfan I[2] | 220 | 0.00435 | NOAA Marine | | | | | | | | | | |
| Endosulfan II[2] | 220 | 0.00435 | NOAA Marine | | | | | | | | | **0.00455** | |
| Endrin | 11 | 0.00115 | NOAA Marine | | | | | | | | | **0.0119** | **0.0106** |
| Endrin ketone[3] | 11 | 0.00115 | NOAA Marine | | | | | | | | | | **0.00190** |
| Heptachlor | 0.15 | 0.0018 | NOAA Marine | | | **0.0195 J** | | | **0.0208** | | **0.0227** | | |
| Heptachlor epoxide | 0.074 | 0.0018 | NOAA Marine | | | | | | | | | | **0.00405** |
| **Chlorinated Herbicides (ug/L)** | | | | | | | | | | | | | |
| Dicamba | 1100 | - | - | | | | | | | | 0.0361 | | |
| Dichloroprop | 290 | - | - | | | | | | | | | | |
| 2,4,5-T | 370 | - | - | | | | | | | | | | |
| MCPA | 18 | - | - | | | | | | | | | | |
| **Metals (mg/L)** | | | | | | | | | | | | | |
| Aluminum | 37 | 0.087 | NOAA Fresh | **0.464** | **0.719** | | | **1.12** | | **0.454** | | **0.672** | |
| Antimony | 0.015 | 0.5 | NOAA Marine | | 0.00953 J | 0.00845 | 0.00884 | | 0.00719 | | | | |
| Arsenic[4] | 0.00045 | 0.036[4] | NOAA Marine | | **0.00276 J** | **0.00269 J** | | | **0.00490** | | | | |
| Barium | 2.6 | - | - | 0.0299 | 0.0302 | 0.0291 | 0.0298 | 0.0340 | 0.0322 | 0.0334 | 0.0326 | 0.0296 | 0.0289 |
| Beryllium | 0.073 | 0.0053 | NOAA Fresh | | | | | | | | | | |
| Cadmium | 0.018 | 0.0093 | NOAA Marine | | | | | | | | | | |
| Calcium | - | - | - | 183 | 193 | 196 | 184 | 172 | 176 | 131 | 138 | 155 | 181 |
| Chromium | 0.11 | 0.05 | NOAA Marine | | 0.00384 | 0.00178 | 0.00144 | | 0.00242 | 0.00252 | | 0.00160 | |
| Cobalt | 0.73 | - | - | | | | | | | | | | |
| Copper | 1.5 | 0.0031 | NOAA Marine | | | | | | | | | | |
| Iron | 11 | 1 | NOAA Fresh | 0.672 | 0.953 | | | **1.10** | 0.0821 | 0.746 | | 0.633 | |
| Mercury | 0.011 | 0.00094 | NOAA Marine | | | | | 0.000106 | | 0.0000750 | | | |
| Lead | | 0.0081 | NOAA Marine | | | | | | | | | | |
| Magnesium | - | - | - | 588 J | 613 J | 602 J | 592 J | 542 J | 543 J | 421 | 437 J | 467 | 572 |
| Manganese | 0.73 | - | - | 0.0676 | 0.0671 | 0.0308 | 0.0326 | 0.0964 | 0.0600 | 0.102 | 0.0528 | 0.0736 | 0.0385 |
| Nickel | 0.73 | 0.0082 | NOAA Marine | | 0.00231 J | | | | | 0.00227 | | | |
| Potassium | - | - | - | 168 J | 180 J | 176 J | 172 J | 156 J | 154 J | 111 J | 120 J | 243 | 171 |
| Selenium | 0.18 | 0.071 | NOAA Marine | 0.0155 | 0.0137 | 0.00965 | 0.0174 | 0.0109 | 0.0105 | 0.00994 | 0.00933 | 0.0113 | 0.0126 |
| Silver | 0.18 | 0.00095 | NOAA Marine | | | | | | | | | | |
| Sodium | - | - | - | 4830 J | 5110 J | 5010 J | 4900 J | 4520 J | 4500 J | 3330 | 3600 J | 3770 | 4560 |
| Thallium | 0.0026 | 2.13 | NOAA Marine | | | | | | **0.00325** | | | | |
| Vanadium | 0.26 | - | - | | | | | | | | | | |
| Zinc | 11 | 0.081 | NOAA Marine | | 0.0110 | | | | | | | | |

NA - Not applicable
- Screening criteria unavailable
Blank cell - Analyte was not detected in any of the samples from the indicated investigation.
B - Concentration similar to low-level concentrations found in associated blanks.
J - Estimated value.
[1] BHC used as surrogate
[2] Endosulfan used as surrogate
[3] Endrin used as surrogate
[4] Total Arsenic used as surrogate
[5] Surface water RBSLs were determined by multiplying tap water RBSLs by 10

(yellow) Indicates result exceeds Human Health Criteria
(cyan) Indicates result exceeds Ecological Health Criteria
(green) Indicates result exceeds Ecological and Human Health Criteria

## Table 2.7. Results of Analyses for Sport Fish (Large Fish) Sampling at Site SS-63, Langley AFB, Virginia

| Parameter | FDA Action Levels | FDA Reference | EPA RBSLs for Fish | BIO-01 | BIO-02 | BIO-03 | BIO-04 | BIO-05 | BIO-06 | BIO-07 | BIO-08 | BIO-10 | BIO-11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lipids (%)** | - | | - | 3.31 | 3.12 | 6.01 | 3.24 | 3.91 | 5.42 | 3.39 | 4.73 | 5.75 | 7.06 |
| **Total Cyanide (mg/kg)** | - | - | 2.7 | | | | | | | | | | |
| **SVOCs (mg/kg)** | | | | | | | | | | | | | |
| **Chlorinated Pesticides & PCBs (ug/kg)** | | | | | | | | | | | | | |
| alpha-BHC | - | - | 0.5 | 0.137 | 0.188 | 0.0744 | 0.212 | 0.223 | 0.104 | 0.134 | 0.132 | | |
| delta-BHC | - | - | 1.8 | 0.178 | 0.212 | | | | | | | | |
| gamma-BHC | - | - | 2.4 | 0.196 | | 0.126 | | | | 0.0813 | | | |
| 4,4'-DDD | - | - | 13 | 2.03 | 2.23 | | | **28.4** | 6.41 | | 6.58 | 5.04 | 6.42 |
| 4,4'-DDE | 5000 | Fish | 9.3 | **13.5** | **11.0** | 4.00 | 6.42 | **37.9** | **22.7** | 4.54 | **15.3** | **29.2** | **30.7** |
| Heptachlor | 300 | Fish | 0.7 | | | | | | | | | | |
| PCB-1248 | 2000 | Fish | 1.6 | | | | | **104** | **19.2** | | **23.7** | **16.7** | **26.2** |
| PCB-1254 | 2000 | Fish | 1.6 | **47.9** | **48.8** | **37.2** | **42.0** | **308** | **142** | **31.1** | **97.3** | **68.9** | **72.5** |
| PCB-1260 | 2000 | Fish | 1.6 | **22.8** | **11.5** | **34.3** | **17.3** | **97.2** | **58.7** | **11.2** | **42.1** | **39.8** | **55.8** |
| **Chlorinated Herbicides (ug/kg)** | | | | | | | | | | | | | |
| **Metals (mg/kg)** | | | | | | | | | | | | | |
| Aluminum | - | - | 140 | | | | | | | | | | |
| Arsenic | 76 | Crustacea | 0.0021 | **1.50** | **1.81** | | **0.840** | **1.28** | **1.04** | **2.56** | **2.10** | **0.742** | **1.03** |
| Barium | - | - | 9.5 | | | | | | | | | | |
| Beryllium | - | - | 0.27 | | | | | | | | | | |
| Cadmium | 3 | Crustacea | 0.14 | | | | | | | | | | |
| Calcium | - | - | - | 1320 | | 276 | | | | 168 | | | 848 |
| Chromium | 12 | Crustacea | 200 | | | | | | | | | | |
| Cobalt | - | - | 2.7 | | | | | | | | | | |
| Copper | - | - | 5.4 | 0.228 | 0.439 | 0.315 | 0.395 | 0.332 | 0.427 | 0.335 | 0.316 | 0.451 | 0.419 |
| Iron | - | - | 41 | | | | | | | | | | |
| Mercury | 1 | Fish | 0.014 | **0.0593** | **0.0512** | **0.0486** | **0.0692** | **0.0521** | **0.0238** | **0.0598 J** | **0.0395** | **0.0504** | **0.0530** |
| Lead | 1.5 | Crustacea | 0.000014 | | | | | | | | | | |
| Magnesium | - | | - | 317 | 288 | 300 | 304 | 348 | 358 | 349 | 360 | 315 | 282 |
| Manganese | - | | 19 | | | | | | | | | | |
| Nickel | 70 | Crustacea | 2.7 | | | | | | | | | | |
| Potassium | - | - | - | 3511 | 3440 | 3489 | 3952 | 3863 | 3711 | 3650 | 3840 | 3525 | 3292 |
| Selenium | - | - | 0.68 | 0.638 | **1.05** | **1.14** | **0.914** | **0.758** | **0.854** | **0.789** | **0.868** | 0.636 | 0.670 |
| Silver | - | - | 0.68 | | | | | | | | | | |
| Sodium | - | - | - | 296 | 317 | 335 | 403 | 633 | 622 | 717 | 707 | 472 | 263 |
| Thallium | - | - | 0.0095 | | | | | | | | | | |
| Vanadium | - | - | 0.95 | | | | | | | | | | |
| Zinc | - | - | 41.0 | 5.77 | 4.78 | 5.78 | 5.36 | 5.31 | 5.13 | 5.45 | 5.65 | 5.72 | 5.13 |
| **PCTs (mg/kg)** | | | | | | | | | | | | | |
| Aroclor 5432 | 2000[3] | Fish | 0.0007 | **0.0226** | | | | **0.379** | **0.155** | | **0.158** | **0.0318** | **0.0586** |
| **Moisture (%)** | - | - | - | 77.2 | 75.6 | 71.4 | 75.3 | 76.3 | 73.3 | 76.1 | 73.7 | 73.5 | 72.1 |

Blank cell - Analyte was not detected in any of the samples from the indicated investigation.
B - Concentration similar to low-level concentrations found in associated blanks.
J - Estimated value.
Yellow indicates result exceeds RBSL

## Table 2.8. Results of Analyses for Blue Crab Sampling at Site SS-63, Langley AFB, Virginia

| Parameter | FDA Action Levels | FDA Reference | EPA RBSLs for Fish | BIO-01 Meat | BIO-01 Total Tissue | BIO-03 Meat | BIO-03 Total Tissue | BIO-04 Meat | BIO-04 Total Tissue | BIO-04 Total Tissue-Dup | BIO-06 Meat | BIO-06 Total Tissue | BIO-08 Meat | BIO-08 Total Tissue | BIO-11 Meat | BIO-11 Total Tissue |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lipids (%)** | - | - | - | 0.647 | 1.47 | 0.998 | 1.25 | 0.93 | 2.34 | 2.11 | 0.599 | 1.45 | 0.655 | 2.84 | 0.624 | 3.18 |
| **Total Cyanide (mg/kg)** | | | | | | | | | | | | | | | | |
| **SVOCs (mg/kg)** | | | | | | | | | | | | | | | | |
| Acenaphthene | | | | | | | | | | | | | | | | |
| Anthracene | | | | | | | | | | | | | | | | |
| Benz(a)anthracene | | | | | | | | | | | | | | | | |
| Benz(a)pyrene | | | | | | | | | | | | | | | | |
| Benzo(b)fluoranthene | | | | | | | | | | | | | | | | |
| Benzo(g,h,i)perylene | | | | | | | | | | | | | | | | |
| Benzo(k)fluoranthene | | | | | | | | | | | | | | | | |
| 4-Methylphenol | - | - | 0.68 | | 0.0754 | | | | 0.130 | 0.144 | | 0.166 | | 0.0902 | | |
| bis(2-Ethylhexyl)phthalate | - | - | 0.23 | 0.120 | | | | | 0.0792 J | | | | | | | 0.198 |
| Phenol | - | - | 81 | | 0.113 | 0.126 | | 0.120 | 0.164 | 0.152 | 0.133 | 0.0680 | | 0.216 | | 0.108 |
| **Chlorinated Pesticides & PCBs (ug/kg)** | | | | | | | | | | | | | | | | |
| alpha-BHC | - | - | 0.5 | | | | | | | | | | | | | |
| delta-BHC | - | - | 1.8 | | | | | | | | | | | 1.08 | | |
| gamma-BHC Lindane | - | - | 2.4 | | | | | | | | | | | | | |
| gamma-Chlordane | 300 | Fish | 9 | | | | | | | | | | | 0.200 | | 0.222 |
| Dieldrin | 300 | Fish | 0.2 | | **1.08** | | | | **2.16** | **2.05** | | | | **3.53** | | **4.62** |
| 4,4'-DDD | - | - | 13 | 3.39 | 2.73 | | 2.25 | | 2.88 | 2.67 | 0.513 | 1.81 | | | | |
| 4,4'-DDE | 5000 | Fish | 9.3 | **11.1** | **10.4** | | 6.30 | 4.05 | **15.8** | **16.6** | | **13.3** | 1.27 | **25.5** | 2.24 | **34.3** |
| Endosulfan I | - | - | 810 | | | | | | | | | | | | | |
| Endosulfan sulfate | - | - | 810 | | | | 0.165 | | 0.180 J | | | 0.196 | | 0.431 | | |
| Endrin | - | - | 41 | | | | | | 1.67 | 1.89 | | | | 2.94 | | 2.38 |
| Heptachlor | 300 | Fish | 0.7 | | 0.156 | | 0.195 | 0.0757 | 0.0864 J | 0.164 J | | 0.166 | | 0.549 | | 0.29 |
| Heptachlor epoxide | 300 | Fish | 0.35 | | **1.43** | | **1.23** | **0.792** | **1.80** | **1.74** | | **1.07** | | **1.92** | | **2.90** |
| PCB-1254 | 2000 | Fish | 1.6 | **23.1** | | **78.8** | | | | | | | | | **8.48** | |
| **Chlorinated Herbicides (ug/kg)** | | | | | | | | | | | | | | | | |
| MCPP | - | - | 140 | | | **24500** | | | | | | | | | | |
| 2,4,5-T | - | - | 1400 | | 20.8 | 28.0 | 19.5 | | | 25.0 J | | | | | | 39.6 |
| 2,4,5-TP | - | - | 1100 | | | | 4.95 | | 3.60 J | 8.82 J | | | | | | |
| **Metals (mg/kg)** | | | | | | | | | | | | | | | | |
| Aluminum | - | - | 140 | 15.3 | 42.8 | 6.51 | 29.7 | 7.25 | 13.2 | 13.4 | 6.19 | 39.6 | 8.12 | 17.5 | 6.53 | 25.2 |
| Antimony | - | - | 0.054 | | | | | | | | | | | | | |
| Arsenic | 76 | Crustacea | 0.0021 | **3.05** | **1.86** | **4.18** | **2.88** | **3.38** | **2.74** | **2.95** | **3.08** | **2.33** | **1.75** | **2.06** | **1.07** | **0.924** |
| Barium | - | - | 9.5 | 0.477 | 0.780 | 0.333 | 1.47 | 0.405 | 0.594 | 0.636 | 0.308 | 0.740 | 0.336 | 1.45 | 0.288 | 0.634 |
| Beryllium | - | - | 0.27 | | | | | | | | | | | | | |
| Cadmium | 3 | Crustacea | 0.14 | | | | | | | | | | | | | |
| Calcium | - | - | - | 2233 | 3237 | 1414 | 6060 | 1989 | 2502 | 2255 | 985 | 4621 | 1506 | 4704 | 806 | 1346 |
| Chromium | 12 | Crustacea | 200 | | 1.16 | | | | | | | | | | 0.304 B | |
| Cobalt | - | - | 2.7 | | | | | | | | | | | | | |
| Copper | - | - | 5.4 | **6.62** | **14.7** | **7.75** | **10.1** | **8.62** | **9.34** | **9.94** | **8.05** | **7.85** | **6.09** | **9.49** | **8.54** | **7.85** |
| Iron | - | - | 41 | 14.20 | **61.8** | 12.1 | **49.7** | 13.1 | 34.4 | **57.4** | 11.1 | **59.9** | 11.4 | 30.2 | 10.2 | **47.4** |
| Mercury | 1 | Fish | 0.014 | | | | | | | | | | | | | |
| Lead | 1.5 | Crustacea | 0.000014 | | | | | | | | | | | | | |
| Magnesium | - | - | - | 547 | 449 | 352 | 642 | 454 | 391 | 420 | 352 | 797 | 444 | 633 | 365 | 305 |
| Manganese | - | - | 19 | 1.45 | 3.13 | 1.47 | 7.55 | 1.58 | 2.81 | 3.18 | 1.09 | 4.15 | 1.10 | 3.57 | 0.848 | 2.14 |
| Nickel | 70 | Crustacea | 2.7 | 0.431 | 0.351 | 0.263 | | 0.370 | 0.342 | 0.431 | 0.496 | 0.347 | 0.425 | 0.274 | **5.25** | 0.792 |
| Potassium | - | - | - | 2002 | 2028 | 2730 | 1461 | 2464 | 2088 | 2276 | 2839 | 1555 | 2443 | 2215 | 2544 | 1175 |
| Selenium | - | - | 0.68 | 0.524 | 0.559 | 0.508 | | 0.616 | 0.594 | 0.574 | **0.684** | | 0.620 | | 0.464 | |
| Silver | - | - | 0.68 | **0.785** | 0.637 | 0.333 | **0.825** | 0.458 | 0.522 | 0.595 | 0.445 | 0.468 | 0.425 | 0.451 | 0.288 | 0.330 |
| Sodium | - | - | - | 3419 | 6279 | 2363 | 2970 | 3643 | 2952 | 3198 | 3061 | 4017 | 3133 | 3606 | 2656 | 2310 |
| Thallium | - | - | 0.0095 | | | | | | | | | | | | | |
| Vanadium | - | - | 0.95 | | 0.208 | | 0.210 | | | | | 0.196 | | | | |
| Zinc | - | - | 41.0 | 37.1 | 25.2 | 33.8 | 29.6 | **41.9** | 25.7 | 26.4 | 31.5 | 26.9 | 38.2 | 37.6 | **41.4** | 33.1 |
| **PCTs (mg/kg)** | | | | | | | | | | | | | | | | |
| **Moisture (%)** | - | - | - | 84.6 | 87.0 | 82.5 | 85.0 | 82.4 | 82.0 | 79.5 | 82.9 | 84.9 | 82.3 | 80.4 | 84.0 | 86.8 |

Blank cell - Analyte was not detected in any of the samples from the indicated investigation.
B - Concentration similar to low-level concentrations found in associated blanks.
J - Estimated value.
Yellow indicates result exceeds RBSL

## Table 2.9. Results of Analyses for *Fundulus* (Small Fish) Sampling at Site SS-63, Langley AFB, Virginia

| Parameter | FDA Action Levels | FDA Reference | EPA RBSLs for Fish | BIO-01 | BIO-01 Duplicate | BIO-02 | BIO-03 | BIO-04 M/M | BIO-05 | BIO-06 | BIO-06 Duplicate | BIO-07 | BIO-08 | BIO-09 | BIO-10 | BIO-11 | BIO-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lipids (%)** | - | - | - | 1.52 | 1.52 | 1.17 | 1.76 | 2.08 | 1.25 | 2.27 | 2.65 | 1.54 | 2.44 | 1.62 | 1.57 | 2.41 | 1.98 |
| **Total Cyanide (mg/kg)** | | | 2.7 | | | | | | | | | | | | | | |
| **SVOCs (mg/kg)** | | | | | | | | | | | | | | | | | |
| bis(2-Ethylhexyl)phthalate | - | - | 0.23 | | | | | | | | | | | | | | |
| Phenol | - | - | 81 | 0.901 J | 0.750 J | | | | 0.114 | | | | | 0.128 | 0.0907 | 0.377 | |
| **Chlorinated Pesticides & PCBs (ug/kg)** | | | | | | | | | | | | | | | | | |
| alpha-BHC | - | - | 0.5 | **0.664** | **0.605** | | 0.116 | | 0.155 | 0.0747 J | 0.320 J | 0.234 | 0.277 | 0.339 | 0.145 | 0.256 | **0.667** |
| beta-BHC | - | - | 1.8 | 1.49 | 1.26 | 0.0941 | | | | 1.12 J | 0.290 J | 0.675 | 0.958 | 0.726 | 0.179 | 0.286 | 0.0815 |
| delta-BHC | - | - | 1.8 | **2.37 J** | 1.57 J | | | | | | | 0.229 | | | | | |
| gamma-BHC | - | - | 2.4 | 0.0758 J | | | | | | | | 0.166 | 0.227 | | | | 0.245 |
| 4,4'-DDD | - | - | 13 | **23.5** | **23.5** | 8.05 | 4.18 | **21.9** | 1.97 | 9.46 | 8.32 | 1.98 | 3.28 | 7.94 | 2.74 | 2.21 | 3.95 |
| 4,4'-DDE | 5000 | Fish | 9.3 | **41.7** | **41.9** | **16.7** | 7.66 | **38.8** | **10.0** | **33.6** | **31.8** | **12.5** | **30.2** | **42.8** | **17.2** | **19.1** | **32.1** |
| Heptachlor | 300 | Fish | 0.7 | | | | | | | | | | | | | | |
| PCB-1248 | 2000 | Fish | 1.6 | | | **3.34** | | | | | **9.07 J** | | | | | | |
| PCB-1254 | 2000 | Fish | 1.6 | **27.3** | **24.2** | **18.4** | **22.0** | **36.0** | **16.4** | **55.3** | **50.4** | **48.2** | **83.2** | **106** | **20.1** | **26.1** | **76.6** |
| PCB-1260 | 2000 | Fish | 1.6 | **62.3** | **63.4** | **11.9** | **5.57** | **27.5** | **8.96** | **82.7** | **76.1** | **17.4** | **40.3** | **174** | **12.3** | **16.1** | **27.2** |
| **Chlorinated Herbicides (ug/kg)**** | | | | | | | | | | | | | | | | | |
| Dicamba | - | - | 4100 | | | | | | | | | | 7.81 | | | | |
| MCPP | - | - | 140 | **37920 J** | | | | | | | | | | | | | |
| 2,4,5-T | - | - | 1400 | | | | 4.41 | | | | | 6.27 | 7.06 | | | | |
| **Metals (mg/kg)** | | | | | | | | | | | | | | | | | |
| Aluminum | - | - | 140 | 57.4 | 51.8 | | 31.6 | | | 54.5 J | 85.2 J | 44.8 | 31.5 | 120 | **164** | 90.9 | |
| Antimony | - | - | 0.054 | | | | | | | | | | | | | | |
| Arsenic | 76 | Crustacea | 0.0021 | **1.28** | **1.38** | **0.690** | **2.18** | **1.59** | **0.941** | **1.42** | **1.51** | **0.747** | **0.605** | **0.944** | **0.931** | **0.879** | **0.766** |
| Barium | - | - | 9.5 | 1.68 | 1.72 | 1.11 | 2.95 | 2.66 | 1.52 | 1.79 | 2.44 | 0.868 | 1.97 | 1.43 | 1.54 | 1.18 | 1.31 |
| Beryllium | - | - | 0.27 | | | | | | | | | | | | | | |
| Cadmium | 3 | Crustacea | 0.14 | | | | | | | | | | | | | | |
| Calcium | - | - | - | 20074 | 19820 | 9823 | 27608 | 11850 | 15568 | 16907 | 20513 | 8435 | 20614 | 22603 | 16415 | 15186 | 13486 |
| Chromium | 12 | Crustacea | 200 | | | | | | | | | | | | | | |
| Cobalt | - | - | 2.7 | | | | | | | | | | | | | | |
| Copper | - | - | 5.4 | 3.65 | 2.78 | 0.627 | 1.95 | 2.17 | 1.32 | 2.12 | 2.55 | 0.988 | 1.41 | 1.77 | 3.63 | 1.08 | 1.06 |
| Iron | - | - | 41 | **65.4** | **59.8** | 21.5 | | 19.8 | 19.1 | **59.3 J** | **98.5 J** | | | **127.00** | **156.00** | **93.60** | |
| Mercury | 1 | Fish | 0.014 | 0.00972 J | **0.0242 J** | **0.0142** | 0.00998 | **0.0277** | 0.0130 | **0.0324** | **0.0353** | **0.0169** | 0.00983 | **0.0215** | **0.0294** | **0.0143** | 0.00963 |
| Lead | 1.5 | Crustacea | 0.000014 | **1.19** | **1.06** | | | | | | | | | | | | |
| Magnesium | - | - | - | 692 | 687 | 443 | 793 | 471 | 598 | 588 | 663 | 465 | 673 | 714 | 635 | 582 | 605 |
| Manganese | - | - | 19 | 10.5 | 9.70 | 1.99 | 12.9 | 4.55 | 2.89 | 4.81 | 6.40 | 4.82 | 5.67 | 14.1 | 15.1 | 11.8 | 2.49 |
| Nickel | 70 | Crustacea | 2.7 | | | | | | | | | | | | | | |
| Potassium | - | - | - | 2678 | 2759 | 2884 | 2668 | 3095 | 2688 | 2938 | 2873 | 2772 | 2671 | 2807 | 2842 | 2811 | 2841 |
| Selenium | - | - | 0.68 | **1.02** | 0.0944 | **0.961** | **0.789** | **0.901** | **0.851** | **0.996** | **1.08** | 0.651 | **0.706** | **1.11** | **0.858** | **0.954** | 0.667 |
| Silver | - | - | 0.68 | 0.147 | 0.140 | | | 0.116 | | | 0.0832 J | | | 0.0702 | 0.0735 | | |
| Sodium | - | - | - | 1716 | 1815 | 1739 | 1993 | 1580 | 1933 | 1863 | 1882 | 1622 | 1704 | 1895 | 1573 | 1581 | 1502 |
| Thallium | - | - | 0.0095 | | | | | | | | | | | | | | |
| Vanadium | - | - | 0.95 | 0.284 | 0.290 | | 0.255 | | | 0.209 | 0.328 | | 0.219 | 0.532 | 0.564 | 0.452 | |
| Zinc | - | - | 41.0 | **43.6** | **44.0** | 19.0 | **48.0** | 31.9 | 30.9 | 32.4 | 38.3 | 25.1 | **42.8** | **44.8** | 40.4 | 34.4 | **46.4** |
| **PCTs (mg/kg)** | | | | | | | | | | | | | | | | | |
| **Moisture (%)** | - | - | - | 76.3 | 75.8 | 79.1 | 76.8 | 76.9 | 77.6 | 75.1 | 74.8 | 75.9 | 74.8 | 75.8 | 75.5 | 74.9 | 75.3 |

Blank cell - Analyte was not detected in any of the samples from the indicated investigation.
B - Concentration similar to low-level concentrations found in associated blanks.
J - Estimated value.
Yellow indicates results exceed RBSL

## Table 2.10. Results of Analyses for Bivalves at Site SS-63, Langley AFB, Virginia

| Parameter | FDA Action Levels | FDA Reference | EPA RBSLs for Fish | BIO-01 Oyster | BIO-02 Mussel | BIO-03 Mussel | BIO-04 Mussel | BIO-05 Mussel | BIO-06 Mussel | BIO-07 Mussel | BIO-08 Mussel | BIO-08 Mussel-Dup | BIO-09 Mussel | BIO-09 Mussel-Dup | BIO-10 Mussel | BIO-11 Mussel | BIO-12 Mussel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lipids (%)** | - | - | - | 0.712 | 0.608 | 0.600 | 0.602 | 0.320 | 0.106 | 0.490 | 1.06 | 0.882 | 0.264 | 0.220 | 0.300 | 0.924 | 0.450 |
| **Total Cyanide (mg/kg)** | - | - | 2.7 | ND | 1.34 | 1.20 | 1.50 | 1.91 | 1.53 | 1.33 | 0.931 | 1.07 | ND | 0.880 | 2.08 | 0.816 | 1.09 |
| **SVOCs (mg/kg)** | | | | | | | | | | | | | | | | | |
| Benz(a)anthracene | - | - | 0.0043 | | ND | | **0.0366** | | | ND | | | | | | | ND |
| Benz(a)pyrene | - | - | 0.00043 | | | | **0.0437** | | | | | | | | | | |
| Benzo(b)fluoranthene | - | - | 0.0043 | | | | **0.0484** | | | | | | | | | | |
| Benzo(g,h,i)perylene | - | - | 4.1 | 0.0596 | | | | | 0.0525 | | | | | | | | |
| Chrysene | - | - | 0.43 | | | | 0.0389 | | | | | | | | | | |
| 2,6-Dinitrotoluene | - | - | 0.14 | | | | | 0.0496 | 0.0742 | | | | | | 0.0516 | | |
| bis(2-Ethylhexyl)phthalate | - | - | 0.23 | | | | | | | | | | | | | | |
| 2-Methylphenol | - | - | 6.8 | | | 0.0518 | 0.0472 | | | | 0.0893 | 0.0725 | | | | 0.0650 | |
| Phenanthrene | - | - | 4.1 | | | | | 0.0336 | | | | | | | | | |
| Pyrene | - | - | 4.1 | | | | 0.0590 | | | | | | | | | | |
| **Chlorinated Pesticides & PCBs (ug/kg)** | | | | | | | | | | | | | | | | | |
| Aldrin | 300 | Fish | 0.19 | **0.303** | | | | | | | 0.134 J | 0.0706 J | | | | 0.131 | |
| alpha-BHC | - | - | 0.5 | 0.160 | | 0.353 | **0.555** | | 0.212 | 0.154 | 0.470 J | 0.304 J | 0.264 J | 0.380 J | | **0.747** | |
| beta-BHC | - | - | 1.8 | | | **2.18** | | | | | | | | | | **2.08** | |
| delta-BHC | - | - | 1.8 | 0.703 | | | | | | | | | | | | | |
| 4,4'-DDD | - | - | 13 | | | | 9.20 | | | | | | | | | 6.47 | |
| 4,4'-DDE | 5000 | Fish | 9.3 | 7.74 | | 0.713 | 1.77 | 0.536 | 0.954 | 0.525 | 3.65 | 3.23 | 1.67 | 2.26 | | 5.01 | |
| 4,4'-DDT | 5000 | Fish | 9.3 | | | | 3.07 | 2.72 | 1.59 | | | | | | | | |
| Endosulfan I | - | - | 810 | | | 0.735 | | | | | | | 0.255 J | | | | |
| Endosulfan sulfate | - | - | 810 | | | | | | | | | | 0.207 J | | | | |
| Endrin aldehyde | - | - | 41 | | 0.555 | 0.420 | | | 0.901 | 1.05 | | | | | 0.660 J | | 0.503 |
| Endrin ketone | - | - | 41 | | | | | | | 0.315 | | | | | 0.282 | | |
| Heptachlor | 300 | Fish | 0.7 | | | | | | | | | | | | | | |
| Heptachlor epoxide | 300 | Fish | 0.35 | **0.427** | | | **0.472** | | | | | | | 0.0935 J | | | |
| PCB-1254 | 2000 | Fish | 1.6 | **35.6** | **9.88** | | **11.8** | **23.2** | **7.42** | **7.70** | **24.0** | **32.3** | | | **9.00** | **16.2** | **24.0** |
| PCB-1260 | 2000 | Fish | 1.6 | | | | | **4.72** | | | | **5.78 J** | | | | | |
| **Chlorinated Herbicides (ug/kg)** | | | | | | | | | | | | | | | | | |
| Dicamba | - | - | 4100 | 2.82 | | | | | | | 9.41 | 10.0 | | ND | | 12.6 | |
| 2,4-DB | 1000 | Fish | 1100 | 24.9 | | 180 | 168 | | | | 144 J | 78.4 J | 8.14 J | | | 98.6 | |
| 2,4,5-T | - | - | 1400 | | 21.3 | | | 22.4 | 21.2 | 23.1 | | | | | 22.2 J | | 23.3 |
| 2,4,5-TP | - | - | 1100 | 1.50 | | 13.7 | | | | | | 8.13 J | 3.52 J | | | 6.47 | |
| **Metals (mg/kg)** | | | | | | | | | | | | | | | | | |
| Aluminum | - | - | 140 | 48.1 | 12.3 | 15.2 | **142** | 35.7 | 18.5 | 32.6 | **160 J** | 63.9 J | | | 15.7 | | 18.1 |
| Antimony | - | - | 0.054 | | | | | | | | | | | | | | |
| Arsenic | 86 | Bivalves | 0.0021 | **1.43** | **0.844** | **0.915** | **1.13** | **0.744** | **0.694** | **0.665** | **1.03** | **0.715** | | | | | **0.818** |
| Barium | - | - | 9.5 | 0.312 | | 0.225 | 1.46 | | | | 0.768 | 0.343 | 0.216 | 0.369 | | 0.262 | |
| Beryllium | - | - | 0.27 | | | | | | | | | | | | | | |
| Cadmium | 4 | | 0.14 | **0.427** | | 0.128 | **0.153** | 0.120 | 0.111 | 0.0980 | **0.144** | 0.127 | 0.136 | 0.121 | | 0.100 | |
| Calcium | - | - | - | 3587 | 1345 J | 551 | 926 | 920 J | 294 J | 334 J | 1776 J | 528 J | 308 | 339 | 247 J | 257 | 243 J |
| Chromium | 13 | Bivalves | 200 | 6.84 | | 0.180 | 1.50 | 1.52 | | 1.13 | 0.682 | 0.529 | 0.383 | 0.385 | | 0.216 | |
| Cobalt | - | - | 2.7 | | | | | | | | | | | | | | |
| Copper | - | - | 5.4 | **18.5** | 1.73 L | 1.16 | 2.08 | | | | 1.75 | 1.31 | 0.937 | 0.864 | | 1.27 | |
| Iron | - | - | 41 | **109** | 24.5 | **42.8** | **297** | **71.6** | 38.1 J | **44.0** | **265 J** | **100 J** | **44.0** | **41.6** | 29.3 | 35.7 | 31.5 |
| Mercury[1] | 1 | Fish | 0.014 | | | 0.00645 | **0.0142** | | **0.0201** | | 0.00922 | 0.0127 | | | | 0.00624 | |
| Lead[2] | 1.7 | Bivalves | 0.000014 | **2.23** | | | | | | | | | | | | | |
| Magnesium | - | - | - | 521 | 401 | 554 | 627 | 410 | 346 | 370 | 757 | 507 | 360 | 364 | 287 | 291 | 324 |
| Manganese | - | - | 19 | 3.99 | 3.53 | 0.968 | 6.21 | 3.61 | 2.45 | **33.2** | 13.5 J | 5.24 J | 1.75 | 1.99 | 2.56 | 2.07 | 4.80 |
| Nickel | 80 | Bivalves | 2.7 | 0.498 | 0.274 | | 0.283 | 0.288 | | 0.959 | 0.346 | 0.196 | | | | 0.216 | 0.225 |
| Potassium | - | - | - | 908 | 590 | 679 | 768 | 662 | 368 | 516 | 676 | 635 | 369 | 358 | 382 | 665 | 628 |
| Selenium | - | - | 0.68 | 0.472 | 0.593 | | **0.779** | 0.480 | 0.620 | 0.630 | | 0.529 J | | | | **0.693** | |
| Silver | - | - | 0.68 | **1.14** | 0.122 | 0.165 | **1.24** | 0.280 | 0.101 | 0.175 | 0.547 | 0.490 | 0.616 J | 0.281 J | 0.102 | 0.193 | 0.203 |
| Sodium | - | - | - | 3186 | 2956 | 4088 | 3788 | 2968 | 2655 | 2737 | 3197 | 3048 | 2477 | 2431 | 2058 | 1825 | 2513 |
| Thallium | - | - | 0.0095 | | | | | | | | | | | | | | |
| Vanadium | - | - | 0.95 | 0.240 | | | **1.09** | | | | 0.365 | 0.284 | | | | | |
| Zinc | - | - | 41.0 | **457** | 6.00 L | 7.03 | 9.45 | 6.50 L | | 5.61 L | 8.48 | 7.90 | | 4.52 | | 6.78 | 5.00 L |
| **PCTs (mg/kg)** | | | | | | | | | | | | | | | | | |
| Aroclor 5432 | 2000[3] | Fish | 0.0007 | **0.0294** | ND | ND | **0.0224** | ND | **0.0403** | ND | **0.0278** | **0.0225** | ND | ND | ND | **0.0223** | **0.0248** |
| **Moisture (%)** | - | - | - | 91.1 | 92.4 | 92.5 | 88.2 | 92.0 | 94.7 | 93.0 | 90.4 | 90.2 | 95.6 | 94.5 | 94.0 | 92.3 | 92.5 |

Blank cell - Analyte was not detected in any of the samples from the indicated investigation.
B - Concentration similar to low-level concentrations found in associated blanks.
J - Estimated value.
L - Potentially biased low.
[1] Methylmercury used as RBSL surrogate
[2] Tetraethyllead used as RBSL surrogate
Yellow indicates result exceeds RBSL
Green indicates result exceeds FDA Action Level and RBSL

## Table 2.11. Human Health Total Risk Summary for Site SS-63, Langley AFB, Virginia

| Medium of Concern | Child Fisher | Adult Fisher | Other Recreational Person[1] | Other Worker[2] |
|---|---|---|---|---|
| **Receptor Hazard Index** | | | | |
| Surface Water | 0.00022 | 0.0001 | 0.008 | 0.002 |
| Animal Tissue (crabs & fish) | 6 (0.98) | 5 (0.80) | NA | NA |
| **Total** | 6 (0.98) | 5 (0.80) | 0.008 | 0.002 |
| **Receptor Cancer Risk** | | | | |
| Surface Water | 4E-09 | 1E-08 | 2E-07 | 2E-07 |
| Animal Tissue (crabs & fish) | 2E-04 (1E-05) | 8E-04 (3E-05) | NA | NA |
| **Total** | 2E-04 (1E-05) | 8E-04 (3E-05) | 2E-07 | 2E-07 |
| | | | | |
| **Receptor Hazard Index** | | | | |
| Animal Tissue (bivalve) | 3 | 2 | NA | NA |
| **Receptor Cancer Risk** | | | | |
| Animal Tissue (bivalve) | 7E-05 | 3E-04 | NA | NA |

NA = Not applicable; pathway not evaluated.
Values in parentheses indicate central tendency value.

[1] JetSkier
[2] Sea Rescue Trainer

## Table 2.12. Total Risk Characterization Summary for Site SS-63: Cancer Risks, Langley AFB, Virginia

| Scenario | Receptor Age | Estimated Total Cancer Risk | | COPC and Pathway Risk ≥ 1E-06 | Primary Site Specific Uncertainties |
|---|---|---|---|---|---|
| | | Reasonable Maximum | Central Tendency | | |
| Current/Future Scenarios | | | | | |
| Fisher (chronic) (Fish & Crabs) | Child | 2E-04 | 1E-05 | 1. Ingestion of arsenic, Aroclor 5432, PCB-1254, PCB-1248, and PCB-1260 in fish tissue.<br>2. Ingestion of arsenic in crab tissue | High uncertainty associated with source, speciation and toxicity of arsenic and with source of PCBs/PCTs in seafood. |
| Fisher (chronic) (Fish & Crabs) | Adult | 8E-04 | 3E-05 | 1. Ingestion of arsenic, arclor 5432, PCB-1254, PCB-1248, PCB-1260 in fish tissue.<br>2. Ingestion of arsenic and PCB-1254 in crab tissue | High uncertainty associated with source, speciation and toxicity of arsenic and with source of PCBs/PCTs in seafood. |
| Other Recreational Person | Adolescent | 2E-07 | NA | NA | NA |
| Other Worker | Adult | 2E-07 | NA | NA | NA |
| | | | | | |
| Fisher (chronic) (Bivalves) | Child | 7E-05 | 4E-06 | 1. Ingestion of arsenic, Aroclor 5432, PCB-1254, and benzo(a)pyrene in bivalve tissue. | High uncertainty associated with source, speciation and toxicity of arsenic and with source of PCBs/PCTs and PAHs in seafood. |
| Fisher (chronic) (Bivalves) | Adult | 3E-04 | 1E-05 | 1. Ingestion of arsenic, Aroclor 5432, PCB-1254, and benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene in bivalve tissue. | High uncertainty associated with source, speciation and toxicity of arsenic and with source of PCBs/PCTs and PAHs in seafood. |

## Table 2.13. Total Risk Characterization Summary for Site SS-63: Non-Cancer Hazards, Langley AFB, Virginia

| Scenario | Receptor Age | Estimated Total Hazard Index | | COPC and Pathway HI ≥ 1 | Target Organ HIs ≥ 1 | Primary Site-Specific Uncertainties |
|---|---|---|---|---|---|---|
| | | Reasonable Maximum | Central Tendency | | | |
| Current/Future Scenarios | | | | | | |
| Fisher (chronic) (Fish & Crabs) | Child | 6 | 0.98 | 1. Ingestion of arsenic and PCB-1254 in fish tissue<br>2. Ingestion of arsenic in crab tissue | Skin/Vascular (arsenic) (HI =3)<br>Eye/Immune System (PCB-1254) (HI = 2) | High uncertainty associated with source, speciation and toxicity of arsenic and with source of PCBs/PCTs in seafood. |
| Fisher (chronic) (Fish & Crabs) | Adult | 5 | 0.80 | 3. Ingestion of arsenic and PCB-1254 in fish tissue<br>4. Ingestion of arsenic in crab tissue | Skin/vascular (arsenic) (HI =3)<br>Immune system/ Eye (PCB-1254) (HI = 2) | High uncertainty associated with source, speciation and toxicity of arsenic and with source of PCBs/PCTs in seafood. |
| Other Recreational Person[3] | Adolescent | 0.008 | NA | NA | NA | NA |
| Other Worker[4] | Adult | 0.002 | NA | NA | NA | NA |
| | | | | | | |
| Fisher (chronic) (Bivalves) | Child | 3 | 0.4 | 1. Ingestion of arsenic in bivalve tissue | Skin/Vascular (arsenic) (HI =1.24) | High uncertainty associated with source, speciation and toxicity of arsenic |
| Fisher (chronic) (Bivalves) | Adult | 2 | 0.3 | 1. Ingestion of arsenic in bivalve tissue | Skin/Vascular (arsenic) (HI =1.12) | High uncertainty associated with source, speciation and toxicity of arsenic |

NA = Not Applicable
RfD = Reference Dose

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## Table 2.14. Human Health Site Risk Summary for Site SS-63, Langley AFB, Virginia

| Medium of Concern | Child Fisher | Adult Fisher | Other Recreational Person[5] | Other Worker[6] |
|---|---|---|---|---|
| **Receptor Hazard Index** | | | | |
| Surface Water | 0.0002 | 0.0001 | 0.008 | 0.002 |
| Animal Tissue(crabs & fish) | 2.6 (0.3) | 2.3 (0.2) | NA | NA |
| **Total** | 2.6 (0.3) | 2.3 (0.2) | 0.008 | 0.002 |
| **Receptor Cancer Risk** | | | | |
| Surface Water | 4E-09 | 1E-08 | 2E-07 | 2E-07 |
| Animal Tissue(crabs & fish) | 5E-05 | 2E-04 (4E-06) | NA | NA |
| **Total** | 5E-05 | 2E-04 (4E-06) | 2E-07 | 2E-07 |
| | | | | |
| **Receptor Hazard Index** | | | | |
| Animal Tissue (bivalve) | 1 | 1 | NA | NA |
| **Receptor Cancer Risk** | | | | |
| Animal Tissue (bivalve) | 2E-05 | 6E-05 | NA | NA |

NA = Not applicable; pathway not evaluated.
Values in parentheses indicate central tendency value.

[5] Jet Skier
[6] Sea Rescue Trainer

## Table 2-15. Site Risk Summary for Site SS-63, Langley AFB, Virginia

| Scenario | Receptor Age | Estimated Total Cancer Risk | | COPC and Pathway Risk ≥ 1E-06 | Primary Site Specific Uncertainties |
|---|---|---|---|---|---|
| | | Reasonable Maximum | Central Tendency | | |
| Current/Future Scenarios | | | | | |
| Fisher (chronic) (Fish & Crabs) | Child | 5E-05 | NA | 1. Ingestion of Aroclor 5432, PCB-1254, PCB-1248, PCB-1260 in fish tissue. | High uncertainty associated with the source of PCBs/PCTs |
| Fisher (chronic) (Fish & Crabs) | Adult | 2E-04 | 4E-06 | 2. Ingestion of Aroclor 5432, PCB-1254, PCB-1248, PCB-1260 in fish tissue.<br>3. Ingestion of PCB-1254 in crab tissue. | High uncertainty associated with the source of PCBs/PCTs. |
| Other Recreational Person | Adolescent | 2E-07 | NA | NA | NA |
| Other Worker | Adult | 2E-07 | NA | NA | NA |
| | | | | | |
| Fisher (chronic) (Bivalves) | Child | 2E-05 | NA | NA | NA |
| Fisher (chronic) (Bivalves) | Adult | 6E-05 | NA | NA | NA |

## Table 2-16. Site Risk Characterization Summary for Site SS-63: Non-Cancer Hazards, Langley AFB, Virginia

| Scenario | Receptor Age | Estimated Total Hazard Index | | COPC and Pathway HI ≥ 1 | Target Organ HIs ≥ 1 | Primary Site-Specific Uncertainties |
|---|---|---|---|---|---|---|
| | | **Reasonable Maximum** | **Central Tendency** | | | |
| Current/Future Scenarios | | | | | | |
| Fisher (chronic) (Fish & Crabs) | Child | 2.6 | 0.3 | 1. Ingestion of PCB-1254 in fish tissue. | Immune System/Eye/Nails (PCB-1254) (HI = 2) | High uncertainty associated with source of PCBs/PCTs. |
| Fisher (chronic) (Fish & Crabs) | Adult | 2.3 | 0.2 | 2. Ingestion of PCB-1254 in fish tissue. | Immune system/Eye/Nails (PCB-1254) (HI = 2) | High uncertainty associated with source of PCBs/PCTs. |
| Other Recreational Person[7] | Adolescent | 0.008 | NA | NA | NA | NA |
| Other Worker[8] | Adult | 0.002 | NA | NA | NA | NA |
| | | | | | | |
| Fisher (chronic) (Bivalves) | Child | 1 | NA | NA | NA | NA |
| Fisher (chronic) (Bivalves) | Adult | 1 | NA | NA | NA | NA |

NA = Not Applicable
RfD = Reference Dose

[7] Jet Skier
[8] Sea Rescue Trainer

**Table 2.17**
**Ecological Exposure Pathways of Concern**
**ERP Site SS-63**

| Exposure Medium | Receptor | Exposure Route | Assessment Endpoints | Measurement Endpoints |
|---|---|---|---|---|
| Sediment | Benthic and Epibenthic Invertebrates | • Direct contact | • Protect benthic and epibenthic invertebrate communities to maintain species diversity, biomass, and nutrient cycling<br>• Provide a food source for higher-level consumers<br>• Minimize bioaccumulation to protect higher trophic level receptors | • Toxicity testing<br>• Enumeration of benthic macroinvertebrates in sediment samples<br>• Comparison of maximum and mean chemical concentrations to NOAELs and LOAELs obtained from the Langley AFB Toxicity Study<br>• Comparison of maximum and mean chemical concentrations to NOAELs and LOAELs from the literature<br>• Collection of bivalves and crabs for chemical analysis of their tissues |
| Sediment and Surface Water | Fish (Atlantic croaker) | • Direct contact<br>• Ingestion | • Protect fish communities to maintain species diversity<br>• Ensure that contaminant ingestion does not negatively affect growth or survival<br>• Minimize bioaccumulation to protect higher-level consumers | • Collection of killifish and sport fish samples for tissue analysis<br>• Comparison of killifish tissue concentrations to toxicity values obtained from the literature<br>• Calculation of chemical intake by sport fish through use of a food chain model. Chemical concentration in food (benthic invertebrates, bivalves, and killifish) determined from sediment and tissue data. Maximum and mean chemical intakes were compared to NOAELs and LOAELs obtained from the literature<br>• Examination of killifish and sport fish samples for evidence of stress or disease |
| Sediment and Surface Water | Piscivorous Birds (belted kingfisher) | • Ingestion | • Ensure that ingestion of contaminants in water or prey (fish, shellfish) does not negatively impact growth, survival, or reproduction | • Calculation of chemical intake through use of a food chain model. Chemical concentration in food obtained from tissue data. Maximum and mean chemical intakes were compared to NOAELs and LOAELs obtained from the literature. |
| Sediment and Surface Water | Semi-aquatic Carnivorous Mammals (mink) | • Ingestion | • Ensure that ingestion of contaminants in water or prey (fish, invertebrates) does not negatively impact growth, survival, or reproduction | • Calculation of chemical intake through use of a food chain model. Chemical concentration in food obtained from tissue and sediment data. Maximum and mean chemical intakes were compared to NOAELs and LOAELs obtained from the literature. |

## Table 2.18
## Comparison of Sediment Remedial Action Alternatives
## ERP Site SS-63 LTA Cove
## Langley AFB, Virginia

| Remedial Alternative | Evaluation Criteria | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Threshold* | | *Balancing* | | | | | *Modifying* | |
| | 1. Overall Protection of Human Health and the Environment | 2. Compliance with ARARs | 3. Long-Term Effectiveness and Permanence | 4. Reduction in Toxicity, Mobility or Volume Through Treatment | 5. Short Term Effectiveness | 6. Implementability | 7. Total Alternative Cost | 8. State Acceptance | 9. Community Acceptance |
| 1: No Action | ○ | ● | ○ | ○ | ● | ● | $ - | NA | NA |
| 2: Manage waste in place – Monitoring | ◒ | ● | ○ | ○ | ● | ● | $ 353,000 | NA | NA |
| 3: Mechanical dredging with off-site disposal | ● | ● | ● | ○ | ◒ | ◒ | $ 952,000 | NA | NA |
| 4: Dry excavation with off-site disposal | ● | ● | ● | ○ | ◒ | ● | $ 821,000 | Accepted | Accepted |
| 5: Capping | ● | ● | ● | ○ | ◒ | ● | $ 1,183,000 | NA | NA |

Ranking Key: ● Fully Satisfies Criteria ◒ Partially Satisfies Criteria ○ Does Not Satisfies Criteria

NA: Not applicable

## Table 2.19. Cost Estimate Summary for ERP Site SS-63
## Dry Excavation with Offsite Disposal
## Langley AFB, Virginia

| Description | Unit | Quantity | Unit Cost | Cost |
|---|---|---|---|---|
| **REMEDIAL ACTIVITIES** | | | | |
| *Site Preparation* | | | | |
| Mobilization | Lump Sum | 1 | $15,000.00 | $15,000 |
| Develop Work Plans | Lump Sum | 1 | $50,000.00 | $50,000 |
| Setup Temporary Facilities | Lump Sum | 1 | $10,000.00 | $10,000 |
| Surveying | Lump Sum | 1 | $3,000.00 | $3,000 |
| *Dredging Activities* | | | | |
| Pre-Confirmation Sampling | Each | 104 | $110.00 | $11,440 |
| Installation of Coffer Dams | Linear Feet | 1,940 | $71.00 | $137,740 |
| Excavation of Sediment | Cubic Yard | 1,693 | $20.60 | $34,876 |
| Dewatering Sediment | Cubic Yard | 1,693 | $15.00 | $25,395 |
| Sediment Characterization (TCLP) | Each | 8 | $1,000.00 | $8,465 |
| *Transportation and Disposal* | | | | |
| PCB/PCT Contaminated Sediment (non-hazardous) | Ton | 3,047 | $60.00 | $182,844 |
| *Site Restoration* | | | | |
| Cleanup and Demobilization | Lump Sum | 1 | $10,000.00 | $10,000 |
| *Site Closeout* | | | | |
| Final Report | Lump Sum | 1 | $50,000.00 | $50,000 |
| **Subtotal** | | | | $538,760 |
| *Additional Costs* | | | | |
| Engineering/Design | 12% of Subtotal | | | $64,651 |
| Project Management | 10% of Subtotal | | | $53,876 |
| Construction Management | 8% of Subtotal | | | $43,101 |
| Residual Wastes Management | 2% of Subtotal | | | $10,775 |
| Contingencies | 20% of Subtotal | | | $110,214 |
| **Total Costs For Dry Excavation with Offsite Disposal** | | | | $821,377 |

Notes:

1. Sources for cost information include vendor-specific data and Means Environmental Remediation Cost Data (2005).
2. A conversion factor of 1.8 was used to convert cubic yard to tons.
3. Unit costs include all labor, equipment, and materials unless otherwise noted in the table.
4. Analysis of decant water included in residual waste management costs.
5. Assumed one characterization sample would be collected per every 200 cubic yards excavated.
6. Assumed PCB/PCT contaminated sediment would be classified as non-hazardous.

# 3.0 RESPONSIVENESS SUMMARY

The public participation requirements set out in the NCP at 40 CFR 300.435(c)(2)(ii) have been met for ERP Site SS-63. No questions or comments were received in the public meeting for the Proposed Plan held on January 8, 2008. No oral or written comments were received during the public comment period that extended from December 16, 2007 through January 15, 2008.

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# 4.0 REFERENCES

CH2M Hill, 1997. Draft Water Quality Assessment of the Back River. February.

HydroGeoLogic, Inc. 2006. Final Feasibility Study, ERP Site SS-63, Langley AFB, Virginia, July.

HydroGeoLogic, Inc. 2007a. Final Record of Decision to Address Environmental Restoration Program Sites Operable Unit 34 (Site LF-17), OT-25 Annex Portion of OU-40, and the LTA Cove Portion of Operable Unit 51 (SS-63), Langley AFB, Virginia, November.

HydroGeoLogic, Inc. 2007b. Final Proposed Plan, ERP Site SS-63, Langley AFB, Virginia, December.

Radian, 1997. IRP Background Chemical Data Document [final]. Langley AFB. October.

Radian, 1999. Preliminary Assessment/Site Inspection Report [final], ERP SS-63, Back River, Langley AFB, Virginia, October.

U.S. Fish and Wildlife Service (FWS), 1993. The Distribution and Biological Effects of Selected Environmental Contaminants in the Back River, Virginia, U.S. Fish and Wildlife Service, Virginia Field Office, White Marsh, Virginia. September.

URS, 2003. Final Remedial Investigation Report Environmental Restoration Program ERP Site SS-63 Langley Air Force Base, Virginia. Delivery Order No. 0058, USACE Contract No. DACA45-96-D-0016. June.

URS, 2004. Back River Sediment Sampling Results, Site SS-63, Langley Air Force Base, Virginia. September.

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# APPENDIX A

# RISK TABLES

**(Source: URS, 2003)**

# Appendix A.1

# RAGS Part D Table 1’s
# Selection of Exposure Pathways

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
SS-63, LANGLEY AFB

| 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 | Surface Water | Surface Water | Surface Water from Back River | Fisher | Child | Ingestion | On-site | None | The physical configuration of the slope embankment of the Back River prevents the fisher from coming into contact with surface water such that ingestion would be unlikely or insignificant. |
| | | | | | | Dermal Absorption | On-site | Quant | Receptor may come into contact with surface water by handling fish/crabs or by rinsing off hands. |
| | | | | | Adult | Ingestion | On-site | None | The physical configuration of the slope embankment of the Back River prevents the fisher from coming into contact with surface water such that ingestion would be unlikely or insignificant. |
| | | | | | | Dermal Absorption | On-site | Quant | Receptor may come into contact with surface water by handling fish/crabs or by rinsing off hands. |
| | | | | Other (1) | Adult | Ingestion | Off-Site | None | Receptor is not likely to ingest surface water from the Back River at an off-site location. |
| | | | | | | Dermal Absorption | Off-Site | None | Receptor is not likely to come into contact with surface water from the Back River at an off-site location. |
| | | | | Other Recreational Person (2) | Adolescents (teens) | Ingestion | On-site | Quant | Receptor incidentally ingests surface water while jet skiing. |
| | | | | | | Dermal Absorption | On-site | Quant | Receptor comes into contact with surface water while jet skiing. |
| | | | | Other Worker (3) | Adult | Ingestion | On-site | Quant | Receptor incidentally ingests surface water during training exercises in the Back River. |
| | | | | | | Dermal Absorption | On-site | Quant | Receptor comes into contact with surface water during training exercises in the Back River. |
| | Sediment | Sediment | Sediment from Back River | Fisher | Child | Ingestion | On-site | None | The physical configuration of the slope embankment of the Back River prevents the fisher from coming into contact with the sediment of the Back River. |
| | | | | | | Dermal Absorption | On-site | None | The physical configuration of the slope embankment of the Back River prevents the fisher from coming into contact with the sediment of the Back River. |
| | | | | | Adult | Ingestion | On site | None | The physical configuration of the slope embankment of the Back River prevents the fisher from coming into contact with the sediment of the Back River. |
| | | | | | | Dermal Absorption | On-site | None | The physical configuration of the slope embankment of the Back River prevents the fisher from coming into contact with the sediment of the Back River. |
| | | | | Other (1) | Adult | Ingestion | Off-Site | None | Receptor is not likely to ingest sediment from the Back River at an off-site location. |
| | | | | | | Dermal Absorption | Off-Site | None | Receptor is not likely to come into contact with sediment from the Back River at an off-site location. |

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

SS-63, LANGLEY AFB

| 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) | Sediment (continued) | Sediment from Back River (continued) | Other Recreational Person (2) | Adolescents (teens) | Ingestion | On-site | None | The physical configuration of the slope embankment of the Back River prevents the jet skier from coming into contact with sediment such that ingestion would be unlikely or insignificant. Jet skier is most likely to enter water via jet ski. |
| | | | | | | Dermal Absorption | On-site | None | The physical configuration of the slope embankment of the Back River prevents the jet skier from coming into contact with sediment such that contact would be unlikely or insignificant. Jet skier is most likely to enter water via jet ski. |
| | | | | Other Worker (3) | Adult | Ingestion | On-site | None | R[illegible]ceptor would enter Back River via watercraft or helicopter and would not likely ingest sediment from the Back River. |
| | | | | | | Dermal Absorption | On-site | None | Receptor would enter Back River via watercraft or helicopter and would not likely come into contact with sediment from the Back River. |
| | Animal Tissue | Animal Tissue | Fish from Back River | Fisher | Child | Ingestion | On-site | Quant | Receptor is likely to consume fish from the Back River. |
| | | | | | Adult | Ingestion | On-site | Quant | Receptor is likely to consume fish from the Back River. |
| | | | | Other (1) | Adult | Ingestion | Off-Site | None | Receptor may consume fish from the Back River, but would most likely be mixed with other fish from other locations and consumption would be insignificant. |
| | | | | Other Recreational Person (2) | Adolescents (teens) | Ingestion | On-site | None | Receptor is not likely to fish from the Back River. |
| | | | | Other Worker (3) | Adult | Ingestion | On-site | None | Receptor is not likely to fish from the Back River. |
| | Animal Tissue | Animal Tissue | Crabs from Back River | Fisher | Child | Ingestion | On-site | Quant | Receptor is likely to consume crabs from the Back River. |
| | | | | | Adult | Ingestion | On-site | Quant | Receptor is likely to consume crabs from the Back River. |
| | | | | Other (1) | Adult | Ingestion | Off-Site | None | Receptor may consume crabs from the Back River, but would most likely be mixed with other crabs from other locations and consumption would be insignificant. |
| | | | | Other Recreational Person (2) | Adolescents (teens) | Ingestion | On-site | None | Receptor is not likely to crab from the Back River. |
| | | | | Other Worker (3) | Adult | Ingestion | On-site | None | Receptor is not likely to crab from the Back River. |

(1) Commercial Fish Consumer

(2) Jet Skier

(3) Sea Rescue Trainer

**Appendix A.2**

**RAGS Part D Table 2's**
**Occurrence, Distribution, and Selection of COPCs**
**Selection of Exposure Pathways**

TABLE 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
ERP Site SS-63 (Back River), Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water-total (9)
Exposure Medium: Surface Water
Exposure Point: Surface Water

| CAS Number | Chemical | Minimum Concentration (1) | Minimum (2) Qualifier | Maximum Concentration (1) | Maximum (2) Qualifier | Units | Location of Maximum Concentration | Detection (3) Frequency | Range of (4) Detection Limits | Concentration (5) Used for Screening | Background Value (6) | Screening Toxicity Value (7) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Contaminant Deletion or Selection (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | INORGANICS | | | | | | | | | | | | | | | |
| 7429-90-5 | Aluminum | 0.246 | | 1.48 | | mg/l | SS63-SW06 | 8/8 | 0.0142 | 1.48 | N/A | 37.0 N | 0.087 | NOAA Fresh | No | b |
| 7440-36-0 | Antimony | 0.00452 | | 0.00953 | J | mg/l | SS63-SW07 | 4/8 | 0.00443 | 0.00953 | N/A | 0.0150 N | 4.3 | SW VA WQC | No | b |
| 7440-38-2 | Arsenic | 0.00276 | J | 0.00374 | | mg/l | SS63-SW06 | 2/8 | 0.00238 | 0.00374 | N/A | 0.00045 C | 0.036 | NOAA Marine | Yes | e |
| 7440-39-3 | Barium | 0.0261 | | 0.0340 | | mg/l | SS63-SW08 | 8/8 | 0.0000800 | 0.0340 | N/A | 2.60 N | N/A | N/A | No | b |
| 7440-70-2 | Calcium | 155 | | 210 | | mg/l | SS63-SW05 | 8/8 | 0.0510 | 210 | N/A | 400 | N/A | N/A | No | c |
| 7440-47-3 | Chromium | 0.000980 | | 0.00384 | | mg/l | SS63-SW07 | 7/8 | 0.000910 | 0.00384 | N/A | 0.110 N | 0.05 | NOAA Marine | No | b |
| 7439-89-6 | Iron | 0.402 | | 1.33 | | mg/l | SS63-SW06 | 8/8 | 0.0145 | 1.33 | N/A | 11 N | 1 | NOAA Fresh | No | b |
| 7439-95-4 | Magnesium | 467 | | 707 | J | mg/l | SS63-SW03 | 8/8 | 0.0804 | 707 | N/A | 158 | N/A | N/A | Yes | f |
| 7439-96-5 | Manganese | 0.0197 | | 0.0964 | | mg/l | SS63-SW08 | 8/8 | 0.000200 | 0.0964 | N/A | 0.73 N | N/A | N/A | No | b |
| 7439-97-6 | Mercury | 0.000106 | | 0.000106 | | mg/l | SS63-SW08 | 1/8 | 0.0000600 | 0.000106 | N/A | 0.011 N | 0.000053 | SW VA WQC | No | b |
| 7440-02-0 | Nickel | 0.00231 | J | 0.00231 | J | mg/l | SS63-SW07 | 1/8 | 0.00202 | 0.00231 | N/A | 0.730 N | 4.6 | SW VA WQC | No | b |
| 7440-09-7 | Potassium | 156 | J | 243 | | mg/l | SS63-SW10 | 8/8 | 0.137 - 2.74 | 243 | N/A | 1000 | N/A | N/A | No | c |
| 7782-49-2 | Selenium | 0.0109 | | 0.0156 | | mg/l | SS63-SW05 | 8/8 | 0.00260 | 0.0156 | N/A | 0.180 N | 11 | SW VA WQC | No | b |
| 7440-23-5 | Sodium | 3770 | | 5720 | J | mg/l | SS63-SW03 | 8/8 | 2.80 | 5720 | N/A | 250 | N/A | N/A | Yes | f |
| 7440-62-2 | Vanadium | 0.00216 | | 0.00216 | | mg/l | SS63-SW06 | 1/8 | 0.000410 | 0.00216 | N/A | 0.260 N | N/A | N/A | No | b |
| 7440-66-6 | Zinc | 0.0110 | | 0.0110 | | mg/l | SS63-SW07 | 1/8 | 0.00365 | 0.0110 | N/A | 11.0 N | 0.081 | NOAA Marine | No | b |
| | ORGANICS | | | | | | | | | | | | | | | |
| 72-54-8 | 4,4'-DDD | 0.0000144 | | 0.0000144 | | mg/l | SS63-SW10 | 1/8 | 0.000000864 - 0.00000191 | 0.0000144 | N/A | 0.0028 C | 0.0000084 | SW VA WQC | No | b |
| 72-55-9 | 4,4'-DDE | 0.00000786 | | 0.00000786 | | mg/l | SS63-SW06 | 1/8 | 0.00000108 - 0.00000233 | 0.00000786 | N/A | 0.002 C | 0.0000059 | SW VA WQC | No | b |
| 67-64-1 | Acetone | 0.00136 | | 0.00186 | | mg/l | SS63-SW06 | 2/8 | 0.000286 - 0.000499 | 0.00186 | N/A | 0.610 N | N/A | N/A | No | b |
| 309-00-2 | Aldrin | 0.00000965 | | 0.0000213 | | mg/l | SS63-SW01 | 6/8 | 0.000000749 - 0.00000144 | 0.0000213 | N/A | 0.000039 C | 0.0000014 | SW VA WQC | No | b |
| 959-98-8 | Endosulfan I | 0.00000248 | | 0.00000514 | | mg/l | SS63-SW06 | 5/8 | 0.000000572 - 0.00000126 | 0.00000514 | N/A | 0.220 N | 0.24 | SW VA WQC | No | b |
| 33213-65-9 | Endosulfan II | 0.00000455 | | 0.00000455 | | mg/l | SS63-SW10 | 1/8 | 0.000000743 - 0.00000157 | 0.00000455 | N/A | 0.220 N | 0.24 | SW VA WQC | No | b |
| 72-20-8 | Endrin | 0.0000119 | | 0.0000119 | | mg/l | SS63-SW10 | 1/8 | 0.00000175 - 0.00000636 | 0.0000119 | N/A | 0.011 N | 0.00081 | SW VA WQC | No | b |
| 53494-70-5 | Endrin Ketone | 0.00000205 | | 0.00000205 | | mg/l | SS63-SW01 | 1/8 | 0.00000157 - 0.00000302 | 0.00000205 | N/A | 0.011 N | N/A | N/A | No | b |
| 76-44-8 | Heptachlor | 0.00000175 | | 0.00000784 | | mg/l | SS63-SW10 | 3/8 | 0.000000661 - 0.00000304 | 0.00000784 | N/A | 0.00015 C | 0.0000021 | SW VA WQC | No | b |
| 1024-57-3 | Heptachlor epoxide | 0.00000463 | | 0.00000463 | | mg/l | SS63-SW02 | 1/8 | 0.000000639 - 0.00000633 | 0.00000463 | N/A | 0.000074 C | 0.0000018 | NOAA Marine | No | b |
| 5103-71-9 | alpha-Chlordane | 0.00000135 | | 0.00000135 | | mg/l | SS63-SW10 | 1/8 | 0.000000623 - 0.00000120 | 0.00000135 | N/A | 0.0019 C | 0.0000059 | SW VA WQC | No | b |
| 319-85-7 | beta-BHC | 0.00000776 | J | 0.00000776 | J | mg/l | SS63-SW07 | 1/8 | 0.000000585 - 0.00000500 | 0.00000776 | N/A | 0.00037 C | N/A | N/A | No | b |
| 319-86-8 | delta-BHC | 0.00000387 | J | 0.0000170 | | mg/l | SS63-SW02 | 6/8 | 0.000000371 - 0.00000133 | 0.0000170 | N/A | 0.00037 C | N/A | N/A | No | b |
| 58-89-9 | gamma-BHC(Lindane) | 0.00000450 | | 0.0000179 | | mg/l | SS63-SW01 | 5/8 | 0.000000410 - 0.000000861 | 0.0000179 | N/A | 0.00052 C | 0.025 | SW VA WQC | No | b |

(1) Minimum/maximum detected concentration.

(2) If minimum/maximum detected concentration comes from average of normal and field duplicate samples, then both qualifiers are presented. In a such case, the format is <normal qualifier>/<field duplicate qualifier>.

(3) Detection Frequency is defined as the number of samples that are detected and are not B-flagged over the total number of samples.

(4) Range of Detection Limits includes limits associated with any dilution factor. See the analytical results section for more details of detection limits and dilution factors, per sample.

(5) Maximum concentration is used for screening.

(6) N/A - Refer to supporting information for background discussion. Background values, derived from statistical analysis, are upper tolerance limits (UTLs).

TABLE 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

ERP Site SS-63 (Back River), Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water-total (9)
Exposure Medium: Surface Water
Exposure Point: Surface Water

| CAS Number | Chemical | Minimum Concentration (1) | Minimum (2) Qualifier | Maximum Concentration (1) | Maximum (2) Qualifier | Units | Location of Maximum Concentration | Detection (3) Frequency | Range of (4) Detection Limits | Concentration (5) Used for Screening | Background Value (6) | Screening Toxicity Value (7) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Contaminant Deletion or Selection (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

(7) Risk-Based Concentration Table, U.S. EPA Region III. October 2000. (Cancer benchmark value = 1E-06, HQ = 0.1). Surface water RBSLs were determined by multiplying the tap water RBSL x 10.

(8) Rationale for Contaminant Deletion or Selection:

a. No measurable results on site.

b. Maximum detected result is less than the RBSL.

c. Maximum detected concentration is less than Essential Nutrient intake rate.

d. Mean site concentration is not significantly greater than mean background concentration (alpha = 0.20) and maximum detected result is less than background UTL.

e. Maximum detected result exceeds screening toxicity value.

f. Maximum detected concentration exceeds Essential Nutrient intake rate.

(9) The surface water sample results are for unfiltered samples only.

Definitions. N/A = Not applicable

SQL = Sample Quantitation Limit

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

MCL = Federal Maximum Contaminant Level

SMCL = Secondary Maximum Contaminant Level

J = Estimated Value

C = Carcinogenic

N = Non-Carcinogenic

TABLE 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

ERP Site SS-63 (Back River), Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Fish from Back River

| CAS Number | Chemical | Minimum (1) Concentration | Minimum (2) Qualifier | Maximum (1) Concentration | Maximum (2) Qualifier | Units | Location of Maximum Concentration | Detection (3) Frequency | Range of (4) Detection Limits | Concentration (5) Used for Screening | Background (6) Value | Screening (7) Toxicity Value | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for (8) Contaminant Deletion or Selection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **INORGANICS** | | | | | | | | | | | | | | | |
| 7440-38-2 | Arsenic | 0.742 | | 2.56 | | mg/kg | SS63-BIO07 | 8/8 | 0.398 - 0.427 | 2.56 | N/A | 0.00210 C | N/A | | Yes | e |
| 7440-70-2 | Calcium | 168 | | 1320 | | mg/kg | SS63-BIO01 | 2/2 | 1.98 - 1.98 | 1320 | N/A | NA | N/A | | Yes | e |
| 7440-50-8 | Copper | 0.228 | | 0.451 | | mg/kg | SS63-BIO10 | 6/6 | 0.108 - 0.111 | 0.451 | N/A | 5.40 N | N/A | | No | b |
| 7439-95-4 | Magnesium | 288 | | 360 | | mg/kg | SS63-BIO08 | 8/8 | 3.18 - 3.31 | 360 | N/A | NA | N/A | | Yes | e |
| 7439-97-6 | Mercury | 0.0238 | | 0.0692 | | mg/kg | SS63-BIO04 | 8/8 | 00610 - 0.0065 | 0.0692 | N/A | 0.014 N | N/A | | Yes | e |
| 7440-09-7 | Potassium | 3440 | | 3950 | | mg/kg | SS63-BIO04 | 8/8 | 24.0 - 24.9 | 3950 | N/A | NA | N/A | | Yes | e |
| 7782-49-2 | Selenium | 0.636 | | 1.05 | | mg/kg | SS63-BIO02 | 8/8 | 0.390 - 0.420 | 1.05 | N/A | 0.680 N | N/A | | Yes | e |
| 7440-23-5 | Sodium | 298 | | 717 | | mg/kg | SS63-BIO07 | 6/6 | 27.0 - 27.9 | 717 | N/A | NA | N/A | | Yes | e |
| 7440-66-6 | Zinc | 4.78 | | 5.77 | | mg/kg | SS63-BIO01 | 8/8 | 0.265 - 0.269 | 5.77 | N/A | 41.0 N | N/A | | No | b |
| | **ORGANICS** | | | | | | | | | | | | | | | |
| 72-54-8 | 4,4'-DDD | 0.00203 | | 0.0284 | | mg/kg | SS63-BIO05 | 6/8 | 000129 - 0.001 | 0.0284 | N/A | 0.0130 C | N/A | | Yes | e |
| 72-55-9 | 4,4'-DDE | 0.00454 | | 0.0379 | | mg/kg | SS63-BIO05 | 8/8 | 000129 - 0.001 | 0.0379 | N/A | 0.00930 C | N/A | | Yes | e |
| | Aroclor 5432 | 0.0226 | | 0.379 | | mg/kg | SS63-BIO05 | 5/8 | 0.0199 - 0.0403 | 0.379 | N/A | 0.0007 C | N/A | | Yes | e |
| 12672-29-6 | PCB-1248 | 0.0167 | | 0.104 | | mg/kg | SS63-BIO05 | 4/8 | 00318 - 0.0066 | 0.104 | N/A | 0.00160 C | N/A | | Yes | e |
| 11097-69-1 | PCB-1254 | 0.0311 | | 0.308 | | mg/kg | SS63-BIO06 | 6/6 | 00318 - 0.0066 | 0.308 | N/A | 0.00160 C | N/A | | Yes | e |
| 11096-82-5 | PCB-1260 | 0.0112 | | 0.0972 | | mg/kg | SS63-BIO05 | 8/8 | 00318 - 0.0066 | 0.0972 | N/A | 0.00160 C | N/A | | Yes | e |
| 319-84-6 | alpha-BHC | 0.000104 | | 0.000223 | | mg/kg | SS63-BIO05 | 7/8 | 00658 - 0.0000 | 0.000223 | N/A | 0.000500 C | N/A | | No | b |
| 319-86-8 | delta-BHC | 0.000178 | | 0.000212 | | mg/kg | SS63-BIO02 | 2/8 | 00858 - 0.0000 | 0.000212 | N/A | 0.0018 C | N/A | | No | b |
| 58-89-9 | gamma-BHC(Lindane) | 0.0000813 | | 0.000198 | | mg/kg | SS63-BIO01 | 2/6 | 000659 - 0.000 | 0.000198 | N/A | 0.00240 C | N/A | | No | b |

(1) Minimum/maximum detected concentration.

(2) If minimum/maximum detected concentration comes from average of normal and field duplicate samples, then both qualifiers are presented. In a such case, the format is <normal qualifer>/<field duplicate qualifer>.

(3) Detection Frequency is defined as the number of samples that are detected and are not B-flagged over the total number of samples.

(4) Range of Detection Limits includes limits associated with any dilution factor. See the analytical results section for more details of detection limits and dilution factors, per sample

(5) Maximum concentration is used for screening.

(6) N/A - Refer to supporting information for background discussion. Background values, derived from statistical analysis, are upper tolerance limits (UTLs).

(7) Risk-Based Concentration Table, U.S. EPA Region III. October 2000. (Cancer benchmark value = 1E-06, HQ = 0.1).

(8) Rationale for Contaminant Deletion or Selection:

a. No measurable results on site.

b. Maximum detected result is less than the RBSL

c. Maximum detected result is less than the Essential Nutrient intake value

d. Mean site concentration is not significantly greater than mean background concentration (alpha = 0.20) and maximum detected result is less than background UTL.

e. Maximum detected result exceeds screening toxicity value.

Definitions. N/A = Not applicable

SQL = Sample Quantitation Limit

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

MCL = Federal Maximum Contaminant Level

SMCL = Secondary Maximum Contaminant Level

TABLE 2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
ERP Site SS-63 (Back River), Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Fish from Back River

| CAS Number | Chemical | Minimum Concentration (1) | Minimum (2) Qualifier | Maximum Concentration (1) | Maximum (2) Qualifier | Units | Location of Maximum Concentration | Detection (3) Frequency | Range of (4) Detection Limits | Concentration (5) Used for Screening | Background Value (6) | Screening Toxicity Value (7) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Contaminant Deletion or Selection (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
ERP Site SS-63 (Back River), Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Crabs from Back River

| CAS Number | Chemical | Minimum Concentration (1) | Minimum (2) Qualifier | Maximum Concentration (1) | Maximum (2) Qualifier | Units | Location of Maximum Concentration | Detection (3) Frequency | Range of (4) Detection Limits | Concentration (5) Used for Screening | Background Value (6) | Screening Toxicity Value (7) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Contaminant Deletion or Selection (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | INORGANICS | | | | | | | | | | | | | | | |
| 7429-90-5 | Aluminum | 6.19 | | 15.3 | | mg/kg | SS63-BIO01 | 4/4 | 3.75 - 3.85 | 15.3 | N/A | NA | N/A | | Yes | e |
| 7440-38-2 | Arsenic | 1.75 | | 3.38 | | mg/kg | SS63-BIO04 | 4/4 | 0.400 - 0.422 | 3.38 | N/A | NA | N/A | | Yes | e |
| 7440-39-3 | Barium | 0.308 | | 0.477 | | mg/kg | SS63-BIO01 | 4/4 | 0.0478 - 0.0498 | 0.477 | N/A | NA | N/A | | Yes | e |
| 7440-70-2 | Calcium | 985 | | 2230 | | mg/kg | SS63-BIO01 | 4/4 | 1.93 - 1.99 | 2230 | N/A | NA | N/A | | Yes | e |
| 7440-50-8 | Copper | 6.09 | | 8.62 | | mg/kg | SS63-BIO04 | 4/4 | 0.106 - 0.109 | 8.62 | N/A | NA | N/A | | Yes | e |
| 7439-89-6 | Iron | 11.1 | | 14.2 | | mg/kg | SS63-BIO01 | 4/4 | 1.93 - 1.99 | 14.2 | N/A | NA | N/A | | Yes | e |
| 7439-95-4 | Magnesium | 352 | | 547 | | mg/kg | SS63-BIO01 | 4/4 | 3.17 - 3.27 | 547 | N/A | NA | N/A | | Yes | e |
| 7439-96-5 | Manganese | 1.09 | | 1.58 | | mg/kg | SS63-BIO04 | 4/4 | 0.0283 - 0.0299 | 1.58 | N/A | NA | N/A | | Yes | e |
| 7440-02-0 | Nickel | 0.370 | | 0.496 | | mg/kg | SS63-BIO06 | 4/4 | 0.188 - 0.200 | 0.496 | N/A | NA | N/A | | Yes | e |
| 7440-09-7 | Potassium | 2000 | | 2840 | | mg/kg | SS63-BIO06 | 4/4 | 24.1 - 24.6 | 2840 | N/A | NA | N/A | | Yes | e |
| 7782-49-2 | Selenium | 0.524 | | 0.684 | | mg/kg | SS63-BIO06 | 4/4 | 0.389 - 0.410 | 0.684 | N/A | NA | N/A | | Yes | e |
| 7440-22-4 | Silver | 0.425 | | 0.785 | | mg/kg | SS63-BIO01 | 4/4 | 0.0581 - 0.0598 | 0.785 | N/A | NA | N/A | | Yes | e |
| 7440-23-5 | Sodium | 3080 | | 3640 | | mg/kg | SS63-BIO04 | 4/4 | 26.9 - 27.8 | 3640 | N/A | NA | N/A | | Yes | e |
| 7440-66-6 | Zinc | 31.5 | | 41.9 | | mg/kg | SS63-BIO04 | 4/4 | 0.268 - 0.282 | 41.9 | N/A | NA | N/A | | Yes | e |
| | ORGANICS | | | | | | | | | | | | | | | |
| 72-54-8 | 4,4'-DDD | 0.000513 | | 0.00339 | | mg/kg | SS63-BIO01 | 2/4 | 00129 - 0.0003 | 0.00339 | N/A | NA | N/A | | Yes | e |
| 72-55-9 | 4,4'-DDE | 0.00127 | | 0.0111 | | mg/kg | SS63-BIO01 | 3/4 | 00129 - 0.0003 | 0.0111 | N/A | NA | N/A | | Yes | e |
| 76-44-8 | Heptachlor | 0.0000757 | | 0.0000757 | | mg/kg | SS63-BIO04 | 1/3 | 00667 - 0.0000 | 0.0000757 | N/A | NA | N/A | | Yes | e |
| 1024-57-3 | Heptachlor epoxide | 0.000792 | | 0.000792 | | mg/kg | SS63-BIO04 | 1/2 | 000669 - 0.000 | 0.000792 | N/A | NA | N/A | | Yes | e |
| 11097-69-1 | PCB-1254 | 0.0231 | | 0.0231 | | mg/kg | SS63-BIO01 | 1/4 | 00325 - 0.0098 | 0.0231 | N/A | NA | N/A | | Yes | e |
| 108-95-2 | Phenol | 0.120 | | 0.133 | | mg/kg | SS63-BIO06 | 2/4 | 0.0667 - 0.0678 | 0.133 | N/A | NA | N/A | | Yes | e |
| 117-81-7 | bis(2-Ethylhexyl)phthalate | 0.120 | | 0.120 | | mg/kg | SS63-BIO01 | 1/4 | 0.0667 - 0.0678 | 0.120 | N/A | NA | N/A | | Yes | e |

(1) Minimum/maximum detected concentration.

(2) If minimum/maximum detected concentration comes from average of normal and field duplicate samples, then both qualifiers are presented. In a such case, the format is <normal qualifier>/<field duplicate qualifier>.

(3) Detection Frequency is defined as the number of samples that are detected and are not B-flagged over the total number of samples.

(4) Range of Detection Limits includes limits associated with any dilution factor. See the analytical results section for more details of detection limits and dilution factors, per sample.

(5) Maximum concentration is used for screening.

(6) N/A - Refer to supporting information for background discussion. Background values, derived from statistical analysis, are upper tolerance limits (UTLs).

(7) Risk-Based Concentration Table, U.S. EPA Region III, October 2000. (Cancer benchmark value = 1E-06, HQ = 0.1).

(8) Rationale for Contaminant Deletion or Selection:

a. No measurable results on site.

b. Maximum detected result is less than the RBSL.

c. Maximum detected result is less than the Essential Nutrient intake value.

d. Mean site concentration is not significantly greater than mean background concentration (alpha = 0.20) and maximum detected result is less than background UTL.

e. Maximum detected result exceeds screening toxicity value.

Definitions: N/A = Not applicable

SQL = Sample Quantitation Limit

COPC = Chemical of Potential Concern

TABLE 2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
ERP Site SS-63 (Back River), Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium. Animal Tissue
Exposure Point: Crabs from Back River

| CAS Number | Chemical | Minimum Concentration (1) | Minimum (2) Qualifier | Maximum Concentration (1) | Maximum (2) Qualifier | Units | Location of Maximum Concentration | Detection (3) Frequency | Range of (4) Detection Limits | Concentration (5) Used for Screening | Background Value (6) | Screening Toxicity Value (7) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Contaminant Deletion or Selection (8) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
MCL = Federal Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

TABLE 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Back River, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Fish-shellfish tissue
Exposure Medium: Fish-shellfish tissue

| Exposure Point | CAS Number | Chemical | Minimum Concentration (Qualifier) (1) | Maximum Concentration (Qualifier) (1) | Units | Location of Maximum Concentration | Detection (2) Frequency | Range of (3) Detection Limits | Concentration (4) Used for Screening | Background (5) Value | Screening Toxicity Value (6) (N/C) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Selection or (7) Deletion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Back River Shellfish | | **Inorganics** | | | | | | | | | | | | | |
| | 7429-90-5 | Aluminum | 12.3 | 142 | mg/kg | SS63-BIO04 | 9/10 | 3.72 - 3.90 | 142 | NA | 140 N | NA | NA | Y | ASL |
| | 7440-38-2 | Arsenic | 0.665 | 1.43 | mg/kg | SS63-BIO01 | 8/10 | 0.398 - 0.418 | 1.43 | NA | 0.00210 C | NA | NA | Y | ASL |
| | 7440-39-3 | Barium | 0.292 | 1.46 | mg/kg | SS63-BIO04 | 4/4 | 0.0484 - 0.0496 | 1.46 | NA | 9.50 N | NA | NA | N | BSL |
| | 7440-43-9 | Cadmium | 0.0980 | 0.427 | mg/kg | SS63-BIO01 | 7/10 | 0.0840 - 0.0912 | 0.427 | NA | 0.140 N | NA | NA | Y | ASL |
| | 7440-70-2 | Calcium | 243 J | 3590 | mg/kg | SS63-BIO01 | 10/10 | 1.90 - 2.00 | 3590 | NA | NA | NA | NA | N | EN |
| | 7440-47-3 | Chromium (Total) | 0.384 | 6.84 | mg/kg | SS63-BIO01 | 6/6 | 0.153 - 0.160 | 6.84 | NA | 200 N | NA | NA | N | BSL |
| | 7440-50-8 | Copper | 0.900 | 18.5 | mg/kg | SS63-BIO01 | 5/5 | 0.100 - 0.109 | 18.5 | NA | 5.40 N | NA | NA | Y | ASL |
| | 57-12-5 | Cyanide | 0.880 J | 2.08 | mg/kg | SS63-BIO10 | 9/10 | 0.177 - 0.184 | 2.08 | NA | 2.70 N | NA | NA | N | BSL |
| | 7439-89-6 | Iron | 24.5 | 297 | mg/kg | SS63-BIO04 | 10/10 | 1.90 - 2.00 | 297 | NA | 41.0 N | NA | NA | Y | ASL |
| | 7439-92-1 | Lead | 2.23 | 2.23 | mg/kg | SS63-BIO01 | 1/10 | 0.933 - 0.980 | 2.23 | NA | NA | NA | NA | Y | ASL |
| | 7439-95-4 | Magnesium | 287 | 632 | mg/kg | SS63-BIO08 | 10/10 | 3.14 - 3.30 | 632 | NA | NA | NA | NA | N | EN |
| | 7439-96-5 | Manganese | 1.87 | 33.2 | mg/kg | SS63-BIO07 | 10/10 | 0.0289 - 0.0304 | 33.2 | NA | 19.0 N | NA | NA | Y | ASL |
| | 7439-97-6 | Mercury | 0.0110 | 0.0201 | mg/kg | SS63-BIO06 | 3/10 | 0.00600 - 0.00649 | 0.0201 | NA | 0.0140 N | NA | NA | Y | ASL |
| | 7440-02-0 | Nickel | 0.225 | 0.959 | mg/kg | SS63-BIO07 | 7/10 | 0.194 - 0.201 | 0.959 | NA | 2.70 N | NA | NA | N | BSL |
| | 7440-09-7 | Potassium | 363 | 908 | mg/kg | SS63-BIO01 | 10/10 | 23.8 - 25.0 | 908 | NA | NA | NA | NA | N | EN |
| | 7782-49-2 | Selenium | 0.472 | 0.779 | mg/kg | SS63-BIO04 | 7/10 | 0.392 - 0.410 | 0.779 | NA | 0.680 N | NA | NA | Y | ASL |
| | 7440-22-4 | Silver | 0.101 | 1.24 | mg/kg | SS63-BIO04 | 10/10 | 0.0576 - 0.0611 | 1.24 | NA | 0.680 N | NA | NA | Y | ASL |
| | 7440-23-5 | Sodium | 2050 | 3790 | mg/kg | SS63-BIO04 | 10/10 | 26.7 - 28.0 | 3790 | NA | NA | NA | NA | N | EN |
| | 7440-62-2 | Vanadium | 0.240 | 1.09 | mg/kg | SS63-BIO04 | 3/10 | 0.180 - 0.192 | 1.09 | NA | 0.960 N | NA | NA | Y | ASL |
| | 7440-66-6 | Zinc | 4.52 | 457 | mg/kg | SS63-BIO01 | 8/8 | 0.270 - 0.281 | 457 | NA | 41.0 N | NA | NA | Y | ASL |
| | | **Organics** | | | | | | | | | | | | | |
| | 93-76-5 | 2,4,5-T | 0.0212 | 0.0233 | mg/kg | SS63-BIO12 | 6/9 | 0.00398 - 0.00802 | 0.0233 | NA | 1.40 N | NA | NA | N | BSL |
| | 93-72-1 | 2,4,5-TP (Silvex) | 0.00150 | 0.00813 J | mg/kg | SS63-BIO08 | 3/10 | 0.000329 - 0.00661 | 0.00813 | NA | 1.10 N | NA | NA | N | BSL |
| | 94-82-6 | 2,4-DB | 0.00814 J | 0.168 | mg/kg | SS63-BIO04 | 4/10 | 0.00329 - 0.0661 | 0.168 | NA | 1.10 N | NA | NA | N | BSL |
| | 606-20-2 | 2,6-Dinitrotoluene | 0.0496 | 0.0742 | mg/kg | SS63-BIO05 | 3/10 | 0.0327 - 0.0333 | 0.0742 | NA | 0.140 N | NA | NA | N | BSL |
| | 95-48-7 | 2-Methylphenol | 0.0472 | 0.0809 | mg/kg | SS63-BIO08 | 2/10 | 0.0327 - 0.0330 | 0.0809 | NA | 6.80 N | NA | NA | N | BSL |
| | 72-54-8 | 4,4'-DDD | 0.00920 | 0.00920 | mg/kg | SS63-BIO04 | 1/10 | 0.000128 - 0.00303 | 0.00920 | NA | 0.0130 C | NA | NA | N | BSL |
| | 72-55-9 | 4,4'-DDE | 0.000525 | 0.00774 | mg/kg | SS63-BIO01 | 7/10 | 0.000128 - 0.000134 | 0.00774 | NA | 0.00930 C | NA | NA | N | BSL |
| | 50-29-3 | 4,4'-DDT | 0.00159 | 0.00307 | mg/kg | SS63-BIO04 | 3/10 | 0.000128 - 0.000134 | 0.00307 | NA | 0.00930 C | NA | NA | N | BSL |
| | 309-00-2 | Aldrin | 0.000102 J/J | 0.000303 | mg/kg | SS63-BIO01 | 2/10 | 0.0000650 - 0.000498 | 0.000303 | NA | 0.000190 C | NA | NA | Y | ASL |
| | 61788-33-8 | Aroclor 5432 | 0.0224 | 0.0403 | mg/kg | SS63-BIO05 | 6/10 | 0.0195 - 0.0203 | 0.0403 | NA | 0.000700 C | NA | NA | Y | ASL |
| | 56-55-3 | Benz(a)anthracene | 0.0366 | 0.0366 | mg/kg | SS63-BIO04 | 1/10 | 0.0327 - 0.0333 | 0.0366 | NA | 0.004 C | NA | NA | Y | ASL |
| | 50-32-8 | Benz(a)pyrene | 0.0437 | 0.0437 | mg/kg | SS63-BIO04 | 1/10 | 0.0327 - 0.0333 | 0.0437 | NA | 0.0004 C | NA | NA | Y | ASL |
| | 205-99-2 | Benzo(b)fluoranthene | 0.0484 | 0.0484 | mg/kg | SS63-BIO04 | 1/10 | 0.0327 - 0.0333 | 0.0484 | NA | 0.004 C | NA | NA | Y | ASL |
| | 191-24-2 | Benzo(g,h,i)perylene | 0.0525 | 0.0595 | mg/kg | SS63-BIO01 | 2/10 | 0.0327 - 0.0333 | 0.0596 | NA | 4.10 N | NA | NA | N | BSL |
| | 218-01-9 | Chrysene | 0.0389 | 0.0389 | mg/kg | SS63-BIO04 | 1/10 | 0.0327 - 0.0333 | 0.0389 | NA | 0.430 C | NA | NA | N | BSL |
| | 1918-00-9 | Dicamba | 0.00282 | 0.00970 | mg/kg | SS63-BIO08 | 2/10 | 0.000757 - 0.0153 | 0.00970 | NA | 4.10 N | NA | NA | N | BSL |
| | 959-98-8 | Endosulfan I | 0.000255 J | 0.000255 J | mg/kg | SS63-BIO09 | 1/10 | 0.0000660 - 0.00396 | 0.000256 | NA | 0.810 N | NA | NA | N | BSL |
| | 1031-07-8 | Endosulfan Sulfate | 0.000207 J | 0.000207 J | mg/kg | SS63-BIO09 | 1/10 | 0.000128 - 0.000673 | 0.000207 | NA | 0.810 N | NA | NA | N | BSL |
| | 7421-93-4 | Endrin Aldehyde | 0.000603 | 0.00105 | mg/kg | SS63-BIO07 | 5/10 | 0.000128 - 0.00104 | 0.00105 | NA | 0.0410 N | NA | NA | N | BSL |
| | 53494-70-5 | Endrin Ketone | 0.000282 | 0.000315 | mg/kg | SS63-BIO07 | 2/10 | 0.000128 - 0.000134 | 0.000315 | NA | 0.0410 N | NA | NA | N | BSL |
| | 1024-57-3 | Heptachlor epoxide | 0.0000935 J | 0.000472 | mg/kg | SS63-BIO04 | 3/10 | 0.0000660 - 0.000800 | 0.000472 | NA | 0.000350 C | NA | NA | Y | ASL |
| | 11097-69-1 | PCB-1254 | 0.00742 | 0.0356 | mg/kg | SS63-BIO01 | 9/10 | 0.00327 - 0.00330 | 0.0356 | NA | 0.00160 C | NA | NA | Y | ASL |
| | 11096-82-5 | PCB-1260 | 0.00472 | 0.00576 J | mg/kg | SS63-BIO08 | 2/10 | 0.00327 - 0.00330 | 0.00576 | NA | 0.00160 C | NA | NA | Y | ASL |
| | 85-01-8 | Phenanthrene | 0.0335 | 0.0335 | mg/kg | SS63-BIO06 | 1/10 | 0.0327 - 0.0333 | 0.0335 | NA | 4.10 N | NA | NA | N | BSL |
| | 129-00-0 | Pyrene | 0.0590 | 0.0590 | mg/kg | SS63-BIO04 | 1/10 | 0.0327 - 0.0335 | 0.0590 | NA | 4.10 N | NA | NA | N | BSL |
| | 319-84-6 | alpha-BHC | 0.000154 | 0.000655 | mg/kg | SS63-BIO04 | 5/10 | 0.0000650 - 0.0000700 | 0.000655 | NA | 0.000500 C | NA | NA | Y | ASL |
| | 319-85-7 | beta-BHC | 0.000394 | 0.000484 | mg/kg | SS63-BIO09 | 2/8 | 0.0000660 - 0.0000700 | 0.000484 | NA | 0.00180 C | NA | NA | N | BSL |
| | 319-86-8 | delta-BHC | 0.000703 | 0.000703 | mg/kg | SS63-BIO01 | 1/10 | 0.0000660 - 0.0000700 | 0.000703 | NA | 0.000500 C | NA | NA | Y | ASL |

(1) Minimum/maximum detected concentration. If minimum/maximum detected concentration comes from average of normal and field duplicate samples, then both qualifiers are presented. In such case, the format is <normal qualifiers>/<field duplicate qualifiers>.
(2) Detection Frequency is defined as the number of samples that are detected and are not B flagged over the total number of samples.
(3) Range of Detection Limits includes limits associated with any dilution factor. See the analytical results section for more details of detection limits and dilution factors, per sample.
(4) Maximum concentration is used for screening.
(5) No background values have been derived for Fish-Shellfish Tissue.
(6) All compounds were screened against the Risk Based Concentration (RBC) Table, U.S. EPA Region III, October 2002 for fish (cancer benchmark = 1E-06, HQ = 0.1).
(7) Rationale Codes

TABLE 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Back River, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Fish shellfish tissue
Exposure Medium: Fish shellfish tissue

| Exposure Point | CAS Number | Chemical | Minimum Concentration (Qualifier) (1) | Maximum Concentration (Qualifier) (1) | Units | Location of Maximum Concentration | Detection (2) Frequency | Range of (3) Detection Limits | Concentration (4) Used for Screening | Background (5) Value | Screening Toxicity Value (6) (N/C) | Potential ARAR/TBC Value | Potential ARAR/TBC Source | COPC Flag | Rationale for Selection or (7) Deletion |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Selection Reason: Above Screening Level (ASL)
Deletion Reason: Below Screening Level (BSL)
Essential Nutrient (EN)

Definitions: NA = Not applicable
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
J = Estimated Value
C = Carcinogenic
N = Non-Carcinogenic

# Appendix A.3

## RAGS Part D Table 3's
## Medium-Specific Exposure Point Concentration Summary

TABLE 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
ERP Site SS-63 (Back River), Langley Air Force Base

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

| Chemical of Potential Concern (a) | Units | Arithmetic Mean | 95% UCL of Normal Data (b) | Maximum Detected Concentration | Maximum Qualifier | EPC Units | Reasonable Maximum Exposure | | | Central Tendency | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Medium EPC Value (c) | Medium EPC Statistic | Medium EPC Rationale | Medium EPC Value (c) | Medium EPC Statistic | Medium EPC Rationale |
| **INORGANICS** | | | | | | | | | | | | |
| Arsenic | mg/L | 0.00171 | 0.00237 | 0.00374 | | mg/L | 0.00237 | 95% UCL-N | W-Test (4) | 0.00171 | Mean-N | W-Test (4) |
| Magnesium | mg/L | 627 | 684 | 707 | J | mg/L | 684 | 95% UCL-N | W-Test (3) | 627 | Mean-N | W-Test (3) |
| Mercury | mg/L | 0.0000427 | 0.0000682 | 0.000106 | | mg/L | 0.0000682 | 95% UCL-N | W-Test (4) | 0.0000427 | Mean-N | W-Test (4) |
| Sodium | mg/L | 5130 | 5590 | 5720 | J | mg/L | 5590 | 95% UCL-N | W-Test (3) | 5130 | Mean-N | W-Test (3) |
| **ORGANICS** | | | | | | | | | | | | |
| 4,4'-DDD | mg/L | 2.42E-06 | 0.00000567 | 0.0000144 | | mg/L | 0.00000567 | 95% UCL-N | W-Test (4) | 0.00000242 | Mean-N | W-Test (4) |
| 4,4'-DDE | mg/L | 1.66E-06 | 0.00000335 | 0.00000766 | | mg/L | 0.00000335 | 95% UCL-N | W-Test (4) | 0.00000166 | Mean-N | W-Test (4) |
| Aldrin | mg/L | 0.0000129 | 0.0000186 | 0.0000213 | | mg/L | 0.0000186 | 95% UCL-N | W-Test (3) | 0.0000129 | Mean-N | W-Test (3) |
| Heptachlor | mg/L | 2.82E-06 | 0.00000489 | 0.00000784 | | mg/L | 0.00000489 | 95% UCL-N | W-Test (4) | 0.00000282 | Mean-N | W-Test (4) |
| Heptachlor epoxide | mg/L | 1.94E-06 | 0.00000309 | 0.00000463 | | mg/L | 0.00000309 | 95% UCL-N | W-Test (4) | 0.00000194 | Mean-N | W-Test (4) |

* Surface soil EPCs will be used for the following exposure points: 1) surface soil at WP-02, and 2) ambient air above WP-02 (vapors and partculates). Surface soil EPCs will be used to model ambient air route EPCs.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

For non-detects, 1/2 sample-specific method detection limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Mean of Normal Data (Mean-N); Mean of Log-transformed Data (Mean-T).

T - Total data set only.

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilk W Test indicates data are normally distributed.

(4) Shapiro-Wilk W Test indicates data are neither log-normally distributed or normally distributed. Therefore, normal distribution equations used as default.

(a) All chemicals are in the site and total data sets unless otherwise footnoted with the letter "T".

(b) 95% UCL of Normal Data defined as the 95% UCL associated with the data's distribution.

(c) See Statistics Section of the report for more information on the calculation of the 95% UCL and the mean.

TABLE 3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
ERP Site S-63 (Back River), Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Fish from Back River

| Chemical of Potential Concern (a) | Units | Arithmetic Mean | 95% UCL of Normal Data (b) | Maximum Detected Concentration | Maximum Qualifier | EPC Units | Reasonable Maximum Exposure | | | Central Tendency | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Medium EPC Value (c) | Medium EPC Statistic | Medium EPC Rationale | Medium EPC Value (c) | Medium EPC Statistic | Medium EPC Rationale |
| **INORGANICS** | | | | | | | | | | | | |
| Arsenic | mg/kg | 1.48 | 1.9 | 2.56 | | mg/kg | 1.9 | 95% UCL-N | W-Test (3) | 1.48 | Mean-N | W-Test (3) |
| Calcium | mg/kg | 744 | 4380 | 1320 | | mg/kg | 1320 | Max | W-Test (2) | 744 | Mean-N | W-Test (3) |
| Magnesium | mg/kg | 330 | 348 | 360 | | mg/kg | 348 | 95% UCL-N | W-Test (3) | 330 | Mean-N | W-Test (3) |
| Mercury | mg/kg | 0.0506 | 0.0599 | 0.0692 | | mg/kg | 0.0599 | 95% UCL-N | W-Test (3) | 0.0506 | Mean-N | W-Test (3) |
| Potassium | mg/kg | 3690 | 3820 | 3950 | | mg/kg | 3820 | 95% UCL-N | W-Test (3) | 3690 | Mean-N | W-Test (3) |
| Selenium | mg/kg | 0.813 | 0.906 | 1.05 | | mg/kg | 0.906 | 95% UCL-N | W-Test (3) | 0.813 | Mean-N | W-Test (3) |
| Sodium | mg/kg | 521 | 636 | 717 | | mg/kg | 636 | 95% UCL-N | W-Test (3) | 521 | Mean-N | W-Test (3) |
| **ORGANICS** | | | | | | | | | | | | |
| 4,4'-DDD | mg/kg | 0.00635 | 5.32 | 0.0284 | | mg/kg | 0.0284 | Max | W-Test (2) | 0.0109 | Mean-T | W-Test (1) |
| 4,4'-DDE | mg/kg | 0.0176 | 0.0254 | 0.0379 | | mg/kg | 0.0254 | 95% UCL-N | W-Test (3) | 0.0176 | Mean-N | W-Test (3) |
| Aroclor 5432 | mg/kg | 0.097 | 1.45 | 0.379 | | mg/kg | 0.379 | Max | W-Test (2) | 0.0941 | Mean-T | W-Test (1) |
| PCB-1248 | mg/kg | 0.0213 | 0.0446 | 0.104 | | mg/kg | 0.0446 | 95% UCL-N | W-Test (4) | 0.0213 | Mean-N | W-Test (4) |
| PCB-1254 | mg/kg | 0.0982 | 0.219 | 0.308 | | mg/kg | 0.219 | 95% UCL-T | W-Test (1) | 0.0941 | Mean-T | W-Test (1) |
| PCB-1260 | mg/kg | 0.0376 | 0.0572 | 0.0972 | | mg/kg | 0.0572 | 95% UCL-N | W-Test (3) | 0.0376 | Mean-N | W-Test (3) |

* Surface soil EPCs will be used for the following exposure points: 1) surface soil at WP-02, and 2) ambient air above WP-02 (vapors and partculates). Surface soil EPCs will be used to model ambient air route EPCs.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Mean of Log-transformed Data (Mean-T); *Mean of Normal Data (Mean-N).*

For non-detects, 1/2 sample-specific method detection limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Mean of Normal Data (Mean-N); Mean of Log-transformed Data (Mean-T).
T - Total data set only.
(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilk W Test indicates data are normally distributed.
(4) Shapiro-Wilk W Test indicates data are neither log-normally distributed or normally distributed. Therefore, normal distribution equations used as default.
(a) All chemicals are in the site and total data sets unless otherwise footnoted with the letter "T".
(b) 95% UCL of Normal Data defined as the 95% UCL associated with the data's distribution.

TABLE 3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
ERP Site S-63 (Back River), Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Fish from Back River

| Chemical of Potential Concern (a) | Units | Arithmetic Mean | 95% UCL of Normal Data (b) | Maximum Detected Concentration | Maximum Qualifier | EPC Units | Reasonable Maximum Exposure | | | Central Tendency | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Medium EPC Value (c) | Medium EPC Statistic | Medium EPC Rationale | Medium EPC Value (c) | Medium EPC Statistic | Medium EPC Rationale |

(c) See Statistics Section of the report for more information on the calculation of the 95% UCL and the mean.

TABLE 3.3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
ERP Site SS-63 (Back River), Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Crabs from Back River

| Chemical of Potential Concern (a) | Units | Arithmetic Mean | 95% UCL of Normal Data (b) | Maximum Detected Concentration | Maximum Qualifier | EPC Units | Reasonable Maximum Exposure | | | Central Tendency | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Medium EPC Value (c) | Medium EPC Statistic | Medium EPC Rationale | Medium EPC Value (c) | Medium EPC Statistic | Medium EPC Rationale |
| **INORGANICS** | | | | | | | | | | | | |
| Aluminum | mg/kg | 9.21 | 14.1 | 15.3 | | mg/kg | 14.1 | 95% UCL-N | W-Test (3) | 9.21 | Mean-N | W-Test (3) |
| Arsenic | mg/kg | 2.81 | 3.66 | 3.38 | | mg/kg | 3.38 | Max | W-Test (2) | 2.81 | Mean-N | W-Test (3) |
| Barium | mg/kg | 0.382 | 0.471 | 0.477 | | mg/kg | 0.471 | 95% UCL-N | W-Test (3) | 0.382 | Mean-N | W-Test (3) |
| Calcium | mg/kg | 1680 | 2330 | 2230 | | mg/kg | 2230 | Max | W-Test (2) | 1680 | Mean-N | W-Test (3) |
| Copper | mg/kg | 7.35 | 8.75 | 8.62 | | mg/kg | 8.62 | Max | W-Test (2) | 7.35 | Mean-N | W-Test (3) |
| Iron | mg/kg | 12.4 | 14.1 | 14.2 | | mg/kg | 14.1 | 95% UCL-N | W-Test (3) | 12.4 | Mean-N | W-Test (3) |
| Magnesium | mg/kg | 449 | 543 | 547 | | mg/kg | 543 | 95% UCL-N | W-Test (3) | 449 | Mean-N | W-Test (3) |
| Manganese | mg/kg | 1.31 | 1.6 | 1.58 | | mg/kg | 1.58 | Max | W-Test (2) | 1.31 | Mean-N | W-Test (3) |
| Nickel | mg/kg | 0.43 | 0.491 | 0.496 | | mg/kg | 0.491 | 95% UCL-N | W-Test (3) | 0.43 | Mean-N | W-Test (3) |
| Potassium | mg/kg | 2440 | 2840 | 2840 | | mg/kg | 2840 | Max | W-Test (2) | 2440 | Mean-N | W-Test (3) |
| Selenium | mg/kg | 0.611 | 0.689 | 0.684 | | mg/kg | 0.684 | Max | W-Test (2) | 0.611 | Mean-N | W-Test (3) |
| Silver | mg/kg | 0.528 | 0.73 | 0.785 | | mg/kg | 0.73 | 95% UCL-N | W-Test (4) | 0.528 | Mean-N | W-Test (4) |
| Sodium | mg/kg | 3310 | 3630 | 3640 | | mg/kg | 3630 | 95% UCL-N | W-Test (3) | 3310 | Mean-N | W-Test (3) |
| Zinc | mg/kg | 37.2 | 42.3 | 41.9 | | mg/kg | 41.9 | Max | W-Test (2) | 37.2 | Mean-N | W-Test (3) |
| **ORGANICS** | | | | | | | | | | | | |
| 4,4'-DDD | mg/kg | 0.00101 | 0.00289 | 0.00339 | | mg/kg | 0.00289 | 95% UCL-N | W-Test (4) | 0.00101 | Mean-N | W-Test (4) |
| 4,4'-DDE | mg/kg | 0.00412 | 0.00993 | 0.0111 | | mg/kg | 0.00993 | 95% UCL-N | W-Test (3) | 0.00412 | Mean-N | W-Test (3) |
| Heptachlor | mg/kg | 0.0000476 | 0.0000887 | 0.0000757 | | mg/kg | 0.0000757 | Max | W-Test (2) | 0.0000476 | Mean-N | W-Test (4) |
| Heptachlor epoxide | mg/kg | 0.000642 | 0.00159 | 0.000792 | | mg/kg | 0.000792 | Max | W-Test (2) | 0.000642 | Mean-N | W-Test (3) |
| PCB-1254 | mg/kg | 0.00702 | 0.0196 | 0.0231 | | mg/kg | 0.0196 | 95% UCL-N | W-Test (4) | 0.00702 | Mean-N | W-Test (4) |
| Phenol | mg/kg | 0.0801 | 0.144 | 0.133 | | mg/kg | 0.133 | Max | W-Test (2) | 0.0801 | Mean-N | W-Test (3) |
| bis(2-Ethylhexyl)phthalate | mg/kg | 0.0551 | 0.106 | 0.12 | | mg/kg | 0.106 | 95% UCL-N | W-Test (4) | 0.0551 | Mean-N | W-Test (4) |

* Surface soil EPCs will be used for the following exposure points: 1) surface soil at WP-02, and 2) ambient air above WP-02 (vapors and partculates). Surface soil EPCs will be used to model ambient air route EPCs.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N).

For non-detects, 1/2 sample-specific method detection limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

TABLE 3.3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
ERP Site SS-63 (Back River), Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Crabs from Back River

| Chemical of Potential Concern (a) | Units | Arithmetic Mean | 95% UCL of Normal Data (b) | Maximum Detected Concentration | Maximum Qualifier | EPC Units | Reasonable Maximum Exposure | | | Central Tendency | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Medium EPC Value (c) | Medium EPC Statistic | Medium EPC Rationale | Medium EPC Value (c) | Medium EPC Statistic | Medium EPC Rationale |

Options: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Mean of Normal Data (Mean-N); Mean of Log-transformed Data (Mean-T).
T - Total data set only.
(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(3) Shapiro-Wilk W Test indicates data are normally distributed.
(4) Shapiro-Wilk W Test indicates data are neither log-normally distributed or normally distributed. Therefore, normal distribution equations used as default.
(a) All chemicals are in the site and total data sets unless otherwise footnoted with the letter "T".
(b) 95% UCL of Normal Data defined as the 95% UCL associated with the data's distribution.
(c) See Statistics Section of the report for more information on the calculation of the 95% UCL and the mean.

TABLE 3.1 RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
Back River, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Fish-shellfish tissue
Exposure Medium: Fish-shellfish tissue

| Exposure Point | Chemical of Potential Concern (a) | Units | Arithmetic Mean | 95% UCL (Distribution) (b) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value (b) | Units | Statistic | Rationale |
| Back River Shellfish | **Inorganics** | | | | | | | | |
| | Aluminum | mg/kg | 43.6 | 228 (T) | 142 | 142 | mg/kg | Max | W-Test (2) |
| | Arsenic | mg/kg | 0.761 | 0.977 (N) | 1.43 | 0.977 | mg/kg | 95% UCL-N | W-Test (3) |
| | Cadmium | mg/kg | 0.131 | 0.240 (T) | 0.427 | 0.240 | mg/kg | 95% UCL-T | W-Test (1) |
| | Chromium (Total) | mg/kg | 2.00 | 10.7 (T) | 6.84 | 6.84 | mg/kg | Max | W-Test (2) |
| | Copper | mg/kg | 4.95 | 133 (T) | 18.5 | 18.5 | mg/kg | Max | W-Test (2) |
| | Iron | mg/kg | 87.1 | 188 (T) | 297 | 188 | mg/kg | 95% UCL-T | W-Test (1) |
| | Lead | mg/kg | 0.654 | 0.974 (N) | 2.23 | 0.974 | mg/kg | 95% UCL-N | W-Test (4) |
| | Manganese | mg/kg | 7.16 | 14.3 (T) | 33.2 | 14.3 | mg/kg | 95% UCL-T | W-Test (1) |
| | Mercury | mg/kg | 0.00669 | 0.0103 (N) | 0.0201 | 0.0103 | mg/kg | 95% UCL-N | W-Test (4) |
| | Selenium | mg/kg | 0.470 | 0.589 (N) | 0.779 | 0.589 | mg/kg | 95% UCL-N | W-Test (3) |
| | Silver | mg/kg | 0.433 | 1.13 (T) | 1.24 | 1.13 | mg/kg | 95% UCL-T | W-Test (1) |
| | Vanadium | mg/kg | 0.230 | 0.411 (N) | 1.09 | 0.411 | mg/kg | 95% UCL-N | W-Test (4) |
| | Zinc | mg/kg | 62.7 | 169 (N) | 457 | 169 | mg/kg | 95% UCL-N | W-Test (4) |
| | **Organics** | | | | | | | | |
| | Aldrin | mg/kg | 0.000154 | 0.000203 (N) | 0.000303 | 0.000203 | mg/kg | 95% UCL-N | W-Test (3) |
| | Aroclor 5432 | mg/kg | 0.0192 | 0.0255 (N) | 0.0403 | 0.0255 | mg/kg | 95% UCL-N | W-Test (4) |
| | Benzo(a)anthracene | mg/kg | 0.0165 | 0.0222 (N) | 0.0366 | 0.0222 | mg/kg | 95% UCL-N | W-Test (4) |
| | Benzo(a)pyrene | mg/kg | 0.0192 | 0.0242 (N) | 0.0437 | 0.0242 | mg/kg | 95% UCL-N | W-Test (4) |
| | Benzo(b)fluoranthene | mg/kg | 0.0197 | 0.0256 (N) | 0.0484 | 0.0256 | mg/kg | 95% UCL-N | W-Test (4) |
| | Heptachlor epoxide | mg/kg | 0.000224 | 0.000317 (N) | 0.000472 | 0.000317 | mg/kg | 95% UCL-N | W-Test (3) |
| | PCB 1254 | mg/kg | 0.0158 | 0.0222 (N) | 0.0356 | 0.0222 | mg/kg | 95% UCL-N | W-Test (3) |
| | PCB 1260 | mg/kg | 0.00237 | 0.00326 (N) | 0.00578 J | 0.00326 | mg/kg | 95% UCL-N | W-Test (4) |
| | alpha-BHC | mg/kg | 0.000192 | 0.000296 (N) | 0.000555 | 0.000296 | mg/kg | 95% UCL-N | W-Test (3) |
| | delta-BHC | mg/kg | 0.000101 | 0.000224 (N) | 0.000703 | 0.000224 | mg/kg | 95% UCL-N | W-Test (4) |

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T)

For non-detects, 1/2 sample-specific method detection limit was used as a proxy concentration; for duplicate sample results, the average value was used in the calculation.

W - Test: Developed by Shapiro and Wilk, refer to Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive 9285.7-081, May 1992.

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(3) Shapiro-Wilk W Test indicates data are normally distributed.

(4) Shapiro-Wilk W Test indicates data are neither log-normally distributed or normally distributed. Therefore, normal distribution equations used as default.

(a) All chemicals are in the site and total data sets unless otherwise footnoted with the letter "T".

(b) See Statistics Section of the report for more information on the calculation of the 95% UCL.

Definitions: J= Estimated Value
N=Normal UCL
T=Lognormal UCL

# Appendix A.4

## RAGS Part D Table 4's Values Used for Daily Intake Calculations

TABLE 4.1

Daily Intake Equations for the Fisher (Child): Dermal Absorption of Surface Water

ERP Site SS-63, Langley Air Force Base

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Surface Water |
| Exposure Medium: Surface Water |
| Exposure Point: Surface Water from Back River |
| Receptor Population: Fisher |
| Receptor Age: Child |

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name (2) |
|---|---|---|---|---|---|---|---|---|
| Dermal | CDI-W | Chronic Daily Intake, Surface Water | mg/kg-day | calculated | -- | -- | -- | CDI-W (Inorganics) = CW-M x CF3 x SA x PC x ET-D x EF x ED x CF2 |
| Absorption | CW-M | Chemical Concentration in Surface Water | mg/l | csv | -- | -- | -- | BW x AT |
| | SA | Skin Surface Area Available for Contact | $cm^2$ | 410 | EPA, 1997 | -- | -- | |
| | EF | Exposure Frequency | days/year | 40 | (1) | 27 | EPA, 1993 | CDI-W (Organics 1) = CW-M x CF3 x SA x (2 x PC x sqrt(6 x tau x ET-D/pi)) |
| | ED | Exposure Duration | years | 7 | (1) | 2.1 | (1) | x EF x ED x CF2 |
| | BW | Body Weight | kg | 20.2 | EPA, 1997 | -- | -- | BW x AT |
| | ET-D | Exposure Time - Dermal | hr/event | 0.25 | (1) | -- | -- | |
| | PC | Permeability Coefficient | cm/hour | csv | -- | -- | -- | CDI-W (Organics 2) = CW-M x CF3 x SA x PC x [(ET-D/1 + B) + 2 x tau |
| | tau | tau | hour | csv | -- | -- | -- | x (1 + (3 x B)/1+B)] x EF x ED x CF2 |
| | B | Cleek and Bunge (1992) parameter | unitless | csv | EPA, 1992 | -- | -- | BW x AT |
| | t* | steady state time factor | hour | csv | EPA, 1992 | -- | -- | |
| | CF3 | Conversion Factor 3 | event/day | 1 | -- | -- | -- | |
| | CF2 | Conversion Factor 2 | $l/cm^3$ | 0.001 | -- | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,555 | ED x 365 days/yr | 767 | ED x 365 days/yr | |

*(1) Professional Judgement (see Appendix F1)*

(2) For organics, if ET-D < t*, then equation (Organics 1) is used. If ET-D > t*, then equation (Organics 2) is used.

csv = chemical-specific value

TABLE 4.2

Daily Intake Equations for the Fisher (Adult): Dermal Absorption of Surface Water

ERP Site SS-63, Langley Air Force Base

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Surface Water |
| Exposure Medium: Surface Water |
| Exposure Point: Surface Water from Back River |
| Receptor Population: Fisher |
| Receptor Age: Adult |

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name (2) |
|---|---|---|---|---|---|---|---|---|
| Dermal | CDI-W | Chronic Daily Intake, Surface Water | mg/kg-day | calculated | -- | -- | -- | CDI-W (Inorganics) = CW-M x CF3 x SA x PC x ET-D x EF x ED x CF2 |
| Absorption | CW-M | Chemical Concentration in Surface Water | mg/l | csv | -- | -- | -- | BW x AT |
| | SA | Skin Surface Area Available for Contact | $cm^2$ | 783 | EPA, 1997 | -- | -- | |
| | EF | Exposure Frequency | days/year | 40 | EPA, 1991 | 27 | EPA, 1993 | CDI-W (Organics 1) = CW-M x CF3 x SA x (2 x PC x sqrt(6 x tau x ET-D/pi)) |
| | ED | Exposure Duration | years | 30 | EPA, 1991 | 9 | EPA, 1993 | x EF x ED x CF2 |
| | BW | Body Weight | kg | 70 | EPA, 1991 | -- | -- | BW x AT |
| | ET-D | Exposure Time - Dermal | hr/event | 0.25 | (1) | -- | -- | |
| | PC | Permeability Coefficient | cm/hour | csv | -- | -- | -- | CDI-W (Organics 2) = CW-M x CF3 x SA x PC x [(ET-D/1 + B) + 2 x tau |
| | tau | tau | hour | csv | -- | -- | -- | x (1 + (3 x B)/1+B)] x EF x ED x CF2 |
| | B | Cleek and Bunge (1992) parameter | unitless | csv | EPA, 1992 | -- | -- | BW x AT |
| | t* | steady state time factor | hour | csv | EPA, 1992 | -- | -- | |
| | CF3 | Conversion Factor 3 | event/day | 1 | -- | -- | -- | |
| | CF2 | Conversion Factor 2 | $l/cm^3$ | 0.001 | -- | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 10,950 | ED x 365 days/yr | 3,285 | ED x 365 days/yr | |

(1) Professional Judgement (see Appendix F1)

(2) For organics, if ET-D < t*, then equation (Organics 1) is used. If ET-D > t*, then equation (Organics 2) is used.

csv = chemical-specific value

TABLE 4.3

Daily Intake Equations for the Other Recreational Person [Adolescents (teens)]: Ingestion/Dermal Absorption of Surface Water

ERP Site SS-63, Langley Air Force Base

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Surface Water |
| Exposure Medium: Surface Water |
| Exposure Point: Surface Water from Back River |
| Receptor Population: Other Recreational Person[3] |
| Receptor Age: Adolescents (teens) |

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name (2) |
|---|---|---|---|---|---|---|---|---|
| Ingestion | CDI-W | Chronic Daily Intake, Surface Water | mg/kg-day | calculated | -- | -- | -- | CDI-W = CW-M x IR-W x EF x ED x FI-W |
| | CW-M | Chemical Concentration in Surface Water | mg/l | csv | -- | -- | -- | BW x AT |
| | IR-W | Ingestion Rate of Water | liters/day | 0.2 | EPA, 1989 | -- | -- | |
| | FI-W | Fraction of Exposure, Surface Water | unitless | 1 | (1) | -- | -- | |
| | EF | Exposure Frequency | days/year | 20 | (1) | 14 | (1) | |
| | ED | Exposure Duration | years | 6 | (1) | 1.8 | (1) | |
| | BW | Body Weight | kg | 57 | EPA, 1997 | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,190 | ED x 365 days/yr | 657 | ED x 365 days/yr | |
| Dermal Absorption | CDI-W | Chronic Daily Intake, Surface Water | mg/kg-day | calculated | -- | -- | -- | CDI-W (Inorganics) = CW-M x CF3 x SA x PC x ET-D x EF x ED x CF2 |
| | CW-M | Chemical Concentration in Surface Water | mg/l | csv | -- | -- | -- | BW x AT |
| | SA | Skin Surface Area Available for Contact | $cm^2$ | 15,800 | EPA, 1997 | -- | -- | |
| | EF | Exposure Frequency | days/year | 20 | (1) | 14 | (1) | CDI-W (Organics 1) = CW-M x CF3 x SA x (2 x PC x sqrt(6 x tau x ET-D/pi)) |
| | ED | Exposure Duration | years | 6 | EPA, 1991 | 1.8 | (1) | x EF x ED x CF2 |
| | BW | Body Weight | kg | 57 | EPA, 1997 | -- | -- | BW x AT |
| | ET-D | Exposure Time - Dermal | hr/event | 4 | (1) | -- | -- | |
| | PC | Permeability Coefficient | cm/hour | csv | -- | -- | -- | CDI-W (Organics 2) = CW-M x CF3 x SA x PC x [(ET-D/1 + B) + 2 x tau |
| | tau | tau | hour | csv | -- | -- | -- | x (1 + (3 x B)/1+B)] x EF x ED x CF2 |
| | B | Cleek and Bunge (1992) parameter | unitless | csv | EPA, 1992 | -- | -- | BW x AT |
| | t* | steady state time factor | hour | csv | EPA, 1992 | -- | -- | |
| | CF3 | Conversion Factor 3 | event/day | 1 | -- | -- | -- | |
| | CF2 | Conversion Factor 2 | $l/cm^3$ | 0.001 | -- | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,190 | ED x 365 days/yr | 657 | ED x 365 days/yr | |

(1) Professional Judgement (see Appendix F1)

(2) For organics, if ET-D < t*, then equation (Organics 1) is used. If ET-D > t*, then equation (Organics 2) is used.

(3) Jet Skier

csv = chemical-specific value

TABLE 4 4

Daily Intake Equations for the Other Worker (Adult): Ingestion/Dermal Absorption of Surface Water

ERP Site SS-63, Langley Air Force Base

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Surface Water |
| Exposure Medium: Surface Water |
| Exposure Point: Surface Water from Back River |
| Receptor Population: Other Worker[4] |
| Receptor Age: Adult |

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name (3) |
|---|---|---|---|---|---|---|---|---|
| Ingestion | CDI-W | Chronic Daily Intake, Surface Water | mg/kg-day | calculated | -- | -- | -- | CDI-W = CW-M x IR-W x EF x ED x FI-W |
| | CW-M | Chemical Concentration in Surface Water | mg/l | csv | -- | -- | -- | BW x AT |
| | IR-W | Ingestion Rate of Water | liters/day | 0.2 | EPA, 1989 | -- | -- | |
| | FI-W | Fraction of Exposure, Surface Water | unitless | 1 | (1) | -- | -- | |
| | EF | Exposure Frequency | days/year | 5 | (1) | 4 | (1) | |
| | ED | Exposure Duration | years | 25 | EPA, 1991 | 7.5 | EPA, 1993 | |
| | BW | Body Weight | kg | 70 | EPA, 1991 | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 9,125 | ED x 365 days/yr | 2,738 | ED x 365 days/yr | |
| Dermal Absorption | CDI-W | Chronic Daily Intake, Surface Water | mg/kg-day | calculated | -- | -- | -- | CDI-W (Inorganics) = CW-M x CF3 x SA x PC x ET-D x EF x ED x CF2 |
| | CW-M | Chemical Concentration in Surface Water | mg/l | csv | -- | -- | -- | BW x AT |
| | SA | Skin Surface Area Available for Contact | $cm^2$ | 20,000 | EPA, 1997 | -- | -- | |
| | EF | Exposure Frequency | days/year | 5 | (1) | 4 | (1) | CDI-W (Organics 1) = CW-M x CF3 x SA x (2 x PC x sqrt(6 x tau x ET-D/pi) |
| | ED | Exposure Duration | years | 25 | EPA, 1991 | 7.5 | EPA, 1993 | x EF x ED x CF2 |
| | BW | Body Weight | kg | 70 | EPA, 1991 | -- | -- | BW x AT |
| | ET-D | Exposure Time - Dermal | hr/event | 4 | (1) | -- | -- | |
| | PC | Permeability Coefficient | cm/hour | csv | -- | -- | -- | CDI-W (Organics 2) = CW-M x CF3 x SA x PC x [(ET-D/1 + B) + 2 x tau |
| | tau | tau | hour | csv | -- | -- | -- | x (1 + (3 x B)/1+B)] x EF x ED x CF2 |
| | B | Cleek and Bunge (1992) parameter | unitless | csv | EPA, 1992 | -- | -- | BW x AT |
| | t* | steady state time factor | hour | csv | EPA, 1992 | -- | -- | |
| | CF3 | Conversion Factor 3 | event/day | 1 | -- | -- | -- | |
| | CF2 | Conversion Factor 2 | $l/cm^3$ | 1.0.E-03 | -- | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 9,125 | ED x 365 days/yr | 2,738 | ED x 365 days/yr | |

(1) Professional Judgement (see Appendix F1)

(2) Combined child/adult cancer risk for these routes will be addressed by adding cancer risk of the child and adult together.

(3) For organics, if ET-D < t*, then equation (Organics 1) is used. If ET-D > t*, then equation (Organics 2) is used.

(4) Sea Rescue Trainer

csv = chemical-specific value

TABLE 4.5

Daily Intake Equations for the Fisher (Child): Ingestion of Fish from Back River

ERP Site SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Fish from Back River
Receptor Population: Fisher
Receptor Age: Child

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|
| Ingestion | CDI-F | Chronic Daily Intake, Fish | mg/kg-day | calculated | -- | -- | -- | CDI-F = $\frac{CF \times IR_C\text{-}F \times EF \times ED \times FI\text{-}F}{BW \times AT}$ |
| | CF | Chemical Concentration in Fish | mg/kg | csv | -- | -- | -- | |
| | $IR_C$-F | Ingestion Rate, Fish for Child | kg/day | 0.008 | EPA, 1997 | 0.003 | EPA, 1997 | |
| | FI-F | Fraction of Exposure, Fish | unitless | 0.5 | (1) | -- | -- | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 234 | EPA, 1993 | |
| | ED | Exposure Duration | years | 7 | (1) | 2.1 | (1) | |
| | BW | Body Weight | kg | 20.2 | EPA, 1997 | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,555 | ED x 365 days/yr | 767 | ED x 365 days/yr | |

(1) Professional Judgement (see Appendix F1)

csv = chemical-specific value

TABLE 4.6

Daily Intake Equations for the Fisher (Adult): Ingestion of Fish from Back River

ERP Site SS-63, Langley Air Force Base

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Animal Tissue |
| Exposure Medium: Animal Tissue |
| Exposure Point: Fish from Back River |
| Receptor Population: Fisher |
| Receptor Age: Adult |

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|
| Ingestion | CDI-F | Chronic Daily Intake, Fish | mg/kg-day | calculated | -- | -- | -- | $CDI\text{-}F = \frac{CF \times IR_A\text{-}F \times EF \times ED \times FI\text{-}F}{BW \times AT}$ |
| | CF | Chemical Concentration in Fish | mg/kg | csv | -- | -- | -- | |
| | $IR_A$-F | Ingestion Rate, Fish for Adult | kg/day | 0.025 | EPA, 1997 | 0.008 | EPA, 1997 | |
| | FI-F | Fraction of Exposure, Fish | unitless | 0.5 | (1) | -- | -- | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 234 | EPA, 1993 | |
| | ED | Exposure Duration | years | 30 | EPA, 1991 | 9 | EPA, 1993 | |
| | BW | Body Weight | kg | 70 | EPA, 1991 | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 10,950 | ED x 365 days/yr | 3,285 | ED x 365 days/yr | |

(1) Professional Judgement (see Appendix F1)

csv = chemical-specific value

TABLE 4.7

Daily Intake Equations for the Fisher (Child): Ingestion of Crabs from Back River

ERP Site SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Crabs from Back River
Receptor Population: Fisher
Receptor Age: Child

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|
| Ingestion | CDI-F | Chronic Daily Intake, Crabs | mg/kg-day | calculated | -- | -- | -- | $\text{CDI-F} = \frac{\text{CF} \times \text{IR}_C\text{-C} \times \text{EF} \times \text{ED} \times \text{FI-C}}{\text{BW} \times \text{AT}}$ |
| | CF | Chemical Concentration in Crabs | mg/kg | csv | -- | -- | -- | |
| | $IR_C$-C | Ingestion Rate, Crabs for Child | kg/day | 0.008 | EPA, 1997 | 0.003 | EPA, 1997 | |
| | FI-C | Fraction of Exposure, Crabs | unitless | 0.5 | (1) | -- | -- | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 234 | EPA, 1993 | |
| | ED | Exposure Duration | years | 7 | (1) | 2.1 | (1) | |
| | BW | Body Weight | kg | 20.2 | EPA, 1997 | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,555 | ED x 365 days/yr | 767 | ED x 365 days/yr | |

(1) Professional Judgement (see Appendix F1)

csv = chemical-specific value

TABLE 4.8

Daily Intake Equations for the Fisher (Adult): Ingestion of Crabs from Back River

ERP Site SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Crabs from Back River
Receptor Population: Fisher
Receptor Age: Adult

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|
| Ingestion | CDI-F | Chronic Daily Intake, Crabs | mg/kg-day | calculated | -- | -- | -- | CDI-F = $\frac{CF \times IR_A\text{-}C \times EF \times ED \times FI\text{-}C}{BW \times AT}$ |
| | CF | Chemical Concentration in Crabs | mg/kg | csv | -- | -- | -- | |
| | $IR_A$-C | Ingestion Rate, Crabs for Adult | kg/day | 0.025 | EPA, 1997 | 0.008 | EPA, 1997 | |
| | FI-C | Fraction of Exposure, Crabs | unitless | 0.5 | (1) | -- | -- | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 234 | EPA, 1993 | |
| | ED | Exposure Duration | years | 30 | EPA, 1991 | 9 | EPA, 1993 | |
| | BW | Body Weight | kg | 70 | EPA, 1991 | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 10,950 | ED x 365 days/yr | 3,285 | ED x 365 days/yr | |

(1) Professional Judgement (see Appendix F1)

csv = chemical-specific value

TABLE 4.1

Daily Intake Equations for the Fisher (Child): Ingestion of Bivalves from Back River

ERP Site SS-63, Langley Air Force Base

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Animal Tissue |
| Exposure Medium: Animal Tissue |
| Exposure Point: Bivalves from Back River |
| Receptor Population: Fisher |
| Receptor Age: Child |

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|
| Ingestion | CDI-BV | Chronic Daily Intake, Bivalves | mg/kg-day | calculated | -- | -- | -- | CDI-BV = $\frac{CF \times IR_C\text{-}C \times EF \times ED \times FI\text{-}C}{BW \times AT}$ |
| | CF | Chemical Concentration in Bivalves | mg/kg | csv | -- | -- | -- | |
| | $IR_C$-BV | Ingestion Rate, Bivalves for Child | kg/day | 0.008 | EPA, 1997 | 0.003 | EPA, 1997 | |
| | FI-BV | Fraction of Exposure, Bivalves | unitless | 1 | (1) | -- | -- | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 234 | EPA, 1993 | |
| | ED | Exposure Duration | years | 7 | (1) | 2.1 | (1) | |
| | BW | Body Weight | kg | 20.2 | EPA, 1997 | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 2,555 | ED x 365 days/yr | 767 | ED x 365 days/yr | |

(1) Professional Judgement (see Appendix F1)

csv = chemical-specific value

TABLE 4.2

Daily Intake Equations for the Fisher (Adult): Ingestion of Bivalves from Back River

ERP Site SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Bivalves from Back River
Receptor Population: Fisher
Receptor Age: Adult

| Exposure Route | Parameter Code | Parameter Definition | Units | RME Value | RME Rationale/ Reference | CT Value | CT Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|
| Ingestion | CDI-BV | Chronic Daily Intake, Bivalves | mg/kg-day | calculated | -- | -- | -- | CDI-BV = $\frac{CF \times IR_A\text{-}C \times EF \times ED \times FI\text{-}C}{BW \times AT}$ |
| | CF | Chemical Concentration in Bivalves | mg/kg | csv | -- | -- | -- | |
| | $IR_A$-BV | Ingestion Rate, Bivalves for Adult | kg/day | 0.025 | EPA, 1997 | 0.008 | EPA, 1997 | |
| | FI-BV | Fraction of Exposure, Bivalves | unitless | 1 | (1) | -- | -- | |
| | EF | Exposure Frequency | days/year | 350 | EPA, 1991 | 234 | EPA, 1993 | |
| | ED | Exposure Duration | years | 30 | EPA, 1991 | 9 | EPA, 1993 | |
| | BW | Body Weight | kg | 70 | EPA, 1991 | -- | -- | |
| | AT-C | Averaging Time (Cancer) | days | 25,550 | 70 x 365 days/yr | -- | -- | |
| | AT-N | Averaging Time (Non-Cancer) | days | 10,950 | ED x 365 days/yr | 3,285 | ED x 365 days/yr | |

*(1) Professional Judgement (see Appendix F1)*

csv = chemical-specific value

# Appendix A.5

## RAGS Part D Table 5's Non-Cancer Toxicity Data

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
ERP Site SS-63, Langley Air Force Base

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD Value | Oral RfD Units | Oral to Dermal Adjustment Factor (1) | Adjusted Dermal RfD (2) | Units | Primary Target Organ | Combined Uncertainty/Modifying Factors | Sources of RfD: Target Organ | Dates of RfD: Target Organ (3) (MM/DD/YY) |
|---|---|---|---|---|---|---|---|---|---|---|
| 4,4'-DDD | Chronic | N/A | N/A | 70% | N/A | N/A | N/A | N/A | N/A | N/A |
| 4,4'-DDE | Chronic | N/A | N/A | 70% | N/A | N/A | N/A | N/A | N/A | N/A |
| Aldrin | Chronic | 3.0E-05 | mg/kg-day | 90% | 2.7E-05 | mg/kg-day | liver | 1000 | IRIS | 03/21/01 |
| Aluminum | Chronic | 1.0E+00 | mg/kg-day | 27% | 2.7E-01 | mg/kg-day | Dev. NS | 100 | NCEA | 08/26/98 |
| Aroclor 5432 | Chronic | N/A | N/A | 90% | N/A | N/A | N/A | N/A | N/A | N/A |
| Arsenic | Chronic | 3.0E-04 | mg/kg-day | 95% | 2.9E-04 | mg/kg-day | skin/vascular | 3 | IRIS | 03/21/01 |
| Barium | Chronic | 7.0E-02 | mg/kg-day | 100% | 7.0E-02 | mg/kg-day | kidney | 3 | IRIS | 03/21/01 |
| bis (2-Ethylhexyl) phthalate | Chronic | 2.0E-02 | mg/kg-day | 55% | 1.1E-02 | mg/kg-day | liver | 1000 | IRIS | 03/21/01 |
| Calcium | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Copper | Chronic | 4.0E-02 | mg/kg-day | 60% | 2.4E-02 | mg/kg-day | GI tract | N/A | NCEA | 04/29/97 |
| Heptachlor | Chronic | 5.0E-04 | mg/kg-day | 90% | 4.5E-04 | mg/kg-day | liver | 300 | IRIS | 03/21/01 |
| Heptachlor epoxide | Chronic | 1.3E-05 | mg/kg-day | 90% | 1.2E-05 | mg/kg-day | liver | 1000 | IRIS | 03/21/01 |
| Iron | Chronic | 3.0E-01 | mg/kg-day | 100% | 3.0E-01 | mg/kg-day | blood/liver/GI tract | 1 | NCEA | 01/05/99 |
| Magnesium | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Manganese (food) | Chronic | 1.4E-01 | mg/kg-day | N/A | N/A | N/A | CNS | 1 | IRIS | 03/21/01 |
| Manganese (non-food) | Chronic | 2.0E-02 | mg/kg-day | 5% | 1.0E-03 | mg/kg-day | CNS | 1 | IRIS | 03/21/01 |
| Mercury | Chronic | 3.0E-04 | mg/kg-day | 100% | 3.0E-04 | mg/kg-day | Immune system | 1000 | IRIS | 03/21/01 |
| Methylmercury | Chronic | 1.0E-04 | mg/kg-day | 90% | 9.0E-05 | mg/kg-day | Dev. NS | 10 | IRIS | 03/21/01 |
| Nickel | Chronic | 2.0E-02 | mg/kg-day | 0.4% | 8.6E-05 | mg/kg-day | heart/liver | 300 | IRIS | 03/21/01 |
| PCB-1248 | Chronic | N/A | N/A | 100% | N/A | N/A | N/A | N/A | N/A | N/A |
| PCB-1254 | Chronic | 2.0E-05 | mg/kg-day | 100% | 2.0E-05 | mg/kg-day | Immune system/eye/nails | 300 | IRIS | 03/21/01 |
| PCB-1260 | Chronic | N/A | N/A | 100% | N/A | N/A | N/A | N/A | N/A | N/A |
| Phenol | Chronic | 6.0E-01 | mg/kg-day | 90% | 5.4E-01 | mg/kg-day | fetus | 100 | IRIS | 03/21/01 |
| Potassium | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Selenium | Chronic | 5.0E-03 | mg/kg-day | 44% | 2.2E-03 | mg/kg-day | Liver/hair/nails/skin/CNS | 3 | IRIS | 03/21/01 |
| Silver | Chronic | 5.0E-03 | mg/kg-day | N/A | 5.0E-03 | mg/kg-day | skin | 3 | IRIS | 03/21/01 |
| Sodium | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Zinc | Chronic | 3.0E-01 | mg/kg-day | 25% | 7.5E-02 | mg/kg-day | blood | 3 | IRIS | 03/21/01 |

N/A = Not Available

(1) Refer to RAGS, Part A

(2) Adjusted Dermal RfD[illegible] = Oral Chronic RfDchemical x GI Absorption Factor[illegible]

(3) The date IRIS was searched.

The date of HEAST.

The date of the article provided by NCEA.

The date of the RBC Region III Tables

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
ERP Site SS-63, Langley Air Force Base

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD Value | Oral RfD Units | Oral to Dermal Adjustment Factor (1) | Adjusted Dermal RfD (2) | Units | Primary Target Organ | Combined Uncertainty/Modifying Factors | Sources of RfD: Target Organ | Dates of RfD: Target Organ (3) (MM/DD/YY) |
|---|---|---|---|---|---|---|---|---|---|---|

Note: Endosulfan was used as a surrogate for endosulfan I and endosulfan sulfate.
Endrin was used as a surrogate for endrin aldehyde, and endrin ketone.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

ERP Site SS-63, Langley Air Force Base

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD Value | Oral RfD Units | Oral to Dermal Adjustment Factor (1) | Adjusted Dermal RfD (2) | Units | Primary Target Organ | Combined Uncertainty/Modifying Factors | Sources of RfD: Target Organ | Dates of RfD: Target Organ (3) (MM/DD/YY) |
|---|---|---|---|---|---|---|---|---|---|---|
| Aldrin | Chronic | 3.0E-05 | mg/kg-day | 90% | 2.7E-05 | mg/kg-day | liver | 1000 | IRIS | 03/21/01 |
| Aluminum | Chronic | 1.0E+00 | mg/kg-day | 27% | 2.7E-01 | mg/kg-day | Dev. NS | 100 | NCEA | 08/26/96 |
| Aroclor 5432 | Chronic | N/A | N/A | 90% | N/A | N/A | N/A | N/A | N/A | N/A |
| Arsenic | Chronic | 3.0E-04 | mg/kg-day | 95% | 2.9E-04 | mg/kg-day | skin/vascular | 3 | IRIS | 03/21/01 |
| Benzo(a)anthracene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Benzo(a)pyrene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Benzo(b) fluoranthene | Chronic | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| alpha-BHC | Chronic | N/A | N/A | 97.4% | N/A | N/A | N/A | N/A | N/A | N/A |
| delta-BHC | Chronic | N/A | N/A | 90% | N/A | N/A | N/A | N/A | N/A | N/A |
| Cadmium | Chronic | 1.0E-03 | mg/kg-day | 2.5% | 2.5E-05 | mg/kg-day | kidney | 10 | IRIS | 03/21/01 |
| Chromium | Chronic | 1.5E+00 | mg/kg-day | 1% | 1.5E-02 | mg/kg-day | GI tract/fetus/bone marrow/spleen/liver | 1000 | IRIS | 03/21/01 |
| Copper | Chronic | 4.0E-02 | mg/kg-day | 60% | 2.4E-02 | mg/kg-day | GI tract | N/A | NCEA | 04/29/97 |
| Heptachlor epoxide | Chronic | 1.3E-05 | mg/kg-day | 90% | 1.2E-05 | mg/kg-day | liver | 1000 | IRIS | 03/21/01 |
| Iron | Chronic | 3.0E-01 | mg/kg-day | 100% | 3.0E-01 | mg/kg-day | blood/liver/GI tract | 1 | NCEA | 01/05/99 |
| Manganese (food) | Chronic | 1.4E-01 | mg/kg-day | N/A | N/A | N/A | CNS | 1 | IRIS | 03/21/01 |
| Methylmercury | Chronic | 1.0E-04 | mg/kg-day | 90% | 9.0E-05 | mg/kg-day | Dev. NS | 10 | IRIS | 03/21/01 |
| PCB-1254 | Chronic | 2.0E-05 | mg/kg-day | 100% | 2.0E-05 | mg/kg-day | Immune system/eye/nails | 300 | IRIS | 03/21/01 |
| PCB-1260 | Chronic | N/A | N/A | 100% | N/A | N/A | N/A | N/A | N/A | N/A |
| Selenium | Chronic | 5.0E-03 | mg/kg-day | 44% | 2.2E-03 | mg/kg-day | Liver/hair/nails/skin/CNS | 3 | IRIS | 03/21/01 |
| Silver | Chronic | 5.0E-03 | mg/kg-day | N/A | 5.0E-03 | mg/kg-day | skin | 3 | IRIS | 03/21/01 |
| Vanadium | Chronic | 7.0E-03 | mg/kg-day | 2% | 1.4E-04 | mg/kg-day | GI tract/CNS/kidney/bone marrow/liver | 100 | HEAST | 04/29/97 |
| Zinc | Chronic | 3.0E-01 | mg/kg-day | 25% | 7.5E-02 | mg/kg-day | blood | 3 | IRIS | 03/21/01 |

N/A = Not Available

(1) Refer to RAGS, Part A

(2) Adjusted Dermal $RfD_{chemical}$ = Oral Chronic RfDchemical x GI Absorption $Factor_{chemical}$

(3) The date IRIS was searched.

The date of HEAST

The date of the article provided by NCEA.

The date of the Region III RBC Tables.

Note: Endosulfan was used as a surrogate for endosulfan I and endosulfan sulfate.

Endrin was used as a surrogate for endrin aldehyde, and endrin ketone.

# Appendix A.6

# RAGS Part D Table 6's
# Cancer Toxicity Data

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
ERP Site SS-63, Langley Air Force Base

| Chemical of Potential Concern | Oral Cancer Slope Factor | Units | Oral to Dermal Adjustment Factor | Adjusted Dermal Cancer Slope Factor (1) | Units | Weight of Evidence/ Cancer Guideline Description | Source | Date (2) (MM/DD/YY) |
|---|---|---|---|---|---|---|---|---|
| 4,4'-DDD | 2.4E-01 | $(mg/kg\text{-}day)^{-1}$ | 70% | 3.4E-01 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 03/21/01 |
| 4,4'-DDE | 3.4E-01 | $(mg/kg\text{-}day)^{-1}$ | 70% | 4.9E-01 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 03/21/01 |
| Aldrin | 1.7E+01 | $(mg/kg\text{-}day)^{-1}$ | 90% | 1.9E+01 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 03/21/01 |
| Aluminum | N/A | $(mg/kg\text{-}day)^{-1}$ | 27% | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |
| Aroclor 5432 | 4.5E+00 | $(mg/kg\text{-}day)^{-1}$ | 90% | 5.0E+00 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 03/21/01 |
| Arsenic | 1.5E+00 | $(mg/kg\text{-}day)^{-1}$ | 95% | 1.6E+00 | $(mg/kg\text{-}day)^{-1}$ | A | IRIS | 03/21/01 |
| Barium | N/A | $(mg/kg\text{-}day)^{-1}$ | 100% | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |
| bis (2-Ethylhexyl) phthalate | 1.4E-02 | $(mg/kg\text{-}day)^{-1}$ | 55% | 2.5E-02 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 03/21/01 |
| Calcium | N/A | $(mg/kg\text{-}day)^{-1}$ | 5% | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |
| Copper | N/A | $(mg/kg\text{-}day)^{-1}$ | 60% | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |
| Heptachlor | 4.5E+00 | $(mg/kg\text{-}day)^{-1}$ | 90.0% | 5.0E+00 | N/A | B2 | IRIS | 03/21/01 |
| Heptachlor epoxide | 9.1E+00 | $(mg/kg\text{-}day)^{-1}$ | 90% | 1.0E+01 | N/A | B2 | IRIS | 03/21/01 |
| Iron | N/A | $(mg/kg\text{-}day)^{-1}$ | 100% | N/A | N/A | N/A | N/A | N/A |
| Magnesium | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A | N/A | N/A | N/A |
| Manganese (food) | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |
| Manganese (non-food) | N/A | $(mg/kg\text{-}day)^{-1}$ | 5% | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |
| Mercury | N/A | N/A | 100% | N/A | N/A | N/A | N/A | N/A |
| Methylmercury | N/A | N/A | 90% | N/A | N/A | N/A | N/A | N/A |
| Nickel | N/A | N/A | 0% | N/A | N/A | N/A | N/A | N/A |
| PCB-1248 | 2.0E+00 | $(mg/kg\text{-}day)^{-1}$ | 100% | 2.0E+00 | N/A | B2 | IRIS | 03/21/01 |
| PCB-1254 | 2.0E+00 | $(mg/kg\text{-}day)^{-1}$ | 100% | 2.0E+00 | $(mg/kg\text{-}day)^{-1}$ | B2 | IRIS | 01/01/01 |
| PCB-1260 | 2.0E+00 | $(mg/kg\text{-}day)^{-1}$ | 100% | 2.0E+00 | N/A | B2 | IRIS | 03/21/01 |
| Phenol | N/A | $(mg/kg\text{-}day)^{-1}$ | 90% | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |
| Potassium | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |
| Selenium | N/A | $(mg/kg\text{-}day)^{-1}$ | 44% | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |
| Silver | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |
| Sodium | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |
| Zinc | N/A | $(mg/kg\text{-}day)^{-1}$ | 25% | N/A | $(mg/kg\text{-}day)^{-1}$ | N/A | N/A | N/A |

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

EPA Group:

A - Human carcinogen

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

ERP Site SS-63, Langley Air Force Base

| Chemical of Potential Concern | Oral Cancer Slope Factor | Units | Oral to Dermal Adjustment Factor | Adjusted Dermal Cancer Slope Factor (1) | Units | Weight of Evidence/ Cancer Guideline Description | Source | Date (2) (MM/DD/YY) |
|---|---|---|---|---|---|---|---|---|

N/A= Not Available

(1) Adjusted $SF_d$ = $Sf_o$ / GI Absorption Factor

(2) The date IRIS was searched.

The date of HEAST.

The date of article provided by NCEA.

Note: For PCTs and PCB-1248.

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

Weight of Evidence:

Known/Likely

Cannot be Determined

Not Likely

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

ERP Site SS-63, Langley Air Force Base

| Chemical of Potential Concern | Oral Cancer Slope Factor | Units | Oral to Dermal Adjustment Factor | Adjusted Dermal Cancer Slope Factor (1) | Units | Weight of Evidence/ Cancer Guideline Description | Source | Date (2) (MM/DD/YY) |
|---|---|---|---|---|---|---|---|---|
| Aldrin | 1.7E+01 | (mg/kg-day) $^{-1}$ | 90% | 1.9E+01 | (mg/kg-day) $^{-1}$ | B2 | IRIS | 03/21/01 |
| Aluminum | N/A | N/A | 27% | N/A | N/A | N/A | N/A | N/A |
| Aroclor 5432 | 4.5E+00 | (mg/kg-day) $^{-1}$ | 90% | 5.0E+00 | (mg/kg-day) $^{-1}$ | B2 | NCEA | 03/21/01 |
| Arsenic | 1.5E+00 | (mg/kg-day) $^{-1}$ | 95% | 1.6E+00 | (mg/kg-day) $^{-1}$ | A | IRIS | 03/21/01 |
| Benzo(a)anthracene | 7.3E-01 | (mg/kg-day) $^{-1}$ | N/A | N/A | N/A | B2 | NCEA, IRIS | 07/01/93, 3/21/01 |
| Benzo(a)pyrene | 7.3E+00 | (mg/kg-day) $^{-1}$ | N/A | N/A | N/A | B2 | IRIS | 03/21/01 |
| Benzo(b)fluoranthene | 7.3E-01 | (mg/kg-day) $^{-1}$ | N/A | N/A | N/A | B2 | NCEA, IRIS | 07/01/93, 03/21/01 |
| alpha-BHC | 6.3E+00 | (mg/kg-day) $^{-1}$ | 97.4% | 6.5E+00 | (mg/kg-day) -1 | B2 | IRIS | 03/21/01 |
| delta-BHC | 1.8E+00 | (mg/kg-day) $^{-1}$ | 90% | 2.0E+00 | (mg/kg-day) -1 | D | IRIS | 03/21/01 |
| Cadmium | N/A | N/A | 2.5% | N/A | N/A | N/A | N/A | N/A |
| Chromium | N/A | N/A | 1% | N/A | N/A | D | N/A | N/A |
| Copper | N/A | N/A | 60% | N/A | N/A | N/A | N/A | N/A |
| Heptachlor epoxide | 9.1E+00 | (mg/kg-day) $^{-1}$ | 90% | 1.0E+01 | (mg/kg-day) $^{-1}$ | B2 | IRIS | 03/21/01 |
| Iron | N/A | (mg/kg-day) $^{-1}$ | 100% | N/A | N/A | N/A | N/A | N/A |
| Manganese (food) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Methylmercury | N/A | N/A | 90% | N/A | N/A | N/A | N/A | N/A |
| PCB-1254 | 2.0E+00 | (mg/kg-day) $^{-1}$ | 100% | 2.0E+00 | (mg/kg-day) $^{-1}$ | B2 | IRIS | 03/21/01 |
| PCB-1260 | 2.0E+00 | (mg/kg-day) $^{-1}$ | 100% | 2.0E+00 | N/A | B2 | IRIS | 03/21/01 |
| Selenium | N/A | N/A | 44% | N/A | N/A | N/A | N/A | N/A |
| Silver | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Vanadium | N/A | N/A | 2% | N/A | N/A | N/A | N/A | N/A |
| Zinc | N/A | N/A | 25% | N/A | N/A | N/A | N/A | N/A |

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

N/A= Not Available

(1) Adjusted $SF_d = Sf_o$ / GI Absorption Factor

(2) The date IRIS was searched.

The date of HEAST.

EPA Group:

A - Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

ERP Site SS-63, Langley Air Force Base

| Chemical of Potential Concern | Oral Cancer Slope Factor | Units | Oral to Dermal Adjustment Factor | Adjusted Dermal Cancer Slope Factor (1) | Units | Weight of Evidence/ Cancer Guideline Description | Source | Date (2) (MM/DD/YY) |
|---|---|---|---|---|---|---|---|---|

The date of article provided by NCEA.

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

Weight of Evidence:

Known/Likely

Cannot be Determined

Not Likely

# Appendix A.7

# RAGS Part D Table 7's
# Calculation of Non-Cancer Hazards
# Resonable Maximum Exposure

TABLE 7 1.RME

RME CALCULATION OF NON-CANCER HAZARDS: DERMAL ABSORPTION OF SURFACE WATER FROM BACK RIVER FOR THE CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water from Back River
Receptor Population: Fisher
Receptor Age: Child

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dermal Absorption | **INORGANICS** | | | | | | | | | | | | |
| | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 1.3E-09 | mg/kg-day | 2.9E-04 | mg/kg-day | N/A | N/A | 0.000005 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 3.8E-04 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Methylmercury | 6.8E-05 | mg/l | 6.8E-05 | mg/l | M | 3.8E-11 | mg/kg-day | 9.0E-05 | mg/kg-day | N/A | N/A | 0.0000004 |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 3.1E-03 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | **ORGANICS** | | | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 1.4E-08 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 6.8E-09 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 3.5E-10 | mg/kg-day | 2.7E-05 | mg/kg-day | N/A | N/A | 0.00001 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 6.8E-10 | mg/kg-day | 4.5E-04 | mg/kg-day | N/A | N/A | 0.00000 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 2.4E-09 | mg/kg-day | 1.2E-05 | mg/kg-day | N/A | N/A | 0.0002 |
| | (Total) | | | | | | | | | | | | 0.0002 |
| | | | | | | | | | | | | Total Hazard Index Across All Exposure Routes/Pathways | 0.0002 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 7.2.RME

RME CALCULATION OF NON-CANCER HAZARDS: DERMAL ABSORPTION

OF SURFACE WATER FROM BACK RIVER FOR THE ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water from Back River
Receptor Population: Fisher
Receptor Age: Adult

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dermal | **INORGANICS** | | | | | | | | | | | | |
| Absorption | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 7.4E-10 | mg/kg-day | 2.9E-04 | mg/kg-day | N/A | N/A | 0.000003 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 2.1E-04 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Methylmercury | 6.8E-05 | mg/l | 6.8E-05 | mg/l | M | 2.1E-11 | mg/kg-day | 9.0E-05 | mg/kg-day | N/A | N/A | 0.0000002 |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 1.7E-03 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | **ORGANICS** | | | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 7.6E-09 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 3.8E-09 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 2.0E-10 | mg/kg-day | 2.7E-05 | mg/kg-day | N/A | N/A | 0.000007 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 3.8E-10 | mg/kg-day | 4.5E-04 | mg/kg-day | N/A | N/A | 0.000001 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 1.3E-09 | mg/kg-day | 1.2E-05 | mg/kg-day | N/A | N/A | 0.0001 |
| | (Total) | | | | | | | | | | | | 0.0001 |
| | | | | | | | | | | | | Total Hazard Index Across All Exposure Routes/Pathways | 0.0001 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation

TABLE 7.3.RME

RME CALCULATION OF NON-CANCER HAZARDS: INGESTION/DERMAL ABSORPTION
OF SURFACE WATER FROM BACK RIVER FOR THE OTHER RECREATIONAL PERSON [ADOLESCENTS (TEENS)]
SS-63, Langley Air Force Base

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Surface Water |
| Exposure Medium: Surface Water |
| Exposure Point: Surface Water from Back River |
| Receptor Population: Other Recreational Person[2] |
| Receptor Age: Adolescents (teens) |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | | | |
| | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 4.6E-07 | mg/kg-day | 3.0E-04 | mg/kg-day | N/A | N/A | 0.002 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 1.3E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Methylmercury | 8.8E-05 | mg/l | 8.8E-05 | mg/l | M | 1.3E-08 | mg/kg-day | 1.0E-04 | mg/kg-day | N/A | N/A | 0.0001 |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 1.1E+00 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | **ORGANICS** | | | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 1.1E-09 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 6.4E-10 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 3.6E-09 | mg/kg-day | 3.0E-05 | mg/kg-day | N/A | N/A | 0.0001 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 9.4E-10 | mg/kg-day | 5.0E-04 | mg/kg-day | N/A | N/A | 0.000002 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 5.9E-10 | mg/kg-day | 1.3E-05 | mg/kg-day | N/A | N/A | 0.00005 |
| | (Total) | | | | | | | | | | | | 0.002 |
| Dermal Absorption | **INORGANICS** | | | | | | | | | | | | |
| | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 1.4E-07 | mg/kg-day | 2.9E-04 | mg/kg-day | N/A | N/A | 0.0005 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 4.2E-02 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Methylmercury | 8.8E-05 | mg/l | 6.8E-05 | mg/l | M | 4.1E-09 | mg/kg-day | 9.0E-05 | mg/kg-day | N/A | N/A | 0.00005 |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 3.4E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | **ORGANICS** | | | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 3.7E-07 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 1.9E-07 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 9.7E-09 | mg/kg-day | 2.7E-05 | mg/kg-day | N/A | N/A | 0.0004 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 1.9E-08 | mg/kg-day | 4.5E-04 | mg/kg-day | N/A | N/A | 0.0000 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 6.5E-08 | mg/kg-day | 1.2E-05 | mg/kg-day | N/A | N/A | 0.006 |
| | (Total) | | | | | | | | | | | | 0.006 |
| | Total Hazard Index Across All Exposure Routes/Pathways | | | | | | | | | | | | 0.008 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Jet Skier

TABLE 7.4.RME
RME CALCULATION OF NON-CANCER HAZARDS: INGESTION/DERMAL ABSORPTION
OF SURFACE WATER FROM BACK RIVER FOR OTHER WORKER (ADULT)
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water from Back River
Receptor Population: Other Worker[2]
Receptor Age: Adult

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | | | |
| | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 9.3E-08 | mg/kg-day | 3.0E-04 | mg/kg-day | N/A | N/A | 0.0003 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 2.7E-02 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Methylmercury | 6.8E-05 | mg/l | 6.8E-05 | mg/l | M | 2.7E-09 | mg/kg-day | 1.0E-04 | mg/kg-day | N/A | N/A | 0.00003 |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 2.2E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | **ORGANICS** | | | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 2.2E-10 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 1.3E-10 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 7.3E-10 | mg/kg-day | 3.0E-05 | mg/kg-day | N/A | N/A | 0.00002 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 1.9E-10 | mg/kg-day | 5.0E-04 | mg/kg-day | N/A | N/A | 0.0000004 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 1.2E-10 | mg/kg-day | 1.3E-05 | mg/kg-day | N/A | N/A | 0.000009 |
| | (Total) | | | | | | | | | | | | 0.0004 |
| Dermal Absorption | **INORGANICS** | | | | | | | | | | | | |
| | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 3.7E-08 | mg/kg-day | 2.9E-04 | mg/kg-day | N/A | N/A | 0.0001 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 1.1E-02 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Methylmercury | 6.8E-05 | mg/l | 6.8E-05 | mg/l | M | 1.1E-09 | mg/kg-day | 9.0E-05 | mg/kg-day | N/A | N/A | 0.00001 |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 8.8E-02 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | **ORGANICS** | | | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 9.6E-08 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 4.6E-08 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 2.5E-09 | mg/kg-day | 2.7E-05 | mg/kg-day | N/A | N/A | 0.00009 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 4.8E-09 | mg/kg-day | 4.5E-04 | mg/kg-day | N/A | N/A | 0.0000 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 1.7E-08 | mg/kg-day | 1.2E-05 | mg/kg-day | N/A | N/A | 0.001 |
| | (Total) | | | | | | | | | | | | 0.002 |
| | | | | | | | | | | | | Total Hazard Index Across All Exposure Routes/Pathways | 0.002 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

(2) Sea Rescue Trainer

TABLE 7.5.RME
RME CALCULATION OF NON-CANCER HAZARDS: INGESTION
OF FISH FROM BACK RIVER FOR THE CHILD FISHER
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Fish from Back River
Receptor Population: Fisher
Receptor Age: Child

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | | | |
| | Arsenic | 1.9E+00 | mg/kg | 1.9E+00 | mg/kg | M | 3.6E-04 | mg/kg-day | 3.0E-04 | mg/kg-day | N/A | N/A | 1 |
| | Calcium | 1.3E+03 | mg/kg | 1.3E+03 | mg/kg | M | 2.5E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Magnesium | 3.5E+02 | mg/kg | 3.5E+02 | mg/kg | M | 6.6E-02 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Methylmercury | 6.0E-02 | mg/kg | 6.0E-02 | mg/kg | M | 1.1E-05 | mg/kg-day | 1.0E-04 | mg/kg-day | N/A | N/A | 0.1 |
| | Potassium | 3.8E+03 | mg/kg | 3.8E+03 | mg/kg | M | 7.3E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Selenium | 9.1E-01 | mg/kg | 9.1E-01 | mg/kg | M | 1.7E-04 | mg/kg-day | 5.0E-03 | mg/kg-day | N/A | N/A | 0.03 |
| | Sodium | 6.4E+02 | mg/kg | 6.4E+02 | mg/kg | M | 1.2E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | **ORGANICS** | | | | | | | | | | | | |
| | 4,4'-DDD | 2.8E-02 | mg/kg | 2.8E-02 | mg/kg | M | 5.4E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | 4,4'-DDE | 2.5E-02 | mg/kg | 2.5E-02 | mg/kg | M | 4.8E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Aroclor 5432 | 3.8E-01 | mg/kg | 3.8E-01 | mg/kg | M | 7.2E-05 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | PCB-1248 | 4.5E-02 | mg/kg | 4.5E-02 | mg/kg | M | 8.5E-06 | mg/kg-day | -- | -- | | | |
| | PCB-1254 | 2.2E-01 | mg/kg | 2.2E-01 | mg/kg | M | 4.2E-05 | mg/kg-day | 2.0E-05 | mg/kg-day | N/A | N/A | 2 |
| | PCB-1260 | 5.7E-02 | mg/kg | 5.7E-02 | mg/kg | M | 1.1E-05 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | (Total) | | | | | | | | | | | | 3.4 |
| | | | | | | | | | | | | Total Hazard Index Across All Exposure Routes/Pathways | 3.4 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 7.6.RME
RME CALCULATION OF NON-CANCER HAZARDS: INGESTION
OF FISH FROM BACK RIVER FOR THE ADULT FISHER
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Fish from Back River
Receptor Population: Fisher
Receptor Age: Adult

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | | | |
| | Arsenic | 1.9E+00 | mg/kg | 1.9E+00 | mg/kg | M | 3.3E-04 | mg/kg-day | 3.0E-04 | mg/kg-day | N/A | N/A | 1 |
| | Calcium | 1.3E+03 | mg/kg | 1.3E+03 | mg/kg | M | 2.3E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Magnesium | 3.5E+02 | mg/kg | 3.5E+02 | mg/kg | M | 6.0E-02 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Methylmercury | 6.0E-02 | mg/kg | 6.0E-02 | mg/kg | M | 1.0E-05 | mg/kg-day | 1.0E-04 | mg/kg-day | N/A | N/A | 0.1 |
| | Potassium | 3.8E+03 | mg/kg | 3.8E+03 | mg/kg | M | 6.5E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Selenium | 9.1E-01 | mg/kg | 9.1E-01 | mg/kg | M | 1.6E-04 | mg/kg-day | 5.0E-03 | mg/kg-day | N/A | N/A | 0.03 |
| | Sodium | 6.4E+02 | mg/kg | 6.4E+02 | mg/kg | M | 1.1E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | **ORGANICS** | | | | | | | | | | | | |
| | 4,4'-DDD | 2.8E-02 | mg/kg | 2.8E-02 | mg/kg | M | 4.9E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | 4,4'-DDE | 2.5E-02 | mg/kg | 2.5E-02 | mg/kg | M | 4.3E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Aroclor 5432 | 3.8E-01 | mg/kg | 3.8E-01 | mg/kg | M | 6.5E-05 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | PCB-1248 | 4.5E-02 | mg/kg | 4.5E-02 | mg/kg | M | 7.6E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | PCB-1254 | 2.2E-01 | mg/kg | 2.2E-01 | mg/kg | M | 3.8E-05 | mg/kg-day | 2.0E-05 | mg/kg-day | N/A | N/A | 2 |
| | PCB-1260 | 5.7E-02 | mg/kg | 5.7E-02 | mg/kg | M | 9.8E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | (Total) | | | | | | | | | | | | 3.1 |
| | | | | | | | | | | | | Total Hazard Index Across All Exposure Routes/Pathways | 3.1 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 7.7.RME
RME CALCULATION OF NON-CANCER HAZARDS: INGESTION
OF CRABS FROM BACK RIVER FOR THE CHILD FISHER
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Crabs from Back River
Receptor Population: Fisher
Receptor Age: Child

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | | | |
| | Aluminum | 1.4E+01 | mg/kg | 1.4E+01 | mg/kg | M | 2.7E-03 | mg/kg-day | 1.0E+00 | mg/kg-day | N/A | N/A | 0.003 |
| | Arsenic | 3.4E+00 | mg/kg | 3.4E+00 | mg/kg | M | 6.4E-04 | mg/kg-day | 3.0E-04 | mg/kg-day | N/A | N/A | 2 |
| | Barium | 4.7E-01 | mg/kg | 4.7E-01 | mg/kg | M | 8.9E-05 | mg/kg-day | 7.0E-02 | mg/kg-day | N/A | N/A | 0.001 |
| | Calcium | 2.2E+03 | mg/kg | 2.2E+03 | mg/kg | M | 4.2E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Copper | 8.6E+00 | mg/kg | 8.6E+00 | mg/kg | M | 1.6E-03 | mg/kg-day | 4.0E-02 | mg/kg-day | N/A | N/A | 0.04 |
| | Iron | 1.4E+01 | mg/kg | 1.4E+01 | mg/kg | M | 2.7E-03 | mg/kg-day | 3.0E-01 | mg/kg-day | N/A | N/A | 0.009 |
| | Magnesium | 5.4E+02 | mg/kg | 5.4E+02 | mg/kg | M | 1.0E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Manganese (food) | 1.6E+00 | mg/kg | 1.6E+00 | mg/kg | M | 3.0E-04 | mg/kg-day | 1.4E-01 | mg/kg-day | N/A | N/A | 0.002 |
| | Nickel | 4.9E-01 | mg/kg | 4.9E-01 | mg/kg | M | 9.3E-05 | mg/kg-day | 2.0E-02 | mg/kg-day | N/A | N/A | 0.005 |
| | Potassium | 2.8E+03 | mg/kg | 2.8E+03 | mg/kg | M | 5.4E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Selenium | 6.8E-01 | mg/kg | 6.8E-01 | mg/kg | M | 1.3E-04 | mg/kg-day | 5.0E-03 | mg/kg-day | N/A | N/A | 0.03 |
| | Silver | 7.3E-01 | mg/kg | 7.3E-01 | mg/kg | M | 1.4E-04 | mg/kg-day | 5.0E-03 | mg/kg-day | N/A | N/A | 0.03 |
| | Sodium | 3.6E+03 | mg/kg | 3.6E+03 | mg/kg | M | 6.9E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Zinc | 4.2E+01 | mg/kg | 4.2E+01 | mg/kg | M | 8.0E-03 | mg/kg-day | 3.0E-01 | mg/kg-day | N/A | N/A | 0.03 |
| | **ORGANICS** | | | | | | | | | | | | |
| | 4,4'-DDD | 2.9E-03 | mg/kg | 2.9E-03 | mg/kg | M | 5.5E-07 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | 4,4'-DDE | 9.9E-03 | mg/kg | 9.9E-03 | mg/kg | M | 1.9E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Heptachlor | 7.6E-05 | mg/kg | 7.6E-05 | mg/kg | M | 1.4E-08 | mg/kg-day | 5.0E-04 | mg/kg-day | N/A | N/A | 0.00003 |
| | Heptachlor epoxide | 7.9E-04 | mg/kg | 7.9E-04 | mg/kg | M | 1.5E-07 | mg/kg-day | 1.3E-05 | mg/kg-day | N/A | N/A | 0.01 |
| | PCB-1254 | 2.0E-02 | mg/kg | 2.0E-02 | mg/kg | M | 3.7E-06 | mg/kg-day | 2.0E-05 | mg/kg-day | N/A | N/A | 0.2 |
| | Phenol | 1.3E-01 | mg/kg | 1.3E-01 | mg/kg | M | 2.5E-05 | mg/kg-day | 6.0E-01 | mg/kg-day | N/A | N/A | 0.00004 |
| | bis (2-Ethylhexyl) phthalate | 1.1E-01 | mg/kg | 1.1E-01 | mg/kg | M | 2.0E-05 | mg/kg-day | 2.0E-02 | mg/kg-day | N/A | N/A | 0.001 |
| | (Total) | | | | | | | | | | | | 2.5 |
| | | | | | | | | | | | Total Hazard Index Across All Exposure Routes/Pathways | | 2.5 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 7.8.RME
RME CALCULATION OF NON-CANCER HAZARDS: INGESTION
OF CRABS FROM BACK RIVER FOR THE ADULT FISHER
SS-63, Langley Air Force Base

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Animal Tissue |
| Exposure Medium: Animal Tissue |
| Exposure Point: Crabs from Back River |
| Receptor Population: Fisher |
| Receptor Age: Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | | | |
| | Aluminum | 1.4E+01 | mg/kg | 1.4E+01 | mg/kg | M | 2.4E-03 | mg/kg-day | 1.0E+00 | mg/kg-day | N/A | N/A | 0.002 |
| | Arsenic | 3.4E+00 | mg/kg | 3.4E+00 | mg/kg | M | 5.8E-04 | mg/kg-day | 3.0E-04 | mg/kg-day | N/A | N/A | 2 |
| | Barium | 4.7E-01 | mg/kg | 4.7E-01 | mg/kg | M | 8.1E-05 | mg/kg-day | 7.0E-02 | mg/kg-day | N/A | N/A | 0.001 |
| | Calcium | 2.2E+03 | mg/kg | 2.2E+03 | mg/kg | M | 3.8E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Copper | 8.6E+00 | mg/kg | 8.6E+00 | mg/kg | M | 1.5E-03 | mg/kg-day | 4.0E-02 | mg/kg-day | N/A | N/A | 0.04 |
| | Iron | 1.4E+01 | mg/kg | 1.4E+01 | mg/kg | M | 2.4E-03 | mg/kg-day | 3.0E-01 | mg/kg-day | N/A | N/A | 0.01 |
| | Magnesium | 5.4E+02 | mg/kg | 5.4E+02 | mg/kg | M | 9.3E-02 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Manganese (food) | 1.6E+00 | mg/kg | 1.6E+00 | mg/kg | M | 2.7E-04 | mg/kg-day | 1.4E-01 | mg/kg-day | N/A | N/A | 0.002 |
| | Nickel | 4.9E-01 | mg/kg | 4.9E-01 | mg/kg | M | 8.4E-05 | mg/kg-day | 2.0E-02 | mg/kg-day | N/A | N/A | 0.004 |
| | Potassium | 2.8E+03 | mg/kg | 2.8E+03 | mg/kg | M | 4.9E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Selenium | 6.8E-01 | mg/kg | 6.8E-01 | mg/kg | M | 1.2E-04 | mg/kg-day | 5.0E-03 | mg/kg-day | N/A | N/A | 0.02 |
| | Silver | 7.3E-01 | mg/kg | 7.3E-01 | mg/kg | M | 1.3E-04 | mg/kg-day | 5.0E-03 | mg/kg-day | N/A | N/A | 0.03 |
| | Sodium | 3.6E+03 | mg/kg | 3.6E+03 | mg/kg | M | 6.2E-01 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Zinc | 4.2E+01 | mg/kg | 4.2E+01 | mg/kg | M | 7.2E-03 | mg/kg-day | 3.0E-01 | mg/kg-day | N/A | N/A | 0.02 |
| | **ORGANICS** | | | | | | | | | | | | |
| | 4,4'-DDD | 2.9E-03 | mg/kg | 2.9E-03 | mg/kg | M | 4.9E-07 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | 4,4'-DDE | 9.9E-03 | mg/kg | 9.9E-03 | mg/kg | M | 1.7E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Heptachlor | 7.6E-05 | mg/kg | 7.6E-05 | mg/kg | M | 1.3E-08 | mg/kg-day | 5.0E-04 | mg/kg-day | N/A | N/A | 0.00003 |
| | Heptachlor epoxide | 7.9E-04 | mg/kg | 7.9E-04 | mg/kg | M | 1.4E-07 | mg/kg-day | 1.3E-05 | mg/kg-day | N/A | N/A | 0.01 |
| | PCB-1254 | 2.0E-02 | mg/kg | 2.0E-02 | mg/kg | M | 3.4E-06 | mg/kg-day | 2.0E-05 | mg/kg-day | N/A | N/A | 0.2 |
| | Phenol | 1.3E-01 | mg/kg | 1.3E-01 | mg/kg | M | 2.3E-05 | mg/kg-day | 6.0E-01 | mg/kg-day | N/A | N/A | 0.00004 |
| | bis (2-Ethylhexyl) phthalate | 1.1E-01 | mg/kg | 1.1E-01 | mg/kg | M | 1.8E-05 | mg/kg-day | 2.0E-02 | mg/kg-day | N/A | N/A | 0.0009 |
| | (Total) | | | | | | | | | | | | 2.2 |
| | | | | | | | | | | | | Total Hazard Index Across All Exposure Routes/Pathways | 2.2 |

(1) *Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.*

TABLE 7.1.RME
RME CALCULATION OF NON-CANCER HAZARDS: INGESTION
OF BIVALVES FROM BACK RIVER FOR THE CHILD FISHER
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Animal Tissue
Exposure Medium: Animal Tissue
Exposure Point: Bivalves from Back River
Receptor Population: Fisher
Receptor Age: Child

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | | | |
| | Aluminum | 142 | mg/kg | 142 | mg/kg | M | 5.4E-02 | mg/kg-day | 1.0E+00 | mg/kg-day | N/A | N/A | 0.05 |
| | Arsenic | 0.977 | mg/kg | 0.977 | mg/kg | M | 3.7E-04 | mg/kg-day | 3.0E-04 | mg/kg-day | N/A | N/A | 1.24 |
| | Cadmium | 0.24 | mg/kg | 0.24 | mg/kg | M | 9.1E-05 | mg/kg-day | 1.0E-03 | mg/kg-day | N/A | N/A | 0.09 |
| | Chromium (Total) | 6.84 | mg/kg | 6.84 | mg/kg | M | 2.6E-03 | mg/kg-day | 1.5E+00 | mg/kg-day | N/A | N/A | 0.0017 |
| | Copper | 18.5 | mg/kg | 18.5 | mg/kg | M | 7.0E-03 | mg/kg-day | 4.0E-02 | mg/kg-day | N/A | N/A | 0.18 |
| | Iron | 188 | mg/kg | 188 | mg/kg | M | 7.1E-02 | mg/kg-day | 3.0E-01 | mg/kg-day | N/A | N/A | 0.24 |
| | Manganese | 14.3 | mg/kg | 14.3 | mg/kg | M | 5.4E-03 | mg/kg-day | 1.4E-01 | mg/kg-day | N/A | N/A | 0.04 |
| | Mercury | 0.0103 | mg/kg | 0.0103 | mg/kg | M | 3.9E-06 | mg/kg-day | 1.0E-04 | mg/kg-day | N/A | N/A | 0.04 |
| | Selenium | 0.589 | mg/kg | 0.589 | mg/kg | M | 2.2E-04 | mg/kg-day | 5.0E-03 | mg/kg-day | N/A | N/A | 0.04 |
| | Silver | 1.13 | mg/kg | 1.13 | mg/kg | M | 4.3E-04 | mg/kg-day | 5.0E-03 | mg/kg-day | N/A | N/A | 0.09 |
| | Vanadium | 0.411 | mg/kg | 0.411 | mg/kg | M | 1.6E-04 | mg/kg-day | 7.0E-03 | mg/kg-day | N/A | N/A | 0.02 |
| | Zinc | 169 | mg/kg | 169 | mg/kg | M | 6.4E-02 | mg/kg-day | 3.0E-01 | mg/kg-day | N/A | N/A | 0.21 |
| | **ORGANICS** | | | | | | | | | | | | |
| | Aldrin | 0.000203 | mg/kg | 0.000203 | mg/kg | M | 7.7E-08 | mg/kg-day | 3.0E-05 | mg/kg-day | N/A | N/A | 0.0026 |
| | Aroclor 5432 | 0.0255 | mg/kg | 0.0255 | mg/kg | M | 9.7E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Benzo(a)anthracene | 0.0222 | mg/kg | 0.0222 | mg/kg | M | 8.4E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Benzo(a)pyrene | 0.0242 | mg/kg | 0.0242 | mg/kg | M | 9.2E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Benzo(b)fluoranthene | 0.0256 | mg/kg | 0.0256 | mg/kg | M | 9.7E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Heptachlor epoxide | 0.000317 | mg/kg | 0.000317 | mg/kg | M | 1.2E-07 | mg/kg-day | 1.3E-05 | mg/kg-day | N/A | N/A | 0.01 |
| | PCB 1254 | 0.0222 | mg/kg | 0.0222 | mg/kg | M | 8.4E-06 | mg/kg-day | 2.0E-05 | mg/kg-day | N/A | N/A | 0.42 |
| | PCB 1260 | 0.00326 | mg/kg | 0.00326 | mg/kg | M | 1.2E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | alpha-BHC | 0.000296 | mg/kg | 0.000296 | mg/kg | M | 1.1E-07 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | delta-BHC | 0.000224 | mg/kg | 0.000224 | mg/kg | M | 8.5E-08 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | (Total) | | | | | | | | | | | | 2.7 |

Total Hazard Index Across All Exposure Routes/Pathways: 2.7

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

TABLE 7.2.RME
RME CALCULATION OF NON-CANCER HAZARDS: INGESTION
*OF BIVALVES FROM BACK RIVER FOR THE ADULT FISHER*
SS-63, Langley Air Force Base

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Animal Tissue |
| Exposure Medium: Animal Tissue |
| Exposure Point: Bivalves from Back River |
| Receptor Population: Fisher |
| Receptor Age: Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Hazard Calculation (1) | Intake (Non-Cancer) | Intake (Non-Cancer) Units | Reference Dose | Reference Dose Units | Reference Concentration | Reference Concentration Units | Hazard Quotient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | | | |
| | Aluminum | 142 | mg/kg | 142 | mg/kg | M | 4.9E-02 | mg/kg-day | 1.0E+00 | mg/kg-day | N/A | N/A | 0.05 |
| | Arsenic | 0.977 | mg/kg | 0.977 | mg/kg | M | 3.3E-04 | mg/kg-day | 3.0E-04 | mg/kg-day | N/A | N/A | 1.12 |
| | Cadmium | 0.24 | mg/kg | 0.24 | mg/kg | M | 8.2E-05 | mg/kg-day | 1.0E-03 | mg/kg-day | N/A | N/A | 0.08 |
| | *Chromium (Total)* | 6.84 | mg/kg | 6.84 | mg/kg | M | 2.3E-03 | mg/kg-day | 1.5E+00 | mg/kg-day | N/A | N/A | 0.0016 |
| | Copper | 18.5 | mg/kg | 18.5 | mg/kg | M | 6.3E-03 | mg/kg-day | 4.0E-02 | mg/kg-day | N/A | N/A | 0.16 |
| | Iron | 188 | mg/kg | 188 | mg/kg | M | 6.4E-02 | mg/kg-day | 3.0E-01 | mg/kg-day | N/A | N/A | 0.21 |
| | Manganese | 14.3 | mg/kg | 14.3 | mg/kg | M | 4.9E-03 | mg/kg-day | 1.4E-01 | mg/kg-day | N/A | N/A | 0.03 |
| | Mercury | 0.0103 | mg/kg | 0.0103 | mg/kg | M | 3.5E-06 | mg/kg-day | 1.0E-04 | mg/kg-day | N/A | N/A | 0.04 |
| | Selenium | 0.589 | mg/kg | 0.589 | mg/kg | M | 2.0E-04 | mg/kg-day | 5.0E-03 | mg/kg-day | N/A | N/A | 0.04 |
| | Silver | 1.13 | mg/kg | 1.13 | mg/kg | M | 3.9E-04 | mg/kg-day | 5.0E-03 | mg/kg-day | N/A | N/A | 0.08 |
| | Vanadium | 0.411 | mg/kg | 0.411 | mg/kg | M | 1.4E-04 | mg/kg-day | 7.0E-03 | mg/kg-day | N/A | N/A | 0.02 |
| | Zinc | 169 | mg/kg | 169 | mg/kg | M | 5.8E-02 | mg/kg-day | 3.0E-01 | mg/kg-day | N/A | N/A | 0.19 |
| | **ORGANICS** | | | | | | | | | | | | |
| | Aldrin | 0.000203 | mg/kg | 0.000203 | mg/kg | M | 7.0E-08 | mg/kg-day | [illegible]E-05 | mg/kg-day | N/A | N/A | 0.0023 |
| | Aroclor 5432 | 0.0255 | mg/kg | 0.0255 | mg/kg | M | 8.7E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Benzo(a)anthracene | 0.0222 | mg/kg | 0.0222 | mg/kg | M | 7.6E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Benzo(a)pyrene | 0.0242 | mg/kg | 0.0242 | mg/kg | M | 8.3E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Benzo(b)fluoranthene | 0.0256 | mg/kg | 0.0256 | mg/kg | M | 8.8E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | Heptachlor epoxide | 0.000317 | mg/kg | 0.000317 | mg/kg | M | 1.1E-07 | mg/kg-day | 1.3E-05 | mg/kg-day | N/A | N/A | 0.01 |
| | PCB 1254 | 0.0222 | mg/kg | 0.0222 | mg/kg | M | 7.6E-06 | mg/kg-day | 2.0E-05 | mg/kg-day | N/A | N/A | 0.38 |
| | PCB 1260 | 0.00326 | mg/kg | 0.00326 | mg/kg | M | 1.1E-06 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | *alpha*-BHC | 0.000296 | mg/kg | 0.000296 | mg/kg | M | 1.0E-07 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | delta-BHC | 0.000224 | mg/kg | 0.000224 | mg/kg | M | 7.7E-08 | mg/kg-day | -- | -- | N/A | N/A | -- |
| | (Total) | | | | | | | | | | | | 2.4 |
| | | | | | | | | | | | | Total Hazard Index Across All Exposure Routes/Pathways | 2.4 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

# Appendix A.8

## RAGS Part D Table 8's
## Calculation of Cancer Risks
## Resonable Maximum

TABLE 8.1.RME

RME CALCULATION OF CANCER RISKS: DERMAL ABSORPTION

OF SURFACE WATER FROM BACK RIVER FOR THE CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water from Back River
Receptor Population: Fisher
Receptor Age: Child

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dermal Absorption | **INORGANICS** | | | | | | | | | | |
| | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 1.3E-10 | mg/kg-day | 1.6E+00 | $mg/kg\text{-}day^{-1}$ | 2.1E-10 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 3.8E-05 | mg/kg-day | -- | -- | -- |
| | Methylmercury | 6.8E-05 | mg/l | 6.8E-05 | mg/l | M | 3.8E-12 | mg/kg-day | -- | -- | -- |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 3.1E-04 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 1.4E-09 | mg/kg-day | 3.4E-01 | $mg/kg\text{-}day^{-1}$ | 4.7E-10 |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 6.8E-10 | mg/kg-day | 4.9E-01 | $mg/kg\text{-}day^{-1}$ | 3.3E-10 |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 3.5E-11 | mg/kg-day | 1.9E+01 | $mg/kg\text{-}day^{-1}$ | 6.7E-10 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 6.8E-11 | mg/kg-day | 5.0E+00 | $mg/kg\text{-}day^{-1}$ | 3.4E-10 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 2.4E-10 | mg/kg-day | 1.0E+01 | $mg/kg\text{-}day^{-1}$ | 2.4E-09 |
| | (Total) | | | | | | | | | | 4E-09 |
| | | | | | | | | | | Total Risk Across All Exposure Routes/Pathways | 4E-09 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.2.RME
RME CALCULATION OF CANCER RISKS: DERMAL ABSORPTION
OF SURFACE WATER FROM BACK RIVER FOR THE ADULT FISHER
SS-63, Langley Air Force Base

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Surface Water |
| Exposure Medium: Surface Water |
| Exposure Point: Surface Water from Back River |
| Receptor Population: Fisher |
| Receptor Age: Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dermal Absorption | **INORGANICS** | | | | | | | | | | |
| | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 3.2E-10 | mg/kg-day | 1.6E+00 | mg/kg-day $^{-1}$ | 5.0E-10 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 9.1E-05 | mg/kg-day | -- | -- | -- |
| | Methylmercury | 6.8E-05 | mg/l | 6.8E-05 | mg/l | M | 9.1E-12 | mg/kg-day | -- | -- | -- |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 7.4E-04 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 3.3E-09 | mg/kg-day | 3.4E-01 | mg/kg-day $^{-1}$ | 1.1E-09 |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 1.6E-09 | mg/kg-day | 4.9E-01 | mg/kg-day $^{-1}$ | 7.9E-10 |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 8.5E-11 | mg/kg-day | 1.9E+01 | mg/kg-day $^{-1}$ | 1.6E-09 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 1.6E-10 | mg/kg-day | 5.0E+00 | mg/kg-day $^{-1}$ | 8.2E-10 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 5.7E-10 | mg/kg-day | 1.0E+01 | mg/kg-day $^{-1}$ | 5.7E-09 |
| | (Total) | | | | | | | | | | 1E-08 |
| | | | | | | | | | | Total Risk Across All Exposure Routes/Pathways | 1E-08 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.3.RME
RME CALCULATION OF CANCER RISKS: INGESTION/DERMAL ABSORPTION
OF SURFACE WATER FROM BACK RIVER FOR THE OTHER RECREATIONAL PERSON [ADOLESCENTS (TEENS)]
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water from Back River
Receptor Population: Other Recreational Person[2]
Receptor Age: Adolescents (teens)

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | |
| | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 3.9E-08 | mg/kg-day | 1.5E+00 | mg/kg-day $^{-1}$ | 5.9E-08 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 1.1E-02 | mg/kg-day | -- | -- | -- |
| | Methylmercury | 6.8E-05 | mg/l | 6.8E-05 | mg/l | M | 1.1E-09 | mg/kg-day | -- | -- | -- |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 9.2E-02 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 9.3E-11 | mg/kg-day | 2.4E-01 | mg/kg-day $^{-1}$ | 2.2E-11 |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 5.5E-11 | mg/kg-day | 3.4E-01 | mg/kg-day $^{-1}$ | 1.9E-11 |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 3.1E-10 | mg/kg-day | 1.7E+01 | mg/kg-day $^{-1}$ | 5.2E-09 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 8.1E-11 | mg/kg-day | 4.5E+00 | mg/kg-day $^{-1}$ | 3.6E-10 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 5.1E-11 | mg/kg-day | 9.1E+00 | mg/kg-day $^{-1}$ | 4.6E-10 |
| | (Total) | | | | | | | | | | 6.5E-08 |
| Dermal Absorption | **INORGANICS** | | | | | | | | | | |
| | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 1.2E-08 | mg/kg-day | 1.6E+00 | mg/kg-day $^{-1}$ | 1.9E-08 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 3.6E-03 | mg/kg-day | -- | -- | -- |
| | Methylmercury | 6.8E-05 | mg/l | 6.8E-05 | mg/l | M | 3.6E-10 | mg/kg-day | -- | -- | -- |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 2.9E-02 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 3.2E-08 | mg/kg-day | 3.4E-01 | mg/kg-day $^{-1}$ | 1.1E-08 |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 1.6E-08 | mg/kg-day | 4.9E-01 | mg/kg-day $^{-1}$ | 7.7E-09 |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 8.3E-10 | mg/kg-day | 1.9E+01 | mg/kg-day $^{-1}$ | 1.6E-08 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 1.6E-09 | mg/kg-day | 5.0E+00 | mg/kg-day $^{-1}$ | 8.0E-09 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 5.6E-09 | mg/kg-day | 1.0E+01 | mg/kg-day $^{-1}$ | 5.6E-08 |
| | (Total) | | | | | | | | | | 1E-07 |
| | | | | | | | | | | Total Risk Across All Exposure Routes/Pathways | 2E-07 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

(2) Jet Skier

TABLE 8.4.RME
RME CALCULATION OF CANCER RISKS: INGESTION/DERMAL ABSORPTION
OF SURFACE WATER FROM BACK RIVER FOR OTHER WORKER (ADULT)
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Surface Water from Back River
Receptor Population: Other Worker[2]
Receptor Age: Adult

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | |
| | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 3.3E-08 | mg/kg-day | 1.5E+00 | $mg/kg\text{-}day^{-1}$ | 5.0E-08 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 9.6E-03 | mg/kg-day | -- | -- | -- |
| | Methylmercury | 6.8E-05 | mg/l | 6.8E-05 | mg/l | M | 9.5E-10 | mg/kg-day | -- | -- | -- |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 7.8E-02 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 7.9E-11 | mg/kg-day | 2.4E-01 | $mg/kg\text{-}day^{-1}$ | 1.9E-11 |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 4.7E-11 | mg/kg-day | 3.4E-01 | $mg/kg\text{-}day^{-1}$ | 1.6E-11 |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 2.6E-10 | mg/kg-day | 1.7E+01 | $mg/kg\text{-}day^{-1}$ | 4.4E-09 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 6.8E-11 | mg/kg-day | 4.5E+00 | $mg/kg\text{-}day^{-1}$ | 3.1E-10 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 4.3E-11 | mg/kg-day | 9.1E+00 | $mg/kg\text{-}day^{-1}$ | 3.9E-10 |
| | (Total) | | | | | | | | | | 5.5E-08 |
| Dermal Absorption | **INORGANICS** | | | | | | | | | | |
| | Arsenic | 2.4E-03 | mg/l | 2.4E-03 | mg/l | M | 1.3E-08 | mg/kg-day | 1.6E+00 | $mg/kg\text{-}day^{-1}$ | 2.1E-08 |
| | Magnesium | 6.8E+02 | mg/l | 6.8E+02 | mg/l | M | 3.8E-03 | mg/kg-day | -- | -- | -- |
| | Methylmercury | 6.8E-05 | mg/l | 6.8E-05 | mg/l | M | 3.8E-10 | mg/kg-day | -- | -- | -- |
| | Sodium | 5.6E+03 | mg/l | 5.6E+03 | mg/l | M | 3.1E-02 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | 4,4'-DDD | 5.7E-06 | mg/l | 5.7E-06 | mg/l | M | 3.4E-08 | mg/kg-day | 3.4E-01 | $mg/kg\text{-}day^{-1}$ | 1.2E-08 |
| | 4,4'-DDE | 3.4E-06 | mg/l | 3.4E-06 | mg/l | M | 1.7E-08 | mg/kg-day | 4.9E-01 | $mg/kg\text{-}day^{-1}$ | 8.3E-09 |
| | Aldrin | 1.9E-05 | mg/l | 1.9E-05 | mg/l | M | 8.9E-10 | mg/kg-day | 1.9E+01 | $mg/kg\text{-}day^{-1}$ | 1.7E-08 |
| | Heptachlor | 4.9E-06 | mg/l | 4.9E-06 | mg/l | M | 1.7E-09 | mg/kg-day | 5.0E+00 | $mg/kg\text{-}day^{-1}$ | 8.6E-09 |
| | Heptachlor epoxide | 3.1E-06 | mg/l | 3.1E-06 | mg/l | M | 6.0E-09 | mg/kg-day | 1.0E+01 | $mg/kg\text{-}day^{-1}$ | 6.0E-08 |
| | (Total) | | | | | | | | | | 1E-07 |
| | | | | | | | | | | Total Risk Across All Exposure Routes/Pathways | 2E-07 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

(2) Sea Rescue Trainer

TABLE 8.5.RME
RME CALCULATION OF CANCER RISKS: INGESTION
OF FISH FROM BACK RIVER FOR THE CHILD FISHER
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Animal Tissue
Exposure Point: Fish from Back River
Receptor Population: Fisher
Receptor Age: Child

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | |
| | Arsenic | 1.9E+00 | mg/kg | 1.9E+00 | mg/kg | M | 3.6E-05 | mg/kg-day | 1.5E+00 | $mg/kg\text{-}day^{-1}$ | 5.4E-05 |
| | Calcium | 1.3E+03 | mg/kg | 1.3E+03 | mg/kg | M | 2.5E-02 | mg/kg-day | -- | -- | -- |
| | Magnesium | 3.5E+02 | mg/kg | 3.5E+02 | mg/kg | M | 6.6E-03 | mg/kg-day | -- | -- | -- |
| | Methylmercury | 6.0E-02 | mg/kg | 6.0E-02 | mg/kg | M | 1.1E-06 | mg/kg-day | -- | -- | -- |
| | Potassium | 3.8E+03 | mg/kg | 3.8E+03 | mg/kg | M | 7.3E-02 | mg/kg-day | -- | -- | -- |
| | Selenium | 9.1E-01 | mg/kg | 9.1E-01 | mg/kg | M | 1.7E-05 | mg/kg-day | -- | -- | -- |
| | Sodium | 6.4E+02 | mg/kg | 6.4E+02 | mg/kg | M | 1.2E-02 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | 4,4'-DDD | 2.8E-02 | mg/kg | 2.8E-02 | mg/kg | M | 5.4E-07 | mg/kg-day | 2.4E-01 | $mg/kg\text{-}day^{-1}$ | 1.3E-07 |
| | 4,4'-DDE | 2.5E-02 | mg/kg | 2.5E-02 | mg/kg | M | 4.8E-07 | mg/kg-day | 3.4E-01 | $mg/kg\text{-}day^{-1}$ | 1.6E-07 |
| | Aroclor 5432 | 3.8E-01 | mg/kg | 3.8E-01 | mg/kg | M | 7.2E-06 | mg/kg-day | 4.5E+00 | $mg/kg\text{-}day^{-1}$ | 3.2E-05 |
| | PCB-1248 | 4.5E-02 | mg/kg | 4.5E-02 | mg/kg | M | 8.5E-07 | mg/kg-day | 2.0E+00 | $mg/kg\text{-}day^{-1}$ | 1.7E-06 |
| | PCB-1254 | 2.2E-01 | mg/kg | 2.2E-01 | mg/kg | M | 4.2E-06 | mg/kg-day | 2.0E+00 | $mg/kg\text{-}day^{-1}$ | 8.3E-06 |
| | PCB-1260 | 5.7E-02 | mg/kg | 5.7E-02 | mg/kg | M | 1.1E-06 | mg/kg-day | 2.0E+00 | $mg/kg\text{-}day^{-1}$ | 2.2E-06 |
| | (Total) | | | | | | | | | | 1E-04 |
| | | | | | | | | | | Total Risk Across All Exposure Routes/Pathways | 1E-04 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.6.RME
RME CALCULATION OF CANCER RISKS: INGESTION
OF FISH FROM BACK RIVER FOR THE ADULT FISHER
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Animal Tissue
Exposure Point: Fish from Back River
Receptor Population: Fisher
Receptor Age: Adult

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | |
| | Arsenic | 1.9E+00 | mg/kg | 1.9E+00 | mg/kg | M | 1.4E-04 | mg/kg-day | 1.5E+00 | $mg/kg\text{-}day^{-1}$ | 2.1E-04 |
| | Calcium | 1.3E+03 | mg/kg | 1.3E+03 | mg/kg | M | 9.7E-02 | mg/kg-day | -- | -- | -- |
| | Magnesium | 3.5E+02 | mg/kg | 3.5E+02 | mg/kg | M | 2.6E-02 | mg/kg-day | -- | -- | -- |
| | Methylmercury | 6.0E-02 | mg/kg | 6.0E-02 | mg/kg | M | 4.4E-06 | mg/kg-day | -- | -- | -- |
| | Potassium | 3.8E+03 | mg/kg | 3.8E+03 | mg/kg | M | 2.8E-01 | mg/kg-day | -- | -- | -- |
| | Selenium | 9.1E-01 | mg/kg | 9.1E-01 | mg/kg | M | 6.6E-05 | mg/kg-day | -- | -- | -- |
| | Sodium | 6.4E+02 | mg/kg | 6.4E+02 | mg/kg | M | 4.7E-02 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | 4,4'-DDD | 2.8E-02 | mg/kg | 2.8E-02 | mg/kg | M | 2.1E-06 | mg/kg-day | 2.4E-01 | $mg/kg\text{-}day^{-1}$ | 5.0E-07 |
| | 4,4'-DDE | 2.5E-02 | mg/kg | 2.5E-02 | mg/kg | M | 1.9E-06 | mg/kg-day | 3.4E-01 | $mg/kg\text{-}day^{-1}$ | 6.3E-07 |
| | Aroclor 5432 | 3.8E-01 | mg/kg | 3.8E-01 | mg/kg | M | 2.8E-05 | mg/kg-day | 4.5E+00 | $mg/kg\text{-}day^{-1}$ | 1.3E-04 |
| | PCB-1248 | 4.5E-02 | mg/kg | 4.5E-02 | mg/kg | M | 3.3E-06 | mg/kg-day | 2.0E+00 | $mg/kg\text{-}day^{-1}$ | 6.5E-06 |
| | PCB-1254 | 2.2E-01 | mg/kg | 2.2E-01 | mg/kg | M | 1.6E-05 | mg/kg-day | 2.0E+00 | $mg/kg\text{-}day^{-1}$ | 3.2E-05 |
| | PCB-1260 | 5.7E-02 | mg/kg | 5.7E-02 | mg/kg | M | 4.2E-06 | mg/kg-day | 2.0E+00 | $mg/kg\text{-}day^{-1}$ | 8.4E-06 |
| | (Total) | | | | | | | | | | 4E-04 |
| | | | | | | | | | | Total Risk Across All Exposure Routes/Pathways | 4E-04 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.7.RME
RME CALCULATION OF CANCER RISKS: INGESTION
OF CRABS FROM BACK RIVER FOR THE CHILD FISHER
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Animal Tissue
Exposure Point: Crabs from Back River
Receptor Population: Fisher
Receptor Age: Child

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | |
| | Aluminum | 1.4E+01 | mg/kg | 1.4E+01 | mg/kg | M | 2.7E-04 | mg/kg-day | -- | -- | -- |
| | Arsenic | 3.4E+00 | mg/kg | 3.4E+00 | mg/kg | M | 6.4E-05 | mg/kg-day | 1.5E+00 | $mg/kg\text{-}day^{-1}$ | 9.6E-05 |
| | Barium | 4.7E-01 | mg/kg | 4.7E-01 | mg/kg | M | 8.9E-06 | mg/kg-day | -- | -- | -- |
| | Calcium | 2.2E+03 | mg/kg | 2.2E+03 | mg/kg | M | 4.2E-02 | mg/kg-day | -- | -- | -- |
| | Copper | 8.6E+00 | mg/kg | 8.6E+00 | mg/kg | M | 1.6E-04 | mg/kg-day | -- | -- | -- |
| | Iron | 1.4E+01 | mg/kg | 1.4E+01 | mg/kg | M | 2.7E-04 | mg/kg-day | -- | -- | -- |
| | Magnesium | 5.4E+02 | mg/kg | 5.4E+02 | mg/kg | M | 1.0E-02 | mg/kg-day | -- | -- | -- |
| | Manganese (food) | 1.6E+00 | mg/kg | 1.6E+00 | mg/kg | M | 3.0E-05 | mg/kg-day | -- | -- | -- |
| | Nickel | 4.9E-01 | mg/kg | 4.9E-01 | mg/kg | M | 9.3E-06 | mg/kg-day | -- | -- | -- |
| | Potassium | 2.8E+03 | mg/kg | 2.8E+03 | mg/kg | M | 5.4E-02 | mg/kg-day | -- | -- | -- |
| | Selenium | 6.8E-01 | mg/kg | 6.8E-01 | mg/kg | M | 1.3E-05 | mg/kg-day | -- | -- | -- |
| | Silver | 7.3E-01 | mg/kg | 7.3E-01 | mg/kg | M | 1.4E-05 | mg/kg-day | -- | -- | -- |
| | Sodium | 3.6E+03 | mg/kg | 3.6E+03 | mg/kg | M | 6.9E-02 | mg/kg-day | -- | -- | -- |
| | Zinc | 4.2E+01 | mg/kg | 4.2E+01 | mg/kg | M | 8.0E-04 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | 4,4'-DDD | 2.9E-03 | mg/kg | 2.9E-03 | mg/kg | M | 5.5E-08 | mg/kg-day | 2.4E-01 | $mg/kg\text{-}day^{-1}$ | 1.3E-08 |
| | 4,4'-DDE | 9.9E-03 | mg/kg | 9.9E-03 | mg/kg | M | 1.9E-07 | mg/kg-day | 3.4E-01 | $mg/kg\text{-}day^{-1}$ | 6.4E-08 |
| | Heptachlor | 7.6E-05 | mg/kg | 7.6E-05 | mg/kg | M | 1.4E-09 | mg/kg-day | 4.5E+00 | $mg/kg\text{-}day^{-1}$ | 6.5E-09 |
| | Heptachlor epoxide | 7.9E-04 | mg/kg | 7.9E-04 | mg/kg | M | 1.5E-08 | mg/kg-day | 9.1E+00 | $mg/kg\text{-}day^{-1}$ | 1.4E-07 |
| | PCB-1254 | 2.0E-02 | mg/kg | 2.0E-02 | mg/kg | M | 3.7E-07 | mg/kg-day | 2.0E+00 | $mg/kg\text{-}day^{-1}$ | 7.4E-07 |
| | Phenol | 1.3E-01 | mg/kg | 1.3E-01 | mg/kg | M | 2.5E-06 | mg/kg-day | -- | -- | -- |
| | bis (2-Ethylhexyl) phthalate | 1.1E-01 | mg/kg | 1.1E-01 | mg/kg | M | 2.0E-06 | mg/kg-day | 1.4E-02 | $mg/kg\text{-}day^{-1}$ | 2.8E-08 |
| | (Total) | | | | | | | | | | 1E-04 |
| | | | | | | | | | | Total Risk Across All Exposure Routes/Pathways | 1E-04 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.8.RME
RME CALCULATION OF CANCER RISKS: INGESTION
OF CRABS FROM BACK RIVER FOR THE ADULT FISHER
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Animal Tissue
*Exposure Point: Crabs from Back River*
Receptor Population: Fisher
Receptor Age: Adult

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | |
| | Aluminum | 1.4E+01 | mg/kg | 1.4E+01 | mg/kg | M | 1.0E-03 | mg/kg-day | -- | -- | -- |
| | Arsenic | 3.4E+00 | mg/kg | 3.4E+00 | mg/kg | M | 2.5E-04 | mg/kg-day | 1.5E+00 | $mg/kg\text{-}day^{-1}$ | 3.7E-04 |
| | Barium | 4.7E-01 | mg/kg | 4.7E-01 | mg/kg | M | 3.5E-05 | mg/kg-day | -- | -- | -- |
| | Calcium | 2.2E+03 | mg/kg | 2.2E+03 | mg/kg | M | 1.6E-01 | mg/kg-day | -- | -- | -- |
| | Copper | 8.6E+00 | mg/kg | 8.6E+00 | mg/kg | M | 6.3E-04 | mg/kg-day | -- | -- | -- |
| | Iron | 1.4E+01 | mg/kg | 1.4E+01 | mg/kg | M | 1.0E-03 | mg/kg-day | -- | -- | -- |
| | Magnesium | 5.4E+02 | mg/kg | 5.4E+02 | mg/kg | M | 4.0E-02 | mg/kg-day | -- | -- | -- |
| | Manganese (food) | 1.6E+00 | mg/kg | 1.6E+00 | mg/kg | M | 1.2E-04 | mg/kg-day | -- | -- | -- |
| | Nickel | 4.9E-01 | mg/kg | 4.9E-01 | mg/kg | M | 3.6E-05 | mg/kg-day | -- | -- | -- |
| | Potassium | 2.8E+03 | mg/kg | 2.8E+03 | mg/kg | M | 2.1E-01 | mg/kg-day | -- | -- | -- |
| | Selenium | 6.8E-01 | mg/kg | 6.8E-01 | mg/kg | M | 5.0E-05 | mg/kg-day | -- | -- | -- |
| | Silver | 7.3E-01 | mg/kg | 7.3E-01 | mg/kg | M | 5.4E-05 | mg/kg-day | -- | -- | -- |
| | Sodium | 3.6E+03 | mg/kg | 3.6E+03 | mg/kg | M | 2.7E-01 | mg/kg-day | -- | -- | -- |
| | Zinc | 4.2E+01 | mg/kg | 4.2E+01 | mg/kg | M | 3.1E-03 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | 4,4'-DDD | 2.9E-03 | mg/kg | 2.9E-03 | mg/kg | M | 2.1E-07 | mg/kg-day | 2.4E-01 | $mg/kg\text{-}day^{-1}$ | 5.1E-08 |
| | 4,4'-DDE | 9.9E-03 | mg/kg | 9.9E-03 | mg/kg | M | 7.3E-07 | mg/kg-day | 3.4E-01 | $mg/kg\text{-}day^{-1}$ | 2.5E-07 |
| | Heptachlor | 7.6E-05 | mg/kg | 7.6E-05 | mg/kg | M | 5.6E-09 | mg/kg-day | 4.5E+00 | $mg/kg\text{-}day^{-1}$ | 2.5E-08 |
| | Heptachlor epoxide | 7.9E-04 | mg/kg | 7.9E-04 | mg/kg | M | 5.8E-08 | mg/kg-day | 9.1E+00 | $mg/kg\text{-}day^{-1}$ | 5.3E-07 |
| | PCB-1254 | 2.0E-02 | mg/kg | 2.0E-02 | mg/kg | M | 1.4E-06 | mg/kg-day | 2.0E+00 | $mg/kg\text{-}day^{-1}$ | 2.9E-06 |
| | Phenol | 1.3E-01 | mg/kg | 1.3E-01 | mg/kg | M | 9.8E-06 | mg/kg-day | -- | -- | -- |
| | bis (2-Ethylhexyl) phthalate | 1.1E-01 | mg/kg | 1.1E-01 | mg/kg | M | 7.8E-06 | mg/kg-day | 1.4E-02 | $mg/kg\text{-}day^{-1}$ | 1.1E-07 |
| | (Total) | | | | | | | | | | 4E-04 |
| | | | | | | | | | | Total Risk Across All Exposure Routes/Pathways | 4E-04 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.1.RME
RME CALCULATION OF CANCER RISKS: INGESTION
OF BIVALVES FROM BACK RIVER FOR THE CHILD FISHER
SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Animal Tissue
Exposure Point: Bivalves from Back River
*Receptor Population: Fisher*
Receptor Age: Child

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | |
| | Aluminum | 142 | mg/kg | 142 | mg/kg | M | 5.4E-03 | mg/kg-day | -- | -- | -- |
| | Arsenic | 0.977 | mg/kg | 0.977 | mg/kg | M | 3.7E-05 | mg/kg-day | 1.5E+00 | mg/kg-day $^{-1}$ | 5.6E-05 |
| | Cadmium | 0.24 | mg/kg | 0.24 | mg/kg | M | 9.1E-06 | mg/kg-day | -- | -- | -- |
| | Chromium (Total) | 6.84 | mg/kg | 6.84 | mg/kg | M | 2.6E-04 | mg/kg-day | -- | -- | -- |
| | Copper | 18.5 | mg/kg | 18.5 | mg/kg | M | 7.0E-04 | mg/kg-day | -- | -- | -- |
| | Iron | 188 | mg/kg | 188 | mg/kg | M | 7.1E-03 | mg/kg-day | -- | -- | -- |
| | Manganese | 14.3 | mg/kg | 14.3 | mg/kg | M | 5.4E-04 | mg/kg-day | -- | -- | -- |
| | Mercury | 0.0103 | mg/kg | 0.0103 | mg/kg | M | 3.9E-07 | mg/kg-day | -- | -- | -- |
| | Selenium | 0.589 | mg/kg | 0.589 | mg/kg | M | 2.2E-05 | mg/kg-day | -- | -- | -- |
| | Silver | 1.13 | mg/kg | 1.13 | mg/kg | M | 4.3E-05 | mg/kg-day | -- | -- | -- |
| | Vanadium | 0.411 | mg/kg | 0.411 | mg/kg | M | 1.6E-05 | mg/kg-day | -- | -- | -- |
| | Zinc | 169 | mg/kg | 169 | mg/kg | M | 6.4E-03 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | Aldrin | 0.000203 | mg/kg | 0.000203 | mg/kg | M | 7.7E-09 | mg/kg-day | 1.7E+01 | mg/kg-day $^{-1}$ | 1.3E-07 |
| | Aroclor 5432 | 0.0255 | mg/kg | 0.0255 | mg/kg | M | 9.7E-07 | mg/kg-day | 4.5E+00 | mg/kg-day $^{-1}$ | 4.4E-06 |
| | Benzo(a)anthracene | 0.0222 | mg/kg | 0.0222 | mg/kg | M | 8.4E-07 | mg/kg-day | 7.3E-01 | mg/kg-day $^{-1}$ | 6.2E-07 |
| | Benzo(a)pyrene | 0.0242 | mg/kg | 0.0242 | mg/kg | M | 9.2E-07 | mg/kg-day | 7.3E+00 | mg/kg-day $^{-1}$ | 6.7E-06 |
| | Benzo(b)fluoranthene | 0.0256 | mg/kg | 0.0256 | mg/kg | M | 9.7E-07 | mg/kg-day | 7.3E-01 | mg/kg-day $^{-1}$ | 7.1E-07 |
| | Heptachlor epoxide | 0.000317 | mg/kg | 0.000317 | mg/kg | M | 1.2E-08 | mg/kg-day | 9.1E+00 | mg/kg-day $^{-1}$ | 1.1E-07 |
| | PCB 1254 | 0.0222 | mg/kg | 0.0222 | mg/kg | M | 8.4E-07 | mg/kg-day | 2.0E+00 | mg/kg-day $^{-1}$ | 1.7E-06 |
| | PCB 1260 | 0.00326 | mg/kg | 0.00326 | mg/kg | M | 1.2E-07 | mg/kg-day | 2.0E+00 | mg/kg-day $^{-1}$ | 2.5E-07 |
| | alpha-BHC | 0.000296 | mg/kg | 0.000296 | mg/kg | M | 1.1E-08 | mg/kg-day | 6.3E+00 | mg/kg-day $^{-1}$ | 7.1E-08 |
| | delta-BHC | 0.000224 | mg/kg | 0.000224 | mg/kg | M | 8.5E-09 | mg/kg-day | 1.8E+00 | mg/kg-day $^{-1}$ | 1.5E-08 |
| | (Total) | | | | | | | | | | 7.0E-05 |
| | | | | | | | | | | Total Risk Across All Exposure Routes/Pathways | 7.0E-05 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.2.RME
RME CALCULATION OF CANCER RISKS: INGESTION
OF BIVALVES FROM BACK RIVER FOR THE ADULT FISHER
SS-63, Langley Air Force Base

| |
|---|
| Scenario Timeframe: Current/Future |
| Medium: Surface Water |
| Exposure Medium: Animal Tissue |
| Exposure Point: Bivalves from Back River |
| Receptor Population: Fisher |
| Receptor Age: Adult |

| Exposure Route | Chemical of Potential Concern | Medium EPC Value | Medium EPC Units | Route EPC Value | Route EPC Units | EPC Selected for Risk Calculation (1) | Intake (Cancer) | Intake (Cancer) Units | Cancer Slope Factor | Cancer Slope Factor Units | Cancer Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ingestion | **INORGANICS** | | | | | | | | | | |
| | Aluminum | 142 | mg/kg | 142 | mg/kg | M | 2.1E-02 | mg/kg-day | -- | -- | -- |
| | Arsenic | 0.977 | mg/kg | 0.977 | mg/kg | M | 1.4E-04 | mg/kg-day | 1.5E+00 | mg/kg-day $^{-1}$ | 2.2E-04 |
| | Cadmium | 0.24 | mg/kg | 0.24 | mg/kg | M | 3.5E-05 | mg/kg-day | -- | -- | -- |
| | Chromium (Total) | 6.84 | mg/kg | 6.84 | mg/kg | M | 1.0E-03 | mg/kg-day | -- | -- | -- |
| | Copper | 18.5 | mg/kg | 18.5 | mg/kg | M | 2.7E-03 | mg/kg-day | -- | -- | -- |
| | Iron | 188 | mg/kg | 188 | mg/kg | M | 2.8E-02 | mg/kg-day | -- | -- | -- |
| | Manganese | 14.3 | mg/kg | 14.3 | mg/kg | M | 2.1E-03 | mg/kg-day | -- | -- | -- |
| | Mercury | 0.0103 | mg/kg | 0.0103 | mg/kg | M | 1.5E-06 | mg/kg-day | -- | -- | -- |
| | Selenium | 0.589 | mg/kg | 0.589 | mg/kg | M | 8.6E-05 | mg/kg-day | -- | -- | -- |
| | Silver | 1.13 | mg/kg | 1.13 | mg/kg | M | 1.7E-04 | mg/kg-day | -- | -- | -- |
| | Vanadium | 0.411 | mg/kg | 0.411 | mg/kg | M | 6.0E-05 | mg/kg-day | -- | -- | -- |
| | Zinc | 169 | mg/kg | 169 | mg/kg | M | 2.5E-02 | mg/kg-day | -- | -- | -- |
| | **ORGANICS** | | | | | | | | | | |
| | Aldrin | 0.000203 | mg/kg | 0.000203 | mg/kg | M | 3.0E-08 | mg/kg-day | 1.7E+01 | mg/kg-day $^{-1}$ | 5.1E-07 |
| | Aroclor 5432 | 0.0255 | mg/kg | 0.0255 | mg/kg | M | 3.7E-06 | mg/kg-day | 4.5E+00 | mg/kg-day $^{-1}$ | 1.7E-05 |
| | Benzo(a)anthracene | 0.0222 | mg/kg | 0.0222 | mg/kg | M | 3.3E-06 | mg/kg-day | 7.3E-01 | mg/kg-day $^{-1}$ | 2.4E-06 |
| | Benzo(a)pyrene | 0.0242 | mg/kg | 0.0242 | mg/kg | M | 3.6E-06 | mg/kg-day | 7.3E+00 | mg/kg-day $^{-1}$ | 2.6E-05 |
| | Benzo(b)fluoranthene | 0.0256 | mg/kg | 0.0256 | mg/kg | M | 3.8E-06 | mg/kg-day | 7.3E-01 | mg/kg-day $^{-1}$ | 2.7E-06 |
| | Heptachlor epoxide | 0.000317 | mg/kg | 0.000317 | mg/kg | M | 4.7E-08 | mg/kg-day | 9.1E+00 | mg/kg-day $^{-1}$ | 4.2E-07 |
| | PCB 1254 | 0.0222 | mg/kg | 0.0222 | mg/kg | M | 3.3E-06 | mg/kg-day | 2.0E+00 | mg/kg-day $^{-1}$ | 6.5E-06 |
| | PCB 1260 | 0.00326 | mg/kg | 0.00326 | mg/kg | M | 4.8E-07 | mg/kg-day | 2.0E+00 | mg/kg-day $^{-1}$ | 9.6E-07 |
| | alpha-BHC | 0.000296 | mg/kg | 0.000296 | mg/kg | M | 4.3E-08 | mg/kg-day | 6.3E+00 | mg/kg-day $^{-1}$ | 2.7E-07 |
| | delta-BHC | 0.000224 | mg/kg | 0.000224 | mg/kg | M | 3.3E-08 | mg/kg-day | 1.8E+00 | mg/kg-day $^{-1}$ | 5.9E-08 |
| | (Total) | | | | | | | | | | 2.7E-04 |
| | | | | | | | | | | Total Risk Across All Exposure Routes/Pathways | 2.7E-04 |

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

# Appendix A.9

## RAGS Part D Table 9’s
## Summary of Receptor Risks and Hazards for COPCs
## Reasonable Maximum Exposure

TABLE 9.1.RME

RME SUMMARY OF SITE CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | -- | -- | 0.0000004 | 0.0000004 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | -- | -- | 4.7E-10 | 5E-10 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | -- | -- | 3.3E-10 | 3E-10 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aldrin | -- | -- | 6.7E-10 | 7E-10 | Aldrin | liver | -- | -- | 0.0000131 | 0.0000131 |
| | | | Heptachlor | -- | -- | 3.4E-10 | 3E-10 | Heptachlor | liver | -- | -- | 0.0000015 | 0.0000015 |
| | | | Heptachlor epoxide | -- | -- | 2.4E-09 | 2E-09 | Heptachlor epoxide | liver | -- | -- | 0.000203 | 0.000203 |
| | | | (Total) | -- | -- | 4E-09 | 4E-09 | (Total) | | -- | -- | 0.00022 | 0.00022 |
| Animal Tissue | Animal Tissue | Fish from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | 0.11 | -- | -- | 0.11 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.03 | -- | -- | 0.03 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | 1.3E-07 | -- | -- | 1E-07 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 1.6E-07 | -- | -- | 2E-07 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aroclor 5432 | 3.2E-05 | -- | -- | 3E-05 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1248 | 1.7E-06 | -- | -- | 2E-06 | PCB-1248 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 8.3E-06 | -- | -- | 8E-06 | PCB-1254 | Immune system/eye/nails | 2 | -- | -- | 2 |
| | | | PCB-1260 | 2.2E-06 | -- | -- | 2E-06 | PCB-1260 | -- | -- | -- | -- | -- |
| | | | (Total) | 4E-05 | -- | -- | 4E-05 | (Total) | | 2.2 | -- | -- | 2.2 |
| | | Crabs from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev. NS | 0.003 | -- | -- | 0.003 |
| | | | Barium | -- | -- | -- | -- | Barium | kidney | 0.001 | -- | -- | 0.001 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.04 | -- | -- | 0.04 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.009 | -- | -- | 0.009 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Manganese (food) | -- | -- | -- | -- | Manganese (food) | CNS | 0.002 | -- | -- | 0.002 |
| | | | Nickel | -- | -- | -- | -- | Nickel | heart/liver | 0.00 | -- | -- | 0.00 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.03 | -- | -- | 0.03 |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.03 | -- | -- | 0.03 |

TABLE 9.1.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Manganese (food) | -- | -- | -- | -- | Manganese (food) | CNS | 0.002 | -- | -- | 0.002 |
| | | | Nickel | -- | -- | -- | -- | Nickel | heart/liver | 0.005 | -- | -- | 0.005 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.03 | -- | -- | 0.03 |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.03 | -- | -- | 0.03 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.03 | -- | -- | 0.03 |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | 1E-08 | -- | -- | 1E-08 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 6E-08 | -- | -- | 6E-08 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Heptachlor | 6E-09 | -- | -- | 6E-09 | Heptachlor | liver | 0.00003 | -- | -- | 0.00003 |
| | | | Heptachlor epoxide | 1E-07 | -- | -- | 1E-07 | Heptachlor epoxide | liver | 0.01 | -- | -- | 0.01 |
| | | | PCB-1254 | 7E-07 | -- | -- | 7E-07 | PCB-1254 | Immune system/eye/nails | 0.2 | -- | -- | 0.2 |
| | | | Phenol | -- | -- | -- | -- | Phenol | fetus | 0.00004 | -- | -- | 0.00004 |
| | | | bis (2-Ethylhexyl) phthalate | 3E-08 | -- | -- | 3E-08 | bis (2-Ethylhexyl) phthalate | liver | 0.001 | -- | -- | 0.001 |
| | | | (Total) | 1E-04 | -- | -- | 1E-04 | (Total) | | 2.5 | -- | -- | 2.5 |

Total Risk Across Surface Water: 4E-09

Total Risk Across Animal Tissue: 2E-04

Total Risk Across All Media and All Exposure Routes: 2E-04

Total Hazard Index Across Surface Water: 0.00022

Total Hazard Index Across Animal Tissue: 6

Total Hazard Index Across All Media and All Exposure Routes: 6

| | |
|---|---|
| Total blood HI = | 0.04 |
| Total CNS HI = | 0.063 |
| Total Dev. NS HI = | 0.116 |
| Total eye HI = | 2 |
| Total fetus HI = | 0.00004 |
| Total GI tract HI = | 0.05 |
| Total hair HI = | 0.06 |
| Total heart HI = | 0.005 |
| Total Immune system HI = | 2 |
| Total kidney HI = | 0.001 |
| Total liver HI = | 0.09 |
| Total nails HI = | 2 |
| Total skin HI = | 3.4 |
| Total vascular HI = | 3.3 |

TABLE 9.2.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | -- | -- | 5.0E-10 | 5E-10 | Arsenic | skin/vascular | -- | -- | 0.000003 | 0.000003 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | -- | -- | 0.0000002 | 0.0000002 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | -- | -- | 1.1E-09 | 1E-09 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | -- | -- | 7.9E-10 | 8E-10 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aldrin | -- | -- | 1.6E-09 | 2E-09 | Aldrin | liver | -- | -- | 0.000007 | 0.000007 |
| | | | Heptachlor | -- | -- | 8.2E-10 | 8E-10 | Heptachlor | liver | -- | -- | 0.000001 | 0.000001 |
| | | | Heptachlor epoxide | -- | -- | 5.7E-09 | 6E-09 | Heptachlor epoxide | liver | -- | -- | 0.0001 | 0.0001 |
| | | | (Total) | -- | -- | 1E-08 | 1E-08 | (Total) | | -- | -- | 0.0001 | 0.0001 |
| Animal Tissue | Animal Tissue | Fish from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | 2.1E-04 | -- | -- | 2E-04 | Arsenic | skin/vascular | 1 | -- | -- | 1 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | 0.1 | -- | -- | 0.1 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.03 | -- | -- | 0.03 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | 5.0E-07 | -- | -- | 5E-07 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 6.3E-07 | -- | -- | 6E-07 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aroclor 5432 | 1.3E-04 | -- | -- | 1E-04 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1248 | 6.5E-08 | -- | -- | 7E-08 | PCB-1248 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 3.2E-05 | -- | -- | 3E-05 | PCB-1254 | Immune system/eye/nails | 2 | -- | -- | 2 |
| | | | PCB-1260 | 8.4E-06 | -- | -- | 8E-06 | PCB-1260 | -- | -- | -- | -- | -- |
| | | | (Total) | 4E-04 | -- | -- | 4E-04 | (Total) | | 3.1 | -- | -- | 3.1 |
| | | Crabs from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev. NS | 0.002 | -- | -- | 0.002 |
| | | | Arsenic | 4E-04 | -- | -- | 4E-04 | Arsenic | skin/vascular | 2 | -- | -- | 2 |
| | | | Barium | -- | -- | -- | -- | Barium | kidney | 0.001 | -- | -- | 0.001 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.037 | -- | -- | 0.04 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.008 | -- | -- | 0.008 |

TABLE 9.2 RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Manganese (food) | -- | -- | -- | -- | Manganese (food) | CNS | 0.002 | -- | -- | 0.002 |
| | | | Nickel | -- | -- | -- | -- | Nickel | heart/liver | 0.004 | -- | -- | 0.004 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.023 | -- | -- | 0.02 |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.025 | -- | -- | 0.03 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.024 | -- | -- | 0.02 |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | 5E-08 | -- | -- | 5E-08 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 2E-07 | -- | -- | 2E-07 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Heptachlor | 2E-08 | -- | -- | 2E-08 | Heptachlor | liver | 0.00003 | -- | -- | 0.00003 |
| | | | Heptachlor epoxide | 5E-07 | -- | -- | 5E-07 | Heptachlor epoxide | liver | 0.010 | -- | -- | 0.01 |
| | | | PCB-1254 | 3E-06 | -- | -- | 3E-06 | PCB-1254 | Immune system/eye/nails | 0.168 | -- | -- | 0.2 |
| | | | Phenol | -- | -- | -- | -- | Phenol | fetus | 0.00004 | -- | -- | 0.00004 |
| | | | bis (2-Ethylhexyl) phthalate | 1E-07 | -- | -- | 1E-07 | bis (2-Ethylhexyl) phthalate | liver | 0.0009 | -- | -- | 0.0009 |
| | | | (Total) | 4E-04 | -- | -- | 4E-04 | (Total) | | 2.2 | -- | -- | 2.2 |

Total Risk Across Surface Water: 1E-08

Total Risk Across Animal Tissue: 8E-04

Total Risk Across All Media and All Exposure Routes: 8E-04

Total Hazard Index Across Surface Water: 0.000124

Total Hazard Index Across Animal Tissue: 5

Total Hazard Index Across All Media and All Exposure Routes: 5

| | |
|---|---|
| Total blood HI = | 0.03 |
| Total CNS HI = | 0.056 |
| Total Dev. NS HI = | 0.105 |
| Total eye HI = | 2 |
| Total fetus HI = | 0.00004 |
| Total GI tract HI = | 0.04 |
| Total hair HI = | 0.054 |
| Total heart HI = | 0.004 |
| Total immune system HI = | 2 |
| Total kidney HI = | 0.001 |
| Total liver HI = | 0.08 |
| Total nails HI = | 2 |
| Total skin HI = | 3 |
| Total vascular HI = | 3 |

TABLE 9.3.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: OTHER RECREATIONAL PERSON [ADOLESCENTS (TEENS)]

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Other Recreational Person'
Receptor Age: Adolescents (teens)

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Arsenic | 5.9E-08 | -- | 1.9E-08 | 8E-08 | Arsenic | skin/vascular | 0.0015 | -- | 0.0005 | 0.002 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | 0.00013 | -- | 0.000046 | 0.0002 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | 2.2E-11 | -- | 1.1E-08 | 1E-08 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 1.9E-11 | -- | 7.7E-09 | 8E-09 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aldrin | 5.2E-09 | -- | 1.6E-08 | 2E-08 | Aldrin | liver | 0.00012 | -- | 0.00036 | 0.0005 |
| | | | Heptachlor | 3.6E-10 | -- | 8.0E-09 | 8E-09 | Heptachlor | liver | 0.0000019 | -- | 0.00004 | 0.0000 |
| | | | Heptachlor epoxide | 4.6E-10 | -- | 5.6E-08 | 6E-08 | Heptachlor epoxide | liver | 0.00005 | -- | 0.006 | 0.006 |
| | | | (Total) | 6E-08 | -- | 1E-07 | 2E-07 | (Total) | | 0.002 | -- | 0.006 | 0.008 |
| | | | | | | Total Risk Across Surface Water | 2E-07 | | | | | Total Hazard Index Across Surface Water | 0.008 |
| | | | | | | Total Risk Across All Media and All Exposure Routes | 2E-07 | | | | | Total Hazard Index Across All Media and All Exposure Routes | 0.008 |

| | |
|---|---|
| Total Dev. NS HI = | 0.0002 |
| Total liver HI = | 0.006 |
| Total skin HI = | 0.002 |
| Total vascular HI = | 0.002 |

(1) Jet Skier

TABLE 9.4.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: OTHER WORKER (ADULT)

SS-63, Langley Air Force Base

| | |
|---|---|
| Scenario Timeframe: | Current/Future |
| Receptor Population: | Other Worker¹ |
| Receptor Age: | Adult |

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Arsenic | 5.0E-08 | – | 2.1E-08 | 7E-08 | Arsenic | skin/vascular | 0.0003 | – | 0.0001 | 0.0004 |
| | | | Magnesium | -- | – | – | -- | Magnesium | -- | – | -- | – | – |
| | | | Methylmercury | -- | -- | – | -- | Methylmercury | Dev. NS | 0.000027 | -- | 0.000012 | 0.00004 |
| | | | Sodium | -- | – | -- | -- | Sodium | – | – | – | -- | – |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | 1.9E-11 | -- | 1.2E-08 | 1E-08 | 4,4'-DDD | – | – | -- | -- | – |
| | | | 4,4'-DDE | 1.6E-11 | – | 8.3E-09 | 8E-09 | 4,4'-DDE | – | -- | – | – | -- |
| | | | Aldrin | 4.4E-09 | -- | 1.7E-08 | 2E-08 | Aldrin | liver | 0.00002 | -- | 0.00009 | 0.0001 |
| | | | Heptachlor | 3.1E-10 | -- | 8.6E-09 | 9E-09 | Heptachlor | liver | 0.0000004 | -- | 0.00001 | 0.0000 |
| | | | Heptachlor epoxide | 3.9E-10 | – | 6.0E-08 | 6E-08 | Heptachlor epoxide | liver | 0.000009 | – | 0.0014 | 0.001 |
| | | | (Total) | 5E-08 | -- | 1E-07 | 2E-07 | (Total) | | 0.0004 | -- | 0.0017 | 0.002 |

Total Risk Across Surface Water: 2E-07

Total Hazard Index Across Surface Water: 0.002

Total Risk Across All Media and All Exposure Routes: 2E-07

Total Hazard Index Across All Media and All Exposure Routes: 0.002

(1) Sea Rescue Trainer

| | |
|---|---|
| *Total Dev. NS HI* = | 0.00004 |
| Total liver HI = | 0.002 |
| Total skin HI = | 0.0004 |
| Total vascular HI = | 0.0004 |

TABLE 9.1.CT

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Arsenic | -- | -- | 3.0E-11 | 3E-11 | Arsenic | skin/vascular | -- | -- | 0.000002 | 0.000002 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | -- | -- | 0.00000018 | 0.00000018 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | -- | -- | 4.0E-11 | 4E-11 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | -- | -- | 3.3E-11 | 3E-11 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aldrin | -- | -- | 9.4E-11 | 9E-11 | Aldrin | liver | -- | -- | 0.0000061 | 0.0000061 |
| | | | Heptachlor | -- | -- | 4.0E-11 | 4E-11 | Heptachlor | liver | -- | -- | 0.0000006 | 0.0000006 |
| | | | Heptachlor epoxide | -- | -- | 3.0E-10 | 3E-10 | Heptachlor epoxide | liver | -- | -- | 0.000086 | 0.000086 |
| | | | (Total) | -- | -- | 5E-10 | 5E-10 | (Total) | | -- | -- | 0.000095 | 0.000095 |
| Animal Tissue | Animal Tissue | Fish from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Arsenic | 3.2E-06 | -- | -- | 3E-06 | Arsenic | skin/vascular | 0.23 | -- | -- | 0.2 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | 0.024 | -- | -- | 0.024 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.008 | -- | -- | 0.008 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | 3.7E-09 | -- | -- | 4E-09 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 8.5E-09 | -- | -- | 9E-09 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aroclor 5432 | 6.0E-07 | -- | -- | 6E-07 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1248 | 6.1E-08 | -- | -- | 6E-08 | PCB-1248 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 2.7E-07 | -- | -- | 3E-07 | PCB-1254 | Immune system/eye/nails | 0.2 | -- | -- | 0.2 |
| | | | PCB-1260 | 1.1E-07 | -- | -- | 1E-07 | PCB-1260 | -- | -- | -- | -- | -- |
| | | | (Total) | 4E-06 | -- | -- | 4E-06 | (Total) | | 0.5 | -- | -- | 0.5 |
| | | Crabs from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev. NS | 0.0004 | -- | -- | 0.0004 |
| | | | Arsenic | 6E-06 | -- | -- | 6E-06 | Arsenic | skin/vascular | 0.45 | -- | -- | 0.4 |
| | | | Barium | -- | -- | -- | -- | Barium | kidney | 0.0003 | -- | -- | 0.0003 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.009 | -- | -- | 0.009 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.002 | -- | -- | 0.002 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Manganese (food) | -- | -- | -- | -- | Manganese (food) | CNS | 0.0004 | -- | -- | 0.0004 |
| | | | Nickel | -- | -- | -- | -- | Nickel | heart/liver | 0.001 | -- | -- | 0.001 |

TABLE 9.1.CT

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.006 | -- | -- | 0.006 |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.005 | -- | -- | 0.005 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.006 | -- | -- | 0.006 |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | 3E-10 | -- | -- | 3E-10 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 2E-09 | -- | -- | 2E-09 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Heptachlor | 3E-10 | -- | -- | 3E-10 | Heptachlor | liver | 0.000005 | -- | -- | 0.000005 |
| | | | Heptachlor epoxide | 8E-09 | -- | -- | 8E-09 | Heptachlor epoxide | liver | 0.002 | -- | -- | 0.002 |
| | | | PCB-1254 | 2E-08 | -- | -- | 2E-08 | PCB-1254 | immune system/eye/nails | 0.02 | -- | -- | 0.02 |
| | | | Phenol | -- | -- | -- | -- | Phenol | fetus | 0.000006 | -- | -- | 0.000006 |
| | | | bis (2-Ethylhexyl) phthalate | 1E-09 | -- | -- | 1E-09 | bis (2-Ethylhexyl) phthalate | liver | 0.0001 | -- | -- | 0.0001 |
| | | | (Total) | 6E-06 | -- | -- | 6E-06 | (Total) | | 0.5 | -- | -- | 0.5 |

| | |
|---|---|
| Total Risk Across Surface Water | 5E-10 |
| Total Risk Across Animal Tissue | 1E-05 |
| Total Risk Across All Media and All Exposure Routes | 1E-05 |

| | |
|---|---|
| Total Hazard Index Across Surface Water | 0.000095 |
| Total Hazard Index Across Animal Tissue | 0.98 |
| Total Hazard Index Across All Media and All Exposure Routes | 0.98 |

| | |
|---|---|
| Total blood HI = | 0.008 |
| Total CNS HI = | 0.0140 |
| Total Dev. NS HI = | 0.0245 |
| Total eye HI = | 0.2 |
| Total fetus HI = | 0.000006 |
| Total GI tract HI = | 0.01 |
| Total hair HI = | 0.014 |
| Total heart HI = | 0.001 |
| Total Immune system HI = | 0.2 |
| Total kidney HI = | 0.0003 |
| Total liver HI = | 0.019 |
| Total nails HI = | 0.25 |
| Total skin HI = | 0.7 |
| Total vascular HI = | 0.7 |

TABLE 9.2 CT

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | -- | -- | 7.3E-11 | 7E-11 | Arsenic | skin/vascular | -- | -- | 0.000001 | 0.000001 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | -- | -- | 0.00000010 | 0.00000010 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | -- | -- | 9.7E-11 | 1E-10 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | -- | -- | 7.9E-11 | 8E-11 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aldrin | -- | -- | 2.2E-10 | 2E-10 | Aldrin | liver | -- | -- | 0.0000034 | 0.0000034 |
| | | | Heptachlor | -- | -- | 9.5E-11 | 1E-10 | Heptachlor | liver | -- | -- | 0.0000003 | 0.0000003 |
| | | | Heptachlor epoxide | -- | -- | 7.3E-10 | 7E-10 | Heptachlor epoxide | liver | -- | -- | 0.000046 | 0.000046 |
| | | | (Total) | -- | -- | 1E-09 | 1E-09 | (Total) | | -- | -- | 0.000053 | 0.000053 |
| Animal Tissue | Animal Tissue | Fish from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | 1.0E-05 | -- | -- | 1E-05 | Arsenic | skin/vascular | 0.2 | -- | -- | 0.2 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | 0.019 | -- | -- | 0.019 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.006 | -- | -- | 0.006 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | 1.2E-08 | -- | -- | 1E-08 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 2.8E-08 | -- | -- | 3E-08 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aroclor 5432 | 2.0E-06 | -- | -- | 2E-06 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1248 | 2.0E-07 | -- | -- | 2E-07 | PCB-1248 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 8.9E-07 | -- | -- | 9E-07 | PCB-1254 | Immune system/eye/nails | 0.2 | -- | -- | 0.2 |
| | | | PCB-1260 | 3.5E-07 | -- | -- | 4E-07 | PCB-1260 | -- | -- | -- | -- | -- |
| | | | (Total) | 1E-05 | -- | -- | 1E-05 | (Total) | | 0.4 | -- | -- | 0.4 |
| | | Crabs from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev. NS | 0.0003 | -- | -- | 0.0003 |
| | | | Arsenic | 2E-05 | -- | -- | 2E-05 | Arsenic | skin/vascular | 0.3 | -- | -- | 0.3 |
| | | | Barium | -- | -- | -- | -- | Barium | kidney | 0.0002 | -- | -- | 0.0002 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.007 | -- | -- | 0.007 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.002 | -- | -- | 0.002 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Manganese (food) | -- | -- | -- | -- | Manganese (food) | CNS | 0.0003 | -- | -- | 0.0003 |
| | | | Nickel | -- | -- | -- | -- | Nickel | heart/liver | 0.0008 | -- | -- | 0.0008 |

TABLE 9.2.CT

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.004 | -- | -- | 0.004 |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.004 | -- | -- | 0.004 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.005 | -- | -- | 0.005 |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | 1E-09 | -- | -- | 1E-09 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 7E-09 | -- | -- | 7E-09 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Heptachlor | 1E-09 | -- | -- | 1E-09 | Heptachlor | liver | 0.000003 | -- | -- | 0.000003 |
| | | | Heptachlor epoxide | 3E-08 | -- | -- | 3E-08 | Heptachlor epoxide | liver | 0.002 | -- | -- | 0.002 |
| | | | PCB-1254 | 7E-08 | -- | -- | 7E-08 | PCB-1254 | Immune system/eye/nails | 0.013 | -- | -- | 0.01 |
| | | | Phenol | -- | -- | -- | -- | Phenol | fetus | 0.000005 | -- | -- | 0.000005 |
| | | | bis (2-Ethylhexyl) phthalate | 4E-09 | -- | -- | 4E-09 | bis (2-Ethylhexyl) phthalate | liver | 0.0001 | -- | -- | 0.0001 |
| | | | (Total) | 2E-05 | -- | -- | 2E-05 | (Total) | | 0.4 | -- | -- | 0.4 |

Total Risk Across Surface Water: 1E-09

Total Risk Across Animal Tissue: 3E-05

Total Risk Across All Media and All Exposure Routes: 3E-05

Total Hazard Index Across Surface Water: 0.000053

Total Hazard Index Across Animal Tissue: 0.8

Total Hazard Index Across All Media and All Exposure Routes: 0.8

| | |
|---|---|
| Total blood HI = | 0.006 |
| Total CNS HI = | 0.0108 |
| Total Dev NS HI = | 0.0189 |
| Total eye HI = | 0.2 |
| Total fetus HI = | 0.000005 |
| Total GI tract HI = | 0.008 |
| Total hair HI = | 0.01 |
| Total heart HI = | 0.0008 |
| Total Immune system HI = | 0.2 |
| Total kidney HI = | 0.0002 |
| Total liver HI = | 0.015 |
| Total nails HI = | 0.20 |
| Total skin HI = | 0.5 |
| Total vascular HI = | 0.5 |

TABLE 9.1.RME

RME SUMMARY OF SITE CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | -- | -- | 0.0000004 | 0.0000004 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | -- | -- | 4.7E-10 | 5E-10 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | -- | -- | 3.3E-10 | 3E-10 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aldrin | -- | -- | 6.7E-10 | 7E-10 | Aldrin | liver | -- | -- | 0.0000131 | 0.0000131 |
| | | | Heptachlor | -- | -- | 3.4E-10 | 3E-10 | Heptachlor | liver | -- | -- | 0.0000015 | 0.0000015 |
| | | | Heptachlor epoxide | -- | -- | 2.4E-09 | 2E-09 | Heptachlor epoxide | liver | -- | -- | 0.000203 | 0.000203 |
| | | | (Total) | -- | -- | 4E-09 | 4E-09 | (Total) | | -- | -- | 0.00022 | 0.00022 |
| Animal Tissue | Animal Tissue | Fish from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | 0.11 | -- | -- | 0.11 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.03 | -- | -- | 0.03 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | 1.3E-07 | -- | -- | 1E-07 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 1.6E-07 | -- | -- | 2E-07 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aroclor 5432 | 3.2E-05 | -- | -- | 3E-05 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1248 | 1.7E-06 | -- | -- | 2E-06 | PCB-1248 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 8.3E-06 | -- | -- | 8E-06 | PCB-1254 | Immune system/eye/nails | 2 | -- | -- | 2 |
| | | | PCB-1260 | 2.2E-06 | -- | -- | 2E-06 | PCB-1260 | -- | -- | -- | -- | -- |
| | | | (Total) | 4E-05 | -- | -- | 4E-05 | (Total) | | 2.2 | -- | -- | 2.2 |
| | | Crabs from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev NS | 0.003 | -- | -- | 0.003 |
| | | | Barium | -- | -- | -- | -- | Barium | kidney | 0.001 | -- | -- | 0.001 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.04 | -- | -- | 0.04 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.009 | -- | -- | 0.009 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Manganese (food) | -- | -- | -- | -- | Manganese (food) | CNS | 0.002 | -- | -- | 0.002 |
| | | | Nickel | -- | -- | -- | -- | Nickel | heart/liver | 0.00 | -- | -- | 0.00 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.03 | -- | -- | 0.03 |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.03 | -- | -- | 0.03 |

TABLE 9.1.RME

RME SUMMARY OF SITE CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.03 | -- | -- | 0.03 |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | 1E-08 | -- | -- | 1E-08 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 6E-08 | -- | -- | 6E-08 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Heptachlor | 6E-09 | -- | -- | 6E-09 | Heptachlor | liver | 0.00003 | -- | -- | 0.00003 |
| | | | Heptachlor epoxide | 1E-07 | -- | -- | 1E-07 | Heptachlor epoxide | liver | 0.01 | -- | -- | 0.01 |
| | | | PCB-1254 | 7E-07 | -- | -- | 7E-07 | PCB-1254 | immune system/eye/nails | 0.2 | -- | -- | 0.2 |
| | | | Phenol | -- | -- | -- | -- | Phenol | fetus | 0.00004 | -- | -- | 0.00004 |
| | | | bis (2-Ethylhexyl) phthalate | 3E-08 | -- | -- | 3E-08 | bis (2-Ethylhexyl) phthalate | liver | 0.001 | -- | -- | 0.001 |
| | | | (Total) | 1E-06 | -- | -- | 1E-06 | (Total) | | 0.3 | -- | -- | 0.3 |

Total Risk Across Surface Water: 4E-09

Total Risk Across Animal Tissue: 5E-05

Total Risk Across All Media and All Exposure Routes: 5E-05

Total Hazard Index Across Surface Water: 0.00022

Total Hazard Index Across Animal Tissue: 2.6

Total Hazard Index Across All Media and All Exposure Routes: 2.6

| | |
|---|---|
| Total blood HI = | 0.04 |
| Total CNS HI = | 0.063 |
| Total Dev. NS HI = | 0.116 |
| Total eye HI = | 2.3 |
| Total fetus HI = | 0.00004 |
| Total GI tract HI = | 0.05 |
| Total hair HI = | 0.06 |
| Total heart HI = | 0.005 |
| Total immune system HI = | 2.3 |
| Total kidney HI = | 0.001 |
| Total liver HI = | 0.09 |
| Total nails HI = | 2.3 |
| Total skin HI = | 0 |
| Total vascular HI = | 0 |

Estimated risk from ingestion of fish and crabs does not include the contribution of arsenic in tissue. Based on statistical analysis of sediment data, it was determined that arsenic in fish and crab tissue is not related to site activities (see Section 4).

3/18/2003

TABLE 9.2.RME

RME SUMMARY OF SITE CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | -- | -- | 0.00000024 | 0.00000024 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | -- | -- | 1.1E-09 | 1E-09 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | -- | -- | 7.9E-10 | 8E-10 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aldrin | -- | -- | 1.6E-09 | 2E-09 | Aldrin | liver | -- | -- | 0.0000073 | 0.0000073 |
| | | | Heptachlor | -- | -- | 8.2E-10 | 8E-10 | Heptachlor | liver | -- | -- | 0.0000008 | 0.0000008 |
| | | | Heptachlor epoxide | -- | -- | 5.7E-09 | 6E-09 | Heptachlor epoxide | liver | -- | -- | 0.000113 | 0.000113 |
| | | | (Total) | -- | -- | 1E-08 | 1E-08 | (Total) | | -- | -- | 0.000122 | 0.0001 |
| Animal Tissue | Animal Tissue | Fish from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | 0.10 | -- | -- | 0.10 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.03 | -- | -- | 0.03 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | 5.0E-07 | -- | -- | 5E-07 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 6.3E-07 | -- | -- | 6E-07 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aroclor 5432 | 1.3E-04 | -- | -- | 1E-04 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1248 | 6.5E-06 | -- | -- | 7E-06 | PCB-1248 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 3.2E-05 | -- | -- | 3E-05 | PCB-1254 | Immune system/eye/nails | 2 | -- | -- | 2 |
| | | | PCB-1260 | 8.4E-06 | -- | -- | 8E-06 | PCB-1260 | -- | -- | -- | -- | -- |
| | | | (Total) | 2E-04 | -- | -- | 2E-04 | (Total) | | 2.0 | -- | -- | 2.0 |
| | | Crabs from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev. NS | 0.002 | -- | -- | 0.002 |
| | | | Barium | -- | -- | -- | -- | Barium | kidney | 0.001 | -- | -- | 0.001 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.037 | -- | -- | 0.04 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.008 | -- | -- | 0.008 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Manganese (food) | -- | -- | -- | -- | Manganese (food) | CNS | 0.002 | -- | -- | 0.002 |
| | | | Nickel | -- | -- | -- | -- | Nickel | heart/liver | 0.004 | -- | -- | 0.004 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.023 | -- | -- | 0.02 |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.025 | -- | -- | 0.03 |

TABLE 9.2.RME

RME SUMMARY OF SITE CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.024 | -- | -- | 0.02 |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | 5E-08 | -- | -- | 5E-08 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 2E-07 | -- | -- | 2E-07 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Heptachlor | 2E-08 | -- | -- | 2E-08 | Heptachlor | liver | 0.00003 | -- | -- | 0.00003 |
| | | | Heptachlor epoxide | 5E-07 | -- | -- | 5E-07 | Heptachlor epoxide | liver | 0.010 | -- | -- | 0.01 |
| | | | PCB-1254 | 3E-06 | -- | -- | 3E-06 | PCB-1254 | immune system/eye/nails | 0.168 | -- | -- | 0.2 |
| | | | Phenol | -- | -- | -- | -- | Phenol | fetus | 0.00004 | -- | -- | 0.00004 |
| | | | bis (2-Ethylhexyl) phthalate | 1E-07 | -- | -- | 1E-07 | bis (2-Ethylhexyl) phthalate | liver | 0.0009 | -- | -- | 0.0009 |
| | | | (Total) | 4E-06 | -- | -- | 4E-06 | (Total) | | 0.3 | -- | -- | 0.31 |

| | |
|---|---|
| Total Risk Across Surface Water | 1E-08 |
| Total Risk Across Animal Tissue | 2E-04 |
| Total Risk Across All Media and All Exposure Routes | 2E-04 |

| | |
|---|---|
| Total Hazard Index Across Surface Water | 0.000122 |
| Total Hazard Index Across Animal Tissue | 2.31 |
| Total Hazard Index Across All Media and All Exposure Routes | 2.31 |

| | |
|---|---|
| Total blood HI = | 0.03 |
| Total CNS HI = | 0.056 |
| Total Dev. NS HI = | 0.105 |
| Total eye HI = | 2.0 |
| Total fetus HI = | 0.00004 |
| Total GI tract HI = | 0.04 |
| Total hair HI = | 0.05 |
| Total heart HI = | 0.004 |
| Total immune system HI = | 2.0 |
| Total kidney HI = | 0.001 |
| Total liver HI = | 0.08 |
| Total nails HI = | 2.1 |
| Total skin HI = | 0.08 |
| Total vascular HI = | 0 |

Estimated risk from ingestion of fish and crabs does not include the contribution of arsenic in tissue. Based on statistical analysis of sediment data, it was determined that arsenic in fish and crab tissue is not related to site activities (see Section 4).

TABLE 9.1.CT

RME SUMMARY OF SITE CANCER RISKS AND NON-CANCER HAZARDS FOR COPC CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | -- | -- | 3.0E-11 | 3E-11 | Arsenic | skin/vascular | -- | -- | 0.000002 | 0.000002 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | -- | -- | 0.00000018 | 0.00000018 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | -- | -- | 4.0E-11 | 4E-11 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | -- | -- | 3.3E-11 | 3E-11 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aldrin | -- | -- | 9.4E-11 | 9E-11 | Aldrin | liver | -- | -- | 0.0000061 | 0.0000061 |
| | | | Heptachlor | -- | -- | 4.0E-11 | 4E-11 | Heptachlor | liver | -- | -- | 0.0000006 | 0.0000006 |
| | | | Heptachlor epoxide | -- | -- | 3.0E-10 | 3E-10 | Heptachlor epoxide | liver | -- | -- | 0.000086 | 0.000086 |
| | | | (Total) | -- | -- | 5E-10 | 5E-10 | (Total) | | -- | -- | 0.000095 | 0.000095 |
| Animal Tissue | Animal Tissue | Fish from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | 0.024 | -- | -- | 0.024 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.008 | -- | -- | 0.008 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | 3.7E-09 | -- | -- | 4E-09 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 8.5E-09 | -- | -- | 9E-09 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aroclor 5432 | 6.0E-07 | -- | -- | 6E-07 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1248 | 6.1E-08 | -- | -- | 6E-08 | PCB-1248 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 2.7E-07 | -- | -- | 3E-07 | PCB-1254 | Immune system/eye/nails | 0.2 | -- | -- | 0.2 |
| | | | PCB-1260 | 1.1E-07 | -- | -- | 1E-07 | PCB-1260 | -- | -- | -- | -- | -- |
| | | | (Total) | 1E-06 | -- | -- | 1E-06 | (Total) | | 0.3 | -- | -- | 0.3 |
| | | Crabs from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev. NS | 0.0004 | -- | -- | 0.0004 |
| | | | Barium | -- | -- | -- | -- | Barium | kidney | 0.0003 | -- | -- | 0.0003 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.009 | -- | -- | 0.009 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.002 | -- | -- | 0.002 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Manganese (food) | -- | -- | -- | -- | Manganese (food) | CNS | 0.0004 | -- | -- | 0.0004 |
| | | | Nickel | -- | -- | -- | -- | Nickel | heart/liver | 0.001 | -- | -- | 0.001 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.006 | -- | -- | 0.006 |

TABLE 9.1.CT

RME SUMMARY OF SITE CANCER RISKS AND NON-CANCER HAZARDS FOR COPC-CHILD FISHER

*SS-63, Langley Air Force Base*

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.005 | -- | -- | 0.005 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.006 | -- | -- | 0.006 |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | 3E-10 | -- | -- | 3E-10 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 2E-09 | -- | -- | 2E-09 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Heptachlor | 3E-10 | -- | -- | 3E-10 | Heptachlor | liver | 0.000005 | -- | -- | 0.000005 |
| | | | Heptachlor epoxide | 8E-09 | -- | -- | 8E-09 | Heptachlor epoxide | liver | 0.002 | -- | -- | 0.002 |
| | | | PCB-1254 | 2E-08 | -- | -- | 2E-08 | PCB-1254 | immune system/eye/nails | 0.02 | -- | -- | 0.02 |
| | | | Phenol | -- | -- | -- | -- | Phenol | fetus | 0.000006 | -- | -- | 0.000006 |
| | | | bis (2-Ethylhexyl) phthalate | 1E-09 | -- | -- | 1E-09 | bis (2-Ethylhexyl) phthalate | liver | 0.0001 | -- | -- | 0.0001 |
| | | | (Total) | 3E-08 | -- | -- | 3E-08 | (Total) | | 0.0 | -- | -- | 0.0 |

| | |
|---|---|
| Total Risk Across Surface Water | 5E-10 |
| Total Risk Across Animal Tissue | 1E-06 |
| Total Risk Across All Media and All Exposure Routes | 1E-06 |

| | |
|---|---|
| Total Hazard Index Across Surface Water | 0.000095 |
| Total Hazard Index Across Animal Tissue | 0.30 |
| Total Hazard Index Across All Media and All Exposure Routes | 0.30 |

| | |
|---|---|
| Total blood HI = | 0.008 |
| Total CNS HI = | 0.0140 |
| Total Dev. NS HI = | 0.0245 |
| Total eye HI = | 0.2 |
| Total fetus HI = | 0.000006 |
| Total GI tract HI = | 0.01 |
| Total hair HI = | 0.014 |
| Total heart HI = | 0.001 |
| Total Immune system HI = | 0.2 |
| Total kidney HI = | 0.0003 |
| Total liver HI = | 0.019 |
| Total nails HI = | 0.25 |
| Total skin HI = | 0.0 |
| Total vascular HI = | 0.0 |

TABLE 9.2.CT

CT SUMMARY OF SITE CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | -- | -- | 7.3E-11 | 7E-11 | Arsenic | skin/vascular | -- | -- | 0.000001 | 0.000001 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | -- | -- | 0.00000010 | 0.00000010 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | -- | -- | 9.7E-11 | 1E-10 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | -- | -- | 7.9E-11 | 8E-11 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aldrin | -- | -- | 2.2E-10 | 2E-10 | Aldrin | liver | -- | -- | 0.0000034 | 0.0000034 |
| | | | Heptachlor | -- | -- | 9.5E-11 | 1E-10 | Heptachlor | liver | -- | -- | 0.0000003 | 0.0000003 |
| | | | Heptachlor epoxide | -- | -- | 7.3E-10 | 7E-10 | Heptachlor epoxide | liver | -- | -- | 0.000048 | 0.000048 |
| | | | (Total) | -- | -- | 1E-09 | 1E-09 | (Total) | | -- | -- | 0.000053 | 0.000053 |
| Animal Tissue | Animal Tissue | Fish from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | 0.019 | -- | -- | 0.019 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.006 | -- | -- | 0.006 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | 1.2E-08 | -- | -- | 1E-08 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 2.8E-08 | -- | -- | 3E-08 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aroclor 5432 | 2.0E-08 | -- | -- | 2E-08 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1248 | 2.0E-07 | -- | -- | 2E-07 | PCB-1248 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 8.9E-07 | -- | -- | 9E-07 | PCB-1254 | Immune system/eye/nails | 0.2 | -- | -- | 0.2 |
| | | | PCB-1260 | 3.5E-07 | -- | -- | 4E-07 | PCB-1260 | -- | -- | -- | -- | -- |
| | | | (Total) | 3E-06 | -- | -- | 3E-06 | (Total) | | 0.2 | -- | -- | 0.2 |
| | | Crabs from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev. NS | 0.0003 | -- | -- | 0.0003 |
| | | | Barium | -- | -- | -- | -- | Barium | kidney | 0.0002 | -- | -- | 0.0002 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.007 | -- | -- | 0.007 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.002 | -- | -- | 0.002 |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Manganese (food) | -- | -- | -- | -- | Manganese (food) | CNS | 0.0003 | -- | -- | 0.0003 |
| | | | Nickel | -- | -- | -- | -- | Nickel | heart/liver | 0.0008 | -- | -- | 0.0008 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.004 | -- | -- | 0.004 |

TABLE 9.2.CT

CT SUMMARY OF SITE CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.004 | -- | -- | 0.004 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.006 | -- | -- | 0.006 |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | 4,4'-DDD | 1E-09 | -- | -- | 1E-09 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 7E-09 | -- | -- | 7E-09 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Heptachlor | 1E-09 | -- | -- | 1E-09 | Heptachlor | liver | 0.000003 | -- | -- | 0.000003 |
| | | | Heptachlor epoxide | 3E-08 | -- | -- | 3E-08 | Heptachlor epoxide | liver | 0.002 | -- | -- | 0.002 |
| | | | PCB-1254 | 7E-08 | -- | -- | 7E-08 | PCB-1254 | immune system/eye/nails | 0.013 | -- | -- | 0.01 |
| | | | Phenol | -- | -- | -- | -- | Phenol | fetus | 0.000005 | -- | -- | 0.000005 |
| | | | bis (2-Ethylhexyl) phthalate | 4E-09 | -- | -- | 4E-09 | bis (2-Ethylhexyl) phthalate | liver | 0.0001 | -- | -- | 0.0001 |
| | | | (Total) | 1E-07 | -- | -- | 1E-07 | (Total) | | 0.0 | -- | -- | 0.0 |

| | |
|---|---|
| Total Risk Across Surface Water | 1E-09 |
| Total Risk Across Animal Tissue | 4E-06 |
| Total Risk Across All Media and All Exposure Routes | 4E-06 |

| | |
|---|---|
| Total Hazard Index Across Surface Water | 0.000053 |
| Total Hazard Index Across Animal Tissue | 0.2 |
| Total Hazard Index Across All Media and All Exposure Routes | 0.2 |

| | |
|---|---|
| Total blood HI = | 0.006 |
| Total CNS HI = | 0.0108 |
| Total Dev. NS HI = | 0.0189 |
| Total eye HI = | 0.2 |
| Total fetus HI = | 0.000005 |
| Total GI tract HI = | 0.006 |
| Total hair HI = | 0.01 |
| Total heart HI = | 0.0008 |
| Total immune system HI = | 0.2 |
| Total kidney HI = | 0.0002 |
| Total liver HI = | 0.015 |
| Total nails HI = | 0.20 |
| Total skin HI = | 0.0 |
| Total vascular HI = | 0.0 |

Estimated risk from ingestion of fish and crabs does not include the contribution of arsenic in tissue. Based on statistical analysis of sediment data, it was determined that arsenic in fish and crab tissue is not related to site activities (see Section 4).

TABLE 9.1.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| *Animal Tissue* | *Animal Tissue* | *Bivalves from Back River* | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev. NS | 0.05 | -- | -- | 0.05 |
| | | | Arsenic | 5.6E-05 | -- | -- | 5.6E-05 | Arsenic | skin/vascular | 1.24 | -- | -- | 1.24 |
| | | | Cadmium | -- | -- | -- | -- | Cadmium | kidney | 0.09 | -- | -- | 0.09 |
| | | | Chromium (Total) | -- | -- | -- | -- | Chromium (Total) | GI tract/fetus/bone marrow/spleen/liver | 0.00 | -- | -- | 0.0017 |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.18 | -- | -- | 0.18 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.24 | -- | -- | 0.24 |
| | | | Manganese | -- | -- | -- | -- | Manganese | CNS | 0.04 | -- | -- | 0.04 |
| | | | Mercury | -- | -- | -- | -- | Mercury | Dev. NS | 0.04 | -- | -- | 0.04 |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.04 | -- | -- | 0.04 |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.09 | -- | -- | 0.09 |
| | | | Vanadium | -- | -- | -- | -- | Vanadium | GI tract/CNS/kidney/bone marrow/liver | 0.02 | -- | -- | 0.02 |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.21 | -- | -- | 0.21 |
| | | | **ORGANICS** | | | | -- | **ORGANICS** | | | | | -- |
| | | | Aldrin | 1.3E-07 | -- | -- | 1.3E-07 | Aldrin | liver | 0.00 | -- | -- | 0.0026 |
| | | | Aroclor 5432 | 4.4E-06 | -- | -- | 4.4E-06 | Aroclor 5432 | N/A | -- | -- | -- | -- |
| | | | Benzo(a)anthracene | 6.2E-07 | -- | -- | 6.2E-07 | Benzo(a)anthracene | N/A | -- | -- | -- | -- |
| | | | Benzo(a)pyrene | 6.7E-06 | -- | -- | 6.7E-06 | Benzo(a)pyrene | N/A | -- | -- | -- | -- |
| | | | Benzo(b)fluoranthene | 7.1E-07 | -- | -- | 7.1E-07 | Benzo(b)fluoranthene | N/A | -- | -- | -- | -- |

TABLE 9.1.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Heptachlor epoxide | 1.1E-07 | -- | -- | 1.1E-07 | Heptachlor epoxide | liver | 0.01 | -- | -- | 0.01 |
| | | | PCB 1254 | 1.7E-06 | -- | -- | 1.7E-06 | PCB 1254 | Immune system/eye/nails | 0.42 | -- | -- | 0.42 |
| | | | PCB 1260 | 2.5E-07 | -- | -- | 2.5E-07 | PCB 1260 | N/A | -- | -- | -- | -- |
| | | | alpha-BHC | 7.1E-08 | -- | -- | 7.1E-08 | alpha-BHC | N/A | -- | -- | -- | -- |
| | | | delta-BHC | 1.5E-08 | -- | -- | 1.5E-08 | delta-BHC | N/A | -- | -- | -- | -- |
| | | | (Total) | 7.0E-05 | -- | -- | 7.0E-05 | (Total) | | 2.7 | -- | -- | 2.7 |

| | |
|---|---|
| Total blood HI = | 0.45 |
| Total CNS HI = | 0.11 |
| Total Dev. NS HI = | 0.093 |
| Total eye HI = | 0.42 |
| Total fetus HI = | 0.0017 |
| Total GI tract HI = | 0.44 |
| Total hair HI = | 0.045 |
| Total Immune system HI = | 0.42 |
| Total kidney HI = | 0.11 |
| Total liver HI = | 0.32 |
| Total nails HI = | 0.47 |
| Total skin HI = | 1.4 |
| Total vascular HI = | 1.2 |
| Total Bone Marrow = | 0.024 |
| Total Spleen HI = | 0.0017 |

TABLE 9.2.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Animal Tissue | Animal Tissue | Bivalves from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev. NS | 0.05 | -- | -- | 0.05 |
| | | | Arsenic | 2.2E-04 | -- | -- | 2.2E-04 | Arsenic | skin/vascular | 1.12 | -- | -- | 1.12 |
| | | | Cadmium | -- | -- | -- | -- | Cadmium | kidney | 0.08 | -- | -- | 0.08 |
| | | | Chromium (Total) | -- | -- | -- | -- | Chromium (Total) | GI tract/fetus/bone marrow/spleen/liver | 0.00 | -- | -- | 0.0016 |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.16 | -- | -- | 0.16 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.21 | -- | -- | 0.21 |
| | | | Manganese | -- | -- | -- | -- | Manganese | CNS | 0.03 | -- | -- | 0.03 |
| | | | Mercury | -- | -- | -- | -- | Mercury | Dev. NS | 0.04 | -- | -- | 0.04 |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.04 | -- | -- | 0.04 |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.08 | -- | -- | 0.08 |
| | | | Vanadium | -- | -- | -- | -- | Vanadium | GI tract/CNS/kidney/bone marrow/liver | 0.02 | -- | -- | 0.02 |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.19 | -- | -- | 0.19 |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | Aldrin | 5.1E-07 | -- | -- | 5.1E-07 | Aldrin | liver | 0.00 | -- | -- | 0.0023 |
| | | | Aroclor 5432 | 1.7E-05 | -- | -- | 1.7E-05 | Aroclor 5432 | N/A | -- | -- | -- | -- |
| | | | Benzo(a)anthracene | 2.4E-06 | -- | -- | 2.4E-06 | Benzo(a)anthracene | N/A | -- | -- | -- | -- |
| | | | Benzo(a)pyrene | 2.6E-05 | -- | -- | 2.6E-05 | Benzo(a)pyrene | N/A | -- | -- | -- | -- |
| | | | Benzo(b)fluoranthene | 2.7E-06 | -- | -- | 2.7E-06 | Benzo(b)fluoranthene | N/A | -- | -- | -- | -- |

TABLE 9.2.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Heptachlor epoxide | 4.2E-07 | -- | -- | 4.2E-07 | Heptachlor epoxide | liver | 0.01 | -- | -- | 0.01 |
| | | | PCB 1254 | 6.5E-06 | -- | -- | 6.5E-06 | PCB 1254 | Immune system/eye/nails | 0.38 | -- | -- | 0.38 |
| | | | PCB 1260 | 9.6E-07 | -- | -- | 9.6E-07 | PCB 1260 | N/A | -- | -- | -- | -- |
| | | | alpha-BHC | 2.7E-07 | -- | -- | 2.7E-07 | alpha-BHC | N/A | -- | -- | -- | -- |
| | | | delta-BHC | 5.9E-08 | -- | -- | 5.9E-08 | delta-BHC | N/A | -- | -- | -- | -- |
| | | | (Total) | 2.7E-04 | -- | -- | 2.7E-04 | (Total) | | 2.4 | -- | -- | 2.4 |

| | |
|---|---|
| Total blood HI = | 0.41 |
| Total CNS HI = | 0.10 |
| Total Dev. NS HI = | 0.084 |
| Total eye HI = | 0.38 |
| Total fetus HI = | 0.0016 |
| Total GI tract HI = | 0.39 |
| Total hair HI = | 0.040 |
| Total immune system HI = | 0.38 |
| Total kidney HI = | 0.10 |
| Total liver HI = | 0.29 |
| Total nails HI = | 0.42 |
| Total skin HI = | 1.2 |
| Total vascular HI = | 1.1 |
| Total Bone Marrow = | 0.022 |
| Total Spleen HI = | 0.0016 |

TABLE 9.1.CT

CT SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Animal Tissue | Animal Tissue | Bivalves from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev. NS | 0.00 | -- | -- | 0.004 |
| | | | Arsenic | 3.3E-06 | -- | -- | 3.3E-06 | Arsenic | skin/vascular | 0.24 | -- | -- | 0.24 |
| | | | Cadmium | -- | -- | -- | -- | Cadmium | kidney | 0.01 | -- | -- | 0.01 |
| | | | Chromium (Total) | -- | -- | -- | -- | Chromium (Total) | GI tract/fetus/bone marrow/spleen/liver | 0.00 | -- | -- | 0.0001 |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.01 | -- | -- | 0.01 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.03 | -- | -- | 0.03 |
| | | | Manganese | -- | -- | -- | -- | Manganese | CNS | 0.00 | -- | -- | 0.005 |
| | | | Mercury | -- | -- | -- | -- | Mercury | Dev. NS | 0.01 | -- | -- | 0.01 |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.01 | -- | -- | 0.01 |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.01 | -- | -- | 0.01 |
| | | | Vanadium | -- | -- | -- | -- | Vanadium | GI tract/CNS/kidney/bone marrow/liver | 0.00 | -- | -- | 0.003 |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.02 | -- | -- | 0.02 |
| | | | **ORGANICS** | | | | -- | **ORGANICS** | | | | | -- |
| | | | Aldrin | 7.5E-09 | -- | -- | 7.5E-09 | Aldrin | liver | 0.00 | -- | -- | 0.0005 |
| | | | Aroclor 5432 | 2.5E-07 | -- | -- | 2.5E-07 | Aroclor 5432 | N/A | -- | -- | -- | -- |
| | | | Benzo(a)anthracene | 3.9E-08 | -- | -- | 3.9E-08 | Benzo(a)anthracene | N/A | -- | -- | -- | -- |
| | | | Benzo(a)pyrene | 4.0E-07 | -- | -- | 4.0E-07 | Benzo(a)pyrene | N/A | -- | -- | -- | -- |
| | | | Benzo(b)fluoranthene | 4.1E-08 | -- | -- | 4.1E-08 | Benzo(b)fluoranthene | N/A | -- | -- | -- | -- |

TABLE 9.1.CT

CT SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Heptachlor epoxide | 5.8E-09 | -- | -- | 5.8E-09 | Heptachlor epoxide | liver | 0.00 | -- | -- | 0.002 |
| | | | PCB 1254 | 9.0E-08 | -- | -- | 9.0E-08 | PCB 1254 | immune system/eye/nails | 0.08 | -- | -- | 0.08 |
| | | | PCB 1260 | 1.4E-08 | -- | -- | 1.4E-08 | PCB 1260 | N/A | -- | -- | -- | -- |
| | | | alpha-BHC | 3.5E-09 | -- | -- | 3.5E-09 | alpha-BHC | N/A | -- | -- | -- | -- |
| | | | delta-BHC | 5.2E-10 | -- | -- | 5.2E-10 | delta-BHC | N/A | -- | -- | -- | -- |
| | | | (Total) | 4.1E-06 | -- | -- | 4.1E-06 | (Total) | | 0.4 | -- | -- | 0.4 |

| | |
|---|---|
| Total blood HI = | 0.05 |
| Total CNS HI = | 0.02 |
| Total Dev. NS HI = | 0.011 |
| Total eye HI = | 0.08 |
| Total fetus HI = | 0.0001 |
| Total GI tract HI = | 0.04 |
| Total hair HI = | 0.009 |
| Total immune system HI = | 0.08 |
| Total kidney HI = | 0.02 |
| Total liver HI = | 0.04 |
| Total nails HI = | 0.08 |
| Total skin HI = | 0.3 |
| Total vascular HI = | 0.2 |
| Total Bone Marrow = | 0.003 |
| Total Spleen HI = | 0.0001 |

TABLE 9.2.CT

CT SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Animal Tissue | Animal Tissue | Bivalves from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Aluminum | -- | -- | -- | -- | Aluminum | Dev. NS | 0.00 | -- | -- | 0.003 |
| | | | Arsenic | 1.1E-05 | -- | -- | 1.1E-05 | Arsenic | skin/vascular | 0.19 | -- | -- | 0.19 |
| | | | Cadmium | -- | -- | -- | -- | Cadmium | kidney | 0.01 | -- | -- | 0.01 |
| | | | Chromium (Total) | -- | -- | -- | -- | Chromium (Total) | GI tract/fetus/bone marrow/spleen/liver | 0.00 | -- | -- | 0.0001 |
| | | | Copper | -- | -- | -- | -- | Copper | GI tract | 0.01 | -- | -- | 0.01 |
| | | | Iron | -- | -- | -- | -- | Iron | blood/liver/GI tract | 0.02 | -- | -- | 0.02 |
| | | | Manganese | -- | -- | -- | -- | Manganese | CNS | 0.00 | -- | -- | 0.004 |
| | | | Mercury | -- | -- | -- | -- | Mercury | Dev. NS | 0.00 | -- | -- | 0.005 |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.01 | -- | -- | 0.01 |
| | | | Silver | -- | -- | -- | -- | Silver | skin | 0.01 | -- | -- | 0.01 |
| | | | Vanadium | -- | -- | -- | -- | Vanadium | GI tract/CNS/kidney/bone marrow/liver | 0.00 | -- | -- | 0.002 |
| | | | Zinc | -- | -- | -- | -- | Zinc | blood | 0.02 | -- | -- | 0.02 |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | Aldrin | 2.5E-08 | -- | -- | 2.5E-08 | Aldrin | liver | 0.00 | -- | -- | 0.0004 |
| | | | Aroclor 5432 | 8.1E-07 | -- | -- | 8.1E-07 | Aroclor 5432 | N/A | -- | -- | -- | -- |
| | | | Benzo(a)anthracene | 1.3E-07 | -- | -- | 1.3E-07 | Benzo(a)anthracene | N/A | -- | -- | -- | -- |
| | | | Benzo(a)pyrene | 1.3E-06 | -- | -- | 1.3E-06 | Benzo(a)pyrene | N/A | -- | -- | -- | -- |
| | | | Benzo(b)fluoranthene | 1.4E-07 | -- | -- | 1.4E-07 | Benzo(b)fluoranthene | N/A | -- | -- | -- | -- |

TABLE 9.2.CT

CT SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| | | | Heptachlor epoxide | 1.9E-08 | -- | -- | 1.9E-08 | Heptachlor epoxide | liver | 0.00 | -- | -- | 0.001 |
| | | | PCB 1254 | 3.0E-07 | -- | -- | 3.0E-07 | PCB 1254 | Immune system/eye/nails | 0.06 | -- | -- | 0.06 |
| | | | PCB 1260 | 4.5E-08 | -- | -- | 4.5E-08 | PCB 1260 | N/A | -- | -- | -- | -- |
| | | | alpha-BHC | 1.1E-08 | -- | -- | 1.1E-08 | alpha-BHC | N/A | -- | -- | -- | -- |
| | | | delta-BHC | 1.7E-09 | -- | -- | 1.7E-09 | delta-BHC | N/A | -- | -- | -- | -- |
| | | | (Total) | 1.4E-05 | -- | -- | 1.4E-05 | (Total) | | 0.3 | -- | -- | 0.3 |

| | |
|---|---|
| Total blood HI = | 0.04 |
| Total CNS HI = | 0.01 |
| Total Dev. NS HI = | 0.008 |
| Total eye HI = | 0.06 |
| Total fetus HI = | 0.0001 |
| Total GI tract HI = | 0.03 |
| Total hair HI = | 0.007 |
| Total immune system HI = | 0.06 |
| Total kidney HI = | 0.01 |
| Total liver HI = | 0.03 |
| Total nails HI = | 0.06 |
| Total skin HI = | 0.2 |
| Total vascular HI = | 0.2 |
| Total Bone Marrow = | 0.003 |
| Total Spleen HI = | 0.0001 |

# Appendix A.10

# RAGS Part D Table 10’s
# Risk Assessment Summary
# Resonable Maximum Exposure

TABLE 10.1.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | (Total) | -- | -- | -- | -- | (Total) | -- | -- | -- | -- | -- |
| Animal Tissue | Animal Tissue | Fish from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | 5.4E-05 | -- | -- | 5E-05 | Arsenic | skin/vascular | 1 | -- | -- | 1 |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | 1.3E-07 | -- | -- | 1E-07 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 1.6E-07 | -- | -- | 2E-07 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aroclor 5432 | 3.2E-05 | -- | -- | 3E-05 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1248 | 1.7E-06 | -- | -- | 2E-06 | PCB-1248 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 8.3E-06 | -- | -- | 8E-06 | PCB-1254 | Immune system/eye/nails | 2 | -- | -- | 2 |
| | | | PCB-1260 | 2.2E-06 | -- | -- | 2E-06 | PCB-1260 | -- | -- | -- | -- | -- |
| | | | (Total) | 1E-04 | -- | -- | 1E-04 | (Total) | | 3.3 | -- | -- | 3.3 |
| | | Crabs from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | 1E-04 | -- | -- | 1E-04 | Arsenic | skin/vascular | 2.1 | -- | -- | 2.1 |
| | | | (Total) | 1E-04 | -- | -- | 1E-04 | (Total) | | 2.1 | -- | -- | 2.1 |

| | |
|---|---|
| Total Risk Across Surface Water | -- |
| Total Risk Across Animal Tissue | 2E-04 |
| Total Risk Across All Media and All Exposure Routes | 2E-04 |

| | |
|---|---|
| Total Hazard Index Across Surface Water | -- |
| Total Hazard Index Across Animal Tissue | 5 |
| Total Hazard Index Across All Media and All Exposure Routes | 5 |

| | |
|---|---|
| Total eye HI = | 2 |
| Total immune system HI = | 2 |
| Total nails HI = | 2 |
| Total skin HI = | 3 |
| Total vascular HI = | 3 |

TABLE 10.2.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | (Total) | -- | -- | -- | -- | (Total) | -- | -- | -- | -- | -- |
| Animal Tissue | Animal Tissue | Fish from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | 2.1E-04 | -- | -- | 2E-04 | Arsenic | skin/vascular | 1 | -- | -- | 1 |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | Aroclor 5432 | 1.3E-04 | -- | -- | 1E-04 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 3.2E-05 | -- | -- | 3E-05 | PCB-1254 | Immune system/eye/nails | 2 | -- | -- | 2 |
| | | | (Total) | 4E-04 | -- | -- | 4E-04 | (Total) | | 3.0 | -- | -- | 3.0 |
| | | Crabs from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | 4E-04 | -- | -- | 4E-04 | Arsenic | skin/vascular | 2 | -- | -- | 2 |
| | | | (Total) | 4E-04 | -- | -- | 4E-04 | (Total) | | 1.9 | -- | -- | 1.9 |

| | |
|---|---|
| Total Risk Across Surface Water | -- |
| Total Risk Across Animal Tissue | 7E-04 |
| Total Risk Across All Media and All Exposure Routes | 7E-04 |

| | |
|---|---|
| Total Hazard Index Across Surface Water | -- |
| Total Hazard Index Across Animal Tissue | 5 |
| Total Hazard Index Across All Media and All Exposure Routes | 5 |

| | |
|---|---|
| Total eye HI = | 2 |
| Total Immune system HI = | 2 |
| Total nails HI = | 2 |
| Total skin HI = | 3 |
| Total vascular HI = | 3 |

TABLE 10.1.CT

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | (Total) | -- | -- | -- | -- | (Total) | -- | -- | -- | -- | -- |
| Animal Tissue | Animal Tissue | Fish from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | 3.2E-06 | -- | -- | 3E-06 | Arsenic | skin/vascular | 0.2 | -- | -- | 0.2 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | 0.024 | -- | -- | 0.024 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.008 | -- | -- | 0.008 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | 3.7E-09 | -- | -- | 4E-09 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 8.5E-09 | -- | -- | 9E-09 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aroclor 5432 | 6.0E-07 | -- | -- | 6E-07 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1248 | 6.1E-08 | -- | -- | 6E-08 | PCB-1248 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 2.7E-07 | -- | -- | 3E-07 | PCB-1254 | Immune system/eye/nails | 0.2 | -- | -- | 0.2 |
| | | | PCB-1260 | 1.1E-07 | -- | -- | 1E-07 | PCB-1260 | -- | -- | -- | -- | -- |
| | | | (Total) | 4E-06 | -- | -- | 4E-06 | (Total) | | 0.5 | -- | -- | 0.5 |
| | | Crabs from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | 6E-06 | -- | -- | 6E-06 | Arsenic | skin/vascular | 0.4 | -- | -- | 0.4 |
| | | | (Total) | 6E-06 | -- | -- | 6E-06 | (Total) | | 0.4 | -- | -- | 0.4 |

Total Risk Across Surface Water: --

Total Risk Across Animal Tissue: 1E-05

Total Risk Across All Media and All Exposure Routes: 1E-05

Total Hazard Index Across Surface Water: --

Total Hazard Index Across Animal Tissue: 0.9

Total Hazard Index Across All Media and All Exposure Routes: 0.9

Total eye HI = 0.2

Total hair HI = 0.008

Total Immune system HI = 0.2

Total nails HI = 0.2

Total skin HI = 0.7

Total vascular HI = 0.7

TABLE 10 2 CT

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Water | Surface Water | Surface Water from Back River | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | (Total) | -- | -- | -- | -- | (Total) | -- | -- | -- | -- | -- |
| Animal Tissue | Animal Tissue | Fish from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | 1.0E-05 | -- | -- | 1E-05 | Arsenic | skin/vascular | 0.2 | -- | -- | 0.2 |
| | | | Calcium | -- | -- | -- | -- | Calcium | -- | -- | -- | -- | -- |
| | | | Magnesium | -- | -- | -- | -- | Magnesium | -- | -- | -- | -- | -- |
| | | | Methylmercury | -- | -- | -- | -- | Methylmercury | Dev. NS | 0.019 | -- | -- | 0.019 |
| | | | Potassium | -- | -- | -- | -- | Potassium | -- | -- | -- | -- | -- |
| | | | Selenium | -- | -- | -- | -- | Selenium | Liver/hair/nails/skin/CNS | 0.006 | -- | -- | 0.006 |
| | | | Sodium | -- | -- | -- | -- | Sodium | -- | -- | -- | -- | -- |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | 4,4'-DDD | 1.2E-08 | -- | -- | 1E-08 | 4,4'-DDD | -- | -- | -- | -- | -- |
| | | | 4,4'-DDE | 2.8E-08 | -- | -- | 3E-08 | 4,4'-DDE | -- | -- | -- | -- | -- |
| | | | Aroclor 5432 | 2.0E-06 | -- | -- | 2E-06 | Aroclor 5432 | -- | -- | -- | -- | -- |
| | | | PCB-1248 | 2.0E-07 | -- | -- | 2E-07 | PCB-1248 | -- | -- | -- | -- | -- |
| | | | PCB-1254 | 8.9E-07 | -- | -- | 9E-07 | PCB-1254 | Immune system/eye/nails | 0.2 | -- | -- | 0.2 |
| | | | PCB-1260 | 3.5E-07 | -- | -- | 4E-07 | PCB-1260 | -- | -- | -- | -- | -- |
| | | | (Total) | 1E-05 | -- | -- | 1E-05 | (Total) | | 0.4 | -- | -- | 0.4 |
| | | Crabs from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | Arsenic | 2E-05 | -- | -- | 2E-05 | Arsenic | skin/vascular | 0.3 | -- | -- | 0.3 |
| | | | (Total) | 2E-05 | -- | -- | 2E-05 | (Total) | | 0.3 | -- | -- | 0.3 |

Total Risk Across Surface Water: --
Total Risk Across Animal Tissue: 3E-05

Total Hazard Index Across Surface Water: --
Total Hazard Index Across Animal Tissue: 0.7

Total Risk Across All Media and All Exposure Routes: 3E-05

Total Hazard Index Across All Media and All Exposure Routes: 0.7

Total eye HI = 0.2
Total hair HI = 0.006
Total Immune system HI = 0.2
Total nails HI = 0.2
Total skin HI = 0.5
Total vascular HI = 0.5

TABLE 10.1.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: CHILD FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Animal Tissue | Animal Tissue | Bivalves from Back River | INORGANICS | | | | | INORGANICS | | | | | |
| | | | | | | | | Arsenic | skin/vascular | 1.2 | -- | -- | 1.2 |
| | | | ORGANICS | | | | | ORGANICS | | | | | |
| | | | (Total) | 0E+00 | -- | -- | 0E+00 | (Total) | | 1.2 | -- | -- | 1.2 |
| | | | Total Risk Across All Exposure Routes/Pathways | | | | 0E+00 | Total Hazard Index Across All Exposure Routes/Pathways | | | | | 1.2 |

| | |
|---|---|
| Total skin HI = | 1.2 |
| Total vascular HI = | 1.2 |

TABLE 10.2.RME

RME SUMMARY OF CANCER RISKS AND NON-CANCER HAZARDS FOR COPCs: ADULT FISHER

SS-63, Langley Air Force Base

Scenario Timeframe: Current/Future
Receptor Population: Fisher
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical | Carcinogenic Risk | | | | Chemical | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | Exposure Routes Total | | Primary Target Organ | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Animal Tissue | Animal Tissue | Bivalves from Back River | **INORGANICS** | | | | | **INORGANICS** | | | | | |
| | | | Arsenic | 2.2E-04 | -- | -- | 2.2E-04 | Arsenic | skin/vascular | 1.1 | -- | -- | 1.1 |
| | | | **ORGANICS** | | | | | **ORGANICS** | | | | | |
| | | | Aroclor 5432 | 1.7E-05 | -- | -- | 1.7E-05 | | | | | | |
| | | | Benzo(a)pyrene | 2.6E-05 | -- | -- | 2.6E-05 | | | | | | |
| | | | (Total) | 2.6E-04 | -- | -- | 2.6E-04 | (Total) | | 1.1 | -- | -- | 1.1 |

Total Risk Across All Exposure Routes/Pathways: 2.6E-04

Total Hazard Index Across All Exposure Routes/Pathways: 1.1

Total skin HI = 1.1
Total vascular HI = 1.1

# Appendix A.11

# Ecological Risk Assessment Data

Table 7.1-1. Summary of SERA Results for Specific Receptors, Site SS-63

| Benthic Invertebrates | | Croaker | | Kingfisher | | Mink | |
|---|---|---|---|---|---|---|---|
| Parameter | SERA Results | Parameter | SERA Results | Parameter | SERA Results | Parameter | SERA Results |
| Inorganic Analytes | | | | | | | |
| **Aluminum** | * | **Aluminum** | * | **Aluminum** | * | **Aluminum** | * |
| **Antimony** | * | **Antimony** | * | **Antimony** | * | **Antimony** | * |
| **Arsenic** | * | **Arsenic** | * | Arsenic | 1 | **Arsenic** | * |
| Barium | 1 | **Barium** | * | Barium | 1 | **Barium** | * |
| **Beryllium** | * | **Beryllium** | * | Calcium | 3 | Beryllium | 1 |
| **Cadmium** | * | **Cadmium** | * | Chromium | 1 | Cadmium | 1 |
| Calcium | 3 | Calcium | 3 | Copper | 1 | Calcium | 3 |
| **Chromium** | * | **Chromium** | * | Iron | 1 | **Chromium** | * |
| **Cobalt** | * | **Cobalt** | * | Lead | 1 | Cobalt | 1 |
| Copper | 1 | **Copper** | * | **Magnesium** | * | Copper | 1 |
| **Cyanide** | * | Cyanide | 1 | Manganese | 1 | Cyanide | 1 |
| Iron | 1 | **Iron** | * | **Mercury** | * | Iron | 1 |
| **Lead** | * | **Lead** | * | Nickel | 1 | **Lead** | * |
| Magnesium | 1 | **Magnesium** | * | Potassium | 3 | **Magnesium** | * |
| Manganese | 1 | **Manganese** | * | Selenium | 1 | Manganese | 1 |
| **Mercury** | * | **Mercury** | * | Silver | 1 | **Mercury** | * |
| **Nickel** | * | **Nickel** | * | Sodium | 3 | Nickel | 1 |
| Potassium | 3 | Potassium | 3 | Vanadium | 1 | Potassium | 3 |
| **Selenium** | * | **Selenium** | * | **Zinc** | * | **Selenium** | * |
| **Silver** | * | **Silver** | * | | | Silver | 1 |
| Sodium | 3 | Sodium | 3 | | | Sodium | 3 |
| Thallium | 1 | **Thallium** | * | | | **Thallium** | * |
| Vanadium | 1 | **Vanadium** | * | | | **Vanadium** | * |
| Zinc | 1 | **Zinc** | * | | | Zinc | 1 |
| | | | | | | | |
| Volatile Organic Compounds | | | | | | | |
| Acetone | 2 | Acetone | 1 | Acetone | 1 | Acetone | 1 |
| 2-Butanone (MEK) | 2 | 2-Butanone (MEK) | 1 | | | 2-Butanone (MEK) | 1 |
| Carbon disulfide | 2 | Carbon disulfide | 1 | | | Carbon disulfide | 1 |
| Methylene chloride | 2 | Methylene chloride | 1 | | | Methylene chloride | 1 |
| Toluene | 2 | Toluene | 1 | | | Toluene | 1 |
| | | | | | | | |
| Semi-volatile Organic Compounds | | | | | | | |
| 2-Methylnaphthalene | 2 | **2-Methylnaphthalene** | * | Bis(2-ethylhexyl)phthalate | 1 | 2-Methylnaphthalene | 1 |
| Acenaphthene | 1 | **Acenaphthene** | * | **Phenol** | * | **Acenaphthene** | * |
| **Acenaphthylene** | * | **Acenaphthylene** | * | | | Acenaphthylene | 1 |
| **Anthracene** | * | **Anthracene** | * | | | **Anthracene** | * |
| **Benz(a)anthracene** | * | **Benz(a)anthracene** | * | | | **Benz(a)anthracene** | * |
| **Benzo(a)pyrene** | * | **Benzo(a)pyrene** | * | | | **Benzo(a)pyrene** | * |
| **Benzo(b)fluoranthene** | * | **Benzo(b)fluoranthene** | * | | | **Benzo(b)fluoranthene** | * |
| **Benzo(g,h,i)perylene** | * | **Benzo(g,h,i)perylene** | * | | | **Benzo(g,h,i)perylene** | * |
| **Benzo(k)fluoranthene** | * | **Benzo(k)fluoranthene** | * | | | **Benzo(k)fluoranthene** | * |
| Butylbenzylphthalate | 2 | Butylbenzylphthalate | 1 | | | Butylbenzylphthalate | 1 |
| **Bis(2-ethylhexyl)phthalate** | * | Bis(2-ethylhexyl)phthalate | 1 | | | Bis(2-ethylhexyl)phthalate | 1 |
| Carbazole | 2 | **Carbazole** | * | | | Carbazole | 1 |
| **Chrysene** | * | **Chrysene** | * | | | **Chrysene** | * |
| **Dibenz(a,h)anthracene** | * | **Dibenz(a,h)anthracene** | * | | | Dibenz(a,h)anthracene | 1 |

**Table 7.1-1. Summary of SERA Results for Specific Receptors, Site SS-63**

| Benthic Invertebrates | | Croaker | | Kingfisher | | Mink | |
|---|---|---|---|---|---|---|---|
| Parameter | SERA Results | Parameter | SERA Results | Parameter | SERA Results | Parameter | SERA Results |
| Dibenzofuran | 2 | Dibenzofuran | * | | | Dibenzofuran | * |
| Fluoranthene | * | Fluoranthene | * | | | Fluoranthene | 1 |
| Fluorene | * | Fluorene | * | | | Fluorene | 1 |
| Indeno(1,2,3-cd)pyrene | * | Indeno(1,2,3-cd)pyrene | * | | | Indeno(1,2,3-cd)pyrene | 1 |
| Naphthalene | 2 | Naphthalene | * | | | Naphthalene | 1 |
| Phenanthrene | * | Phenanthrene | * | | | Phenanthrene | * |
| Pyrene | * | Pyrene | * | | | Pyrene | 1 |
| | | 2,6-Dinitrotoluene | 2 | | | Phenol | 1 |
| | | 2-Methylphenol | * | | | | |
| | | | | | | | |
| Pesticides & PCBs | | | | | | | |
| Aldrin | * | Aldrin | 1 | Aldrin | 1 | Aldrin | 1 |
| Arochlor 5432 | * | Arochlor 5432 | * | Dieldrin | 1 | Arochlor 5432 | 1 |
| Arochlor 6040 | * | Arochlor 6040 | * | alpha-BHC | 1 | Arochlor 6040 | 1 |
| Arochlor 6062 | * | Arochlor 6062 | * | beta-BHC | 1 | Arochlor 6062 | 1 |
| Arochlor 6070 | * | Arochlor 6070 | * | gamma-BHC(Lindane) | 1 | Arochlor 6070 | 1 |
| Dieldrin | 1 | Dicamba | 1 | alpha-Chlordane | 1 | Dieldrin | 1 |
| alpha-BHC | 1 | Dieldrin | 1 | gamma-Chlordane | 1 | alpha-BHC | 1 |
| beta-BHC | 1 | alpha-BHC | * | Endosulfan I | 1 | beta-BHC | 1 |
| gamma-BHC(Lindane) | 1 | beta-BHC | * | Endosulfan II | 1 | gamma-BHC(Lindane) | 1 |
| alpha-Chlordane | 1 | gamma-BHC(Lindane) | * | Endosulfan Sulfate | 1 | alpha-Chlordane | 1 |
| gamma-Chlordane | * | alpha-Chlordane | * | Endrin | 1 | gamma-Chlordane | 1 |
| Endosulfan I | * | gamma-Chlordane | * | Endrin Ketone | 1 | delta - BHC | 1 |
| Endosulfan II | * | delta - BHC | * | 4,4'-DDD | 1 | Endosulfan I | 1 |
| Endosulfan Sulfate | * | Endosulfan I | 1 | 4,4'-DDE | 1 | Endosulfan II | 1 |
| Endrin | * | Endosulfan II | 1 | Heptachlor | 1 | Endosulfan Sulfate | 1 |
| Endrin Ketone | * | Endosulfan Sulfate | 1 | Heptachlor epoxide | 1 | Endrin | 1 |
| Endrin Aldehyde | * | Endrin | * | PCB-1248 | 1 | Endrin Ketone | 1 |
| 4,4'-DDD | * | Endrin Ketone | 1 | PCB-1254 | 1 | Endrin Aldehyde | 1 |
| 4,4'-DDE | * | Endrin Aldehyde | 1 | PCB-1260 | 1 | 4,4'-DDD | 1 |
| 4,4'-DDT | * | 4,4'-DDD | 1 | 2,4,5-T | 1 | 4,4'-DDE | 1 |
| Heptachlor | * | 4,4'-DDE | 1 | MCPP | * | 4,4'-DDT | 1 |
| Heptachlor epoxide | * | 4,4'-DDT | 1 | Dicamba | 1 | Heptachlor | 1 |
| MCPA | 2 | Heptachlor | * | delta - BHC | 1 | Heptachlor epoxide | 1 |
| Methoxychlor | * | Heptachlor epoxide | * | 2,4,5 - TP | 2 | MCPA | * |
| PCB-1254 | * | MCPA | * | | | MCPP | * |
| PCB-1260 | 1 | Methoxychlor | * | | | Methoxychlor | 1 |
| 2,4,5-T | 1 | PCB - 1248 | * | | | PCB - 1248 | 1 |
| 2,4-D | 2 | PCB-1254 | * | | | PCB-1254 | * |
| | | PCB-1260 | * | | | PCB-1260 | 1 |
| | | 2,4,5-T | 1 | | | 2,4,5-T | 1 |
| | | 2,4,5-TP | 1 | | | 2,4-D | 1 |
| | | 2,4-D | 1 | | | Dicamba | 1 |
| | | 2,4-DB | * | | | | |

* - Chemical will be evaluated in BERA (chemicals are in bold type)

1 - Hazard Quotient less than 1 - not evaluated in BERA

2 - No TEV available - not evaluated in BERA

## Table 7.1-2. Baseline Assessment and Measurement Endpoints for the Evaluation of Aquatic Ecosystems, Site SS-63

| Assessment Goal | Assessment Endpoint | Risk Questions | Measurement Endpoint |
|---|---|---|---|
| Protection of aquatic ecosystem structure and function | Protection of benthic and epibenthic invertebrate communities from toxic effects of contaminants in sediment to maintain species diversity, biomass, and nutrient cycling (trophic structure); to provide a food source for higher level consumers; and to insure that contaminant levels in benthic invertebrate tissue are low enough to minimize the risk of bioaccumulation and/or other negative toxic effects in higher trophic levels. | *Are levels of site contaminants in sediment sufficient to cause adverse alterations to the structure and/or function to the benthic community at either the population or community level?* | To determine whether concentrations of chemicals in sediment are toxic to benthic organisms, a 10-day toxicity evaluation was performed using the amphipod *Leptocheirus plumulosus*. The endpoint for this evaluation was survival. Test results were compared with those from a reference location. This test was used previously to determine toxicity of sediment during basewide toxicity testing at Langley AFB. Collocated sediment samples were analyzed for Target Analyte List (TAL) metals, Target Compound List (TCL) organics, PCTs, chlorinated herbicides, total organic carbon, particle size distribution, and percent moisture. Care was taken to collect sediment samples from depositional areas.<br><br>To determine whether concentrations of chemicals in sediment which become resuspended and dissolved in the water column are toxic to organisms inhabiting the water column or upper portions of the benthic substrate and to determine whether contaminants are impacting the reproductive capability of these organisms, a 7-day toxicity evaluation was performed using mysid shrimp (*Mysidopsis bahia*). The endpoints for this evaluation were survival, growth and fecundity. Test results were compared with those from a reference location. To evaluate the effects of sediment resuspension on the water column and the subsequent impact on aquatic organisms, this test was performed using elutriate prepared by mixing sediment and water. This test provided insight into whether epibenthic organisms are being adversely affected by contaminants and addressed the potential effect of the frequent sediment resuspension, which occurs in the Back River. Collocated sediment samples were analyzed for TAL metals, TCL compounds, PCTs, chlorinated herbicides, total organic carbon, and particle size distribution. |

## Table 7.1-2. Baseline Assessment and Measurement Endpoints for the Evaluation of Aquatic Ecosystems, Site SS-63 (Continued)

| Assessment Goal | Assessment Endpoint | Risk Questions | Measurement Endpoint |
|---|---|---|---|
| Protection of aquatic ecosystem structure and function. | Protection of benthic and epibenthic invertebrate communities from toxic effects of contaminants in sediment to maintain species diversity, biomass, and nutrient cycling (trophic structure); to provide a food source for higher level consumers; and to insure that contaminant levels in benthic invertebrate tissue are low enough to minimize the risk of bioaccumulation and/or other negative toxic effects in higher trophic levels. | *Are levels of site contaminants in sediment sufficient to cause adverse alterations to the structure and/or function to the benthic community at either the population or community level?* | To determine whether concentrations of chemicals in the sediment are causing adverse alterations to the structure of the benthic macroinvertebrate community, sediment samples were collected for identification and enumeration of benthic macroinvertebrates. Indices measuring the richness and diversity of species composition were used to assess community structure and for comparison with a reference location. Similar evaluation was performed at other near-shore locations at Langley during the PA/SI. Collocated sediment samples were analyzed for TAL metals, TCL compounds, PCTs, chlorinated herbicides, total organic carbon, particle size distribution, and percent moisture.<br><br>To provide additional evidence concerning the potential for adverse effects to benthic organisms attributable to concentrations of chemicals in sediment collected from near-shore locations, these chemical data were used in the BERA in conjunction with TEVs to determine HQ values for COCs. |
| Protection of aquatic ecosystem structure and function. | Protecting fish communities from toxic effects of contaminants in surface water to maintain species diversity; also ensuring that ingestion of contaminants by fish not have a negative impact on growth or survival; additionally, ensuring that contaminant levels accumulated in fish tissue are low enough to minimize risk of accumulation and negative effects to higher trophic levels. | *Are levels of site contaminants in water and sediment sufficient to cause adverse alterations to the structure and reproductive capacity of the aquatic community?* | To provide information concerning the potential for adverse effects to the fish community attributable to concentrations of chemicals in the sediment and biota which are components of the fish diet, chemical data from sediment and biota samples collected from near-shore locations were used to estimate the dose of various chemicals to the fish. The diet of the selected indicator species, the Atlantic croaker, was assumed to consist of benthic invertebrates (assumed to have chemical concentrations equal to those detected in sediment), bivalves and killifish. The dose calculated for the croaker was then used in the BERA in conjunction with TEVs to determine HQ values for the COCs. |

## Table 7.1-2. Baseline Assessment and Measurement Endpoints for the Evaluation of Aquatic Ecosystems, Site SS-63 (Continued)

| Assessment Goal | Assessment Endpoint | Risk Questions | Measurement Endpoint |
|---|---|---|---|
| Protection of aquatic ecosystem structure and function. | Protecting fish communities from toxic effects of contaminants in surface water to maintain species diversity; also ensuring that ingestion of contaminants by fish not have a negative impact on growth or survival; additionally, ensuring that contaminant levels accumulated in fish tissue are low enough to minimize risk of accumulation and negative effects to higher trophic levels. | *Are levels of site contaminants in water and sediment sufficient to cause adverse alterations to the structure and reproductive capacity of the aquatic community?* | To provide insight concerning whether chemicals contained in dietary components are accumulating in fish, samples of killifish were collected from near-shore locations adjacent to Langley AFB and analyzed for TAL metals, SVOCs, organochlorine pesticides, PCBs, PCTs, chlorinated herbicides, and cyanide. Samples of sport fish (predominantly croaker and spot) were also collected from near-shore locations adjacent to Langley and analyzed for the same list of chemicals. Because the sport fish were used for evaluation of potential adverse effects to human health, only the fillets were submitted for chemical analysis. Although analysis of the fillets excludes internal organs and other tissues in which chemicals may concentrate and may underestimate the concentrations of some chemicals in the fish, this was still considered to be useful information when used in conjunction with the killifish whole body data. The absence of specific chemicals or classes of chemicals in the fish tissue would provide an indication that these chemicals are being metabolized by the fish.<br><br>To determine whether concentrations of chemicals in surface water and sediment are adversely affecting the aquatic community, samples of killifish were collected and analyzed for TAL metals, SVOCs, organochlorine pesticides, PCBs, PCTs, chlorinated herbicides, cyanide, percent lipids, percent solids, and percent water content. These data was compared to TEVs for survival or reproductive capacity from current scientific literature. |

## Table 7.1-2. Baseline Assessment and Measurement Endpoints for the Evaluation of Aquatic Ecosystems, Site SS-63 (Continued)

| Assessment Goal | Assessment Endpoint | Risk Questions | Measurement Endpoint |
|---|---|---|---|
| Protection of aquatic ecosystem structure and function. | Protecting fish communities from toxic effects of contaminants in surface water to maintain species diversity; also ensuring that ingestion of contaminants by fish not have a negative impact on growth or survival; additionally, ensuring that contaminant levels accumulated in fish tissue are low enough to minimize risk of accumulation and negative effects to higher trophic levels. | *Are levels of site contaminants in water and sediment sufficient to cause adverse alterations to the structure and reproductive capacity of the aquatic community?* | To provide insight into the overall health of aquatic organisms and the potential for adverse effects from specific contaminants, samples of killifish and larger sport fish (such as spot or croaker) were carefully examined for any indication of stress or disease. At locations where elevated concentrations of specific contaminants are present such as lead concentrations in the vicinity of ERP Site LF-17 and PAH and PCB concentrations in the vicinity of Outfall 4 in the Southwest Branch, internal organs of fish were examined for contaminant-specific abnormalities. For lead, these include damage to the liver, kidney or gill. For PCBs and PAHs, these include damage to the liver or kidney. A similar evaluation was performed for fish obtained at a reference location. It is acknowledged that the fish collected during this effort cannot be closely associated with a discreet portion of shoreline because of their much larger home range, however, this effort still provides useful information concerning the health of fish whose range includes the contaminated areas as well as the overall health of the aquatic community. |
| Protection of aquatic ecosystem structure and function. | Protecting piscivorous birds to ensure that ingestion of contaminants in water or food organisms does not have negative impact on growth, survival, or reproduction. | *Are levels of site contaminants in surface water and fish sufficient to have adverse effects on the long-term health and reproductive capacity of aquatic feeding birds [belted kingfisher (Ceryle alcyon)] that utilize the site?* | A food chain model was used to evaluate risk to aquatic feeding birds that utilize the site as a food source. The selected endpoint receptor species is the belted kingfisher (*Ceryle alcyon*). Fish were identified as the primary food source for the kingfisher with shellfish as a secondary source. A dietary dose was calculated based on ingestion of fish and shellfish. The concentration of COCs in the fish and in shellfish was obtained from direct measurement. The resulting total daily dose was compared to existing toxicity data through the calculation of a HQ. |

## Table 7.1-2. Baseline Assessment and Measurement Endpoints for the Evaluation of Aquatic Ecosystems, Site SS-63 (Continued)

| Assessment Goal | Assessment Endpoint | Risk Questions | Measurement Endpoint |
|---|---|---|---|
| Protection of aquatic ecosystem structure and function. | Protecting semi-aquatic carnivorous mammals that feed on aquatic life to ensure that contaminants in water and in food organisms do not have a negative impact on growth, survival, or reproduction. | *Are levels of site contaminants in surface water and fish sufficient to have adverse effects on the long-term health and reproductive capacity of carnivorous semi-aquatic mammals [mink (Mustela vison)] that utilize the site?* | A food chain model was used to evaluate risk to carnivorous semi-aquatic mammals that utilize the site as a food source. The selected endpoint receptor species is the mink (*Mustela vison*). Fish and invertebrates were identified as the primary food source for the mink. A dietary dose was calculated based on ingestion of fish and invertebrates. The concentration of COCs in the fish was obtained from direct measurement. Concentrations of chemicals in invertebrates were assumed the same as those detected in sediment. The resulting total daily dose was compared to existing toxicity data through the calculation of a HQ. |

* Measurement endpoint evaluated in the SERA.

**Table 7.4-1**

**Summary of Baseline Assessment NOAEL-Based Hazard Quotients**
**Site SS-63**

| COPEC (maximum concentration) (mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| **Inorganic Analytes** | | | | |
| Aluminum-max | **1.38E+00** | **8.28E+02** | 6.75E-02 | **2.94E+00** |
| Aluminum-mean | 5.61E-01 | **3.38E+02** | 3.37E-02 | **1.20E+00** |
| Antimony-max | **1.95E+00** | 3.23E-02 | 1.65E-02 | 7.19E-03 |
| Antimony-mean | 2.85E-01 | 4.75E-03 | 7.51E-03 | 1.10E-03 |
| Arsenic-max | **1.42E+00** | **3.80E+01** | NC | 9.24E-01 |
| Arsenic-mean | 6.69E-01 | **1.86E+01** | NC | 4.52E-01 |
| Barium-max | NC | **1.16E+03** | NC | 1.52E-02 |
| Barium-mean | NC | **5.26E+02** | NC | 6.96E-03 |
| Beryllium-max | **1.48E+00** | 3.04E-01 | NC | NC |
| Beryllium-mean | 5.05E-01 | 1.04E-01 | NC | NC |
| Cadmium-max | **1.72E+00** | **2.30E+00** | NC | NC |
| Cadmium-mean | 2.34E-01 | 3.82E-01 | NC | NC |
| Chromium-max | **3.02E+00** | **3.69E+01** | NC | 8.34E-03 |
| Chromium-mean | **1.32E+00** | **1.57E+01** | NC | 3.65E-03 |
| Cobalt-max | **1.56E+00** | **3.32E+01** | NC | NC |
| Cobalt-mean | 5.89E-01 | **1.25E+01** | NC | NC |
| Copper-max | NC | **8.56E+01** | NC | NC |
| Copper-mean | NC | **2.35E+01** | NC | NC |
| Cyanide-max | **1.04E+00** | NC | NC | NC |
| Cyanide-mean | 2.51E-01 | NC | NC | NC |
| Iron-max | NC | **4.22E+03** | NC | NC |
| Iron-mean | NC | **1.86E+03** | NC | NC |
| Lead-max | **7.81E+00** | **5.35E+03** | NC | 6.37E-02 |
| Lead-mean | **1.80E+00** | **1.24E+03** | NC | 1.48E-02 |
| Magnesium-max | NC | **1.04E+03** | **1.55E+00** | 6.82E-01 |
| Magnesium-mean | NC | **5.59E+02** | **1.28E+00** | 4.47E-01 |
| Manganese-max | NC | **9.80E+01** | NC | NC |
| Manganese-mean | NC | **4.32E+01** | NC | NC |
| Mercury-max | **1.17E+00** | **3.42E+03** | **2.07E+00** | 3.77E-01 |
| Mercury-mean | 3.99E-01 | **1.23E+03** | **1.18E+00** | 1.39E-01 |

Table 7.4-1

**Summary of Baseline Assessment NOAEL-Based Hazard Quotients**
**Site SS-63**

| COPEC (maximum concentration) (mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| Nickel-max | **2.57E+00** | **6.93E+02** | NC | NC |
| Nickel-mean | **1.11E+00** | **2.98E+02** | NC | NC |
| Selenium-max | **2.70E+00** | **7.83E+00** | NC | 8.98E-02 |
| Selenium-mean | **1.14E+00** | **4.81E+00** | NC | 5.89E-02 |
| Silver-max | **2.20E+00** | **9.27E+01** | NC | NC |
| Silver-mean | 7.05E-01 | **3.10E+01** | NC | NC |
| Thallium-max | NC | **1.84E+00** | NC | 2.38E-01 |
| Thallium-mean | NC | 9.15E-01 | NC | 1.19E-01 |
| Vanadium-max | NC | **8.22E+00** | NC | 5.26E-02 |
| Vanadium-mean | NC | **3.64E+00** | NC | 2.34E-02 |
| Zinc-max | NC | **4.44E+00** | 3.12E-01 | NC |
| Zinc-mean | NC | **1.21E+00** | 2.43E-01 | NC |
| **Semivolatile Organic Compounds** | | | | |
| 2-Methylnaphthalene-max | NC | **1.34E+01** | NC | NC |
| 2-Methylnaphthalene-mean | NC | **1.34E+01** | NC | NC |
| Acenaphthene-max | NC | **2.24E+00** | NC | **1.79E+00** |
| Acenaphthene-mean | NC | 1.90E-01 | NC | 1.52E-01 |
| Acenaphthylene-max | **8.86E+00** | **4.93E+00** | NC | NC |
| Acenaphthylene-mean | **8.86E+00** | **4.93E+00** | NC | NC |
| Anthracene-max | **9.37E+03** | **8.80E+02** | NC | 1.87E-01 |
| Anthracene-mean | **4.31E+02** | **4.05E+01** | NC | 8.62E-03 |
| Benz(a)anthracene-max | **2.14E+01** | **9.44E+02** | NC | 1.10E-01 |
| Benz(a)anthracene-mean | 9.25E-01 | **4.13E+01** | NC | 4.75E-03 |
| Benzo(a)pyrene-max | **2.28E+01** | **3.36E+03** | NC | 1.69E-01 |
| Benzo(a)pyrene-mean | **1.03E+00** | **1.52E+02** | NC | 7.58E-03 |
| Benzo(b)fluoranthene-max | **9.95E+00** | **2.44E+03** | NC | 3.83E-01 |
| Benzo(b)fluoranthene-mean | 5.10E-01 | **1.27E+02** | NC | 1.97E-02 |

## Table 7.4-1

## Summary of Baseline Assessment NOAEL-Based Hazard Quotients
## Site SS-63

| COPEC (maximum concentration) (mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| Benzo(g,h,i)perylene-max | **2.37E+01** | **1.95E+03** | NC | 9.80E-02 |
| Benzo(g,h,i)perylene-mean | **1.11E+00** | **9.30E+01** | NC | 4.57E-03 |
| Benzo(k)fluoranthene-max | **1.19E+01** | **2.91E+03** | NC | 2.53E-01 |
| Benzo(k)fluoranthene-mean | 5.60E-01 | **1.37E+02** | NC | 1.19E-02 |
| Bis(2-ethylhexyl)phthalate-max | **8.17E+00** | NC | NC | NC |
| Bis(2-ethylhexyl)phthalate-mean | **1.49E+00** | NC | NC | NC |
| Carbazole-max | NC | **1.94E+02** | NC | NC |
| Carbazole-mean | NC | **2.32E+01** | NC | NC |
| Chrysene-max | **1.30E+02** | **1.06E+01** | NC | 4.27E-01 |
| Chrysene-mean | **6.00E+00** | 4.92E-01 | NC | 1.96E-02 |
| Dibenz(a,h)anthracene-max | **2.40E+02** | **1.26E+02** | NC | NC |
| Dibenz(a,h)anthracene-mean | **2.27E+01** | **1.19E+01** | NC | NC |
| Dibenzofuran-max | NC | **6.17E+01** | NC | **2.14E+03** |
| Dibenzofuran-mean | NC | **1.67E+01** | NC | **5.80E+02** |
| Fluoranthene-max | **2.52E+01** | **1.16E+03** | NC | NC |
| Fluoranthene-mean | **1.02E+00** | **4.70E+01** | NC | NC |
| Fluorene-max | **4.81E+01** | **1.77E+02** | NC | NC |
| Fluorene-mean | **9.77E+00** | **3.59E+01** | NC | NC |
| Indeno(1,2,3-cd)pyrene-max | **2.27E+01** | **1.77E+03** | NC | NC |
| Indeno(1,2,3-cd)pyrene-mean | **1.09E+00** | **8.55E+01** | NC | NC |
| Naphthalene-max | NC | **7.79E+01** | NC | NC |
| Naphthalene-mean | NC | **3.32E+01** | NC | NC |
| Phenanthrene-max | **1.86E+01** | **5.60E+03** | NC | 4.48E-01 |
| Phenanthrene-mean | 7.92E-01 | **2.41E+02** | NC | 1.90E-02 |

**Table 7.4-1**

**Summary of Baseline Assessment NOAEL-Based Hazard Quotients**
**Site SS-63**

| COPEC (maximum concentration) (mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| Pyrene-max | **2.32E+01** | **1.20E+04** | NC | NC |
| Pyrene-mean | 9.67E-01 | **5.01E+02** | NC | NC |
| Phenol-max | NC | NC | **1.40E+02** | NC |
| Phenol-mean | NC | NC | **3.19E+01** | NC |
| 2-Methylphenol-max | NC | **4.27E+00** | NC | NC |
| 2-Methylphenol-mean | NC | **1.37E+00** | NC | NC |
| | | | | |
| **Pesticides & PCBs** | | | | |
| 4,4'-DDD-max | **1.44E+01** | NC | NC | NC |
| 4,4'-DDD-mean | **1.98E+00** | NC | NC | NC |
| 4,4'-DDE-max | **5.48E+00** | NC | NC | NC |
| 4,4'-DDE-mean | **1.10E+00** | NC | NC | NC |
| 4,4'-DDT-max | **9.94E+01** | NC | NC | NC |
| 4,4'-DDT-mean | **1.09E+01** | NC | NC | NC |
| Aldrin-max | **1.95E+00** | NC | NC | NC |
| Aldrin-mean | 3.58E-01 | NC | NC | NC |
| Arochlor 5432-max | **7.20E+02** | **2.65E+05** | NC | NC |
| Arochlor 5432-mean | **6.81E+01** | **2.55E+04** | NC | NC |
| Arochlor 6040-max | **3.80E+01** | **1.39E+04** | NC | NC |
| Arochlor 6040-mean | **6.12E+00** | **2.25E+03** | NC | NC |
| Arochlor 6062-max | **7.60E+01** | **2.79E+04** | NC | NC |
| Arochlor 6062-mean | **6.08E+00** | **2.23E+03** | NC | NC |
| Arochlor 6070-max | **1.50E+01** | **5.51E+03** | NC | NC |
| Arochlor 6070-mean | **3.88E+00** | **1.42E+03** | NC | NC |
| alpha-BHC-max | NC | **3.54E+03** | NC | NC |
| alpha-BHC-mean | NC | **8.17E+02** | NC | NC |

**Table 7.4-1**

**Summary of Baseline Assessment NOAEL-Based Hazard Quotients**
**Site SS-63**

| COPEC<br>(maximum concentration)<br>(mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| beta-BHC-max | NC | **5.92E+00** | NC | NC |
| beta-BHC-mean | NC | 5.82E-01 | NC | NC |
| delta-BHC-max | NC | 3.93E-01 | NC | NC |
| delta-BHC-mean | NC | 6.45E-02 | NC | NC |
| gamma-BHC(Lindane)-max | NC | **7.33E+02** | NC | NC |
| gamma-BHC(Lindane)-mean | NC | **6.13E+02** | NC | NC |
| alpha-Chlordane-max | NC | **8.30E+02** | NC | NC |
| alpha-Chlordane-mean | NC | **2.29E+02** | NC | NC |
| Endosulfan I-max | **6.00E+01** | NC | NC | NC |
| Endosulfan I-mean | **1.66E+01** | NC | NC | NC |
| Endosulfan II-max | **5.50E+02** | NC | NC | NC |
| Endosulfan II-mean | **4.91E+01** | NC | NC | NC |
| Endosulfan Sulfate-max | **6.50E+02** | NC | NC | NC |
| Endosulfan Sulfate-mean | **1.05E+02** | NC | NC | NC |
| Endrin-max | **4.34E+03** | 6.04E-03 | NC | NC |
| Endrin-mean | **1.43E+02** | 1.99E-04 | NC | NC |
| Endrin Ketone-max | **1.23E+03** | NC | NC | NC |
| Endrin Ketone-mean | **8.18E+01** | NC | NC | NC |
| Endrin Aldehyde-max | **1.02E+05** | NC | NC | NC |
| Endrin Aldehyde-mean | **5.95E+03** | NC | NC | NC |
| PCB-1248-max | NC | **2.56E+02** | NC | NC |
| PCB-1248-mean | NC | **7.23E+01** | NC | NC |
| PCB-1260-max | NC | **9.04E+03** | NC | NC |
| PCB-1260-mean | NC | **2.09E+03** | NC | NC |
| PCB-1254-max | **4.18E+02** | **1.57E+05** | NC | 5.67E-01 |
| PCB-1254-mean | **1.89E+01** | **8.75E+03** | NC | 3.18E-02 |

**Table 7.4-1**

**Summary of Baseline Assessment NOAEL-Based Hazard Quotients**
**Site SS-63**

| COPEC (maximum concentration) (mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| MCPA-max | NC | **4.99E+01** | NC | 5.58E-01 |
| MCPA-mean | NC | **7.65E+00** | NC | 8.56E-02 |
| MCPP-max | NC | NC | **2.75E+03** | **1.38E+00** |
| MCPP-mean | NC | NC | **1.31E+03** | 6.61E-01 |
| gamma-Chlordane-max | **2.84E+01** | **4.34E+04** | NC | NC |
| gamma-Chlordane-mean | **1.32E+00** | **2.02E+03** | NC | NC |
| Heptachlor-max | **6.00E+00** | **4.24E+02** | NC | NC |
| Heptachlor-mean | **2.84E+00** | **2.01E+02** | NC | NC |
| Heptachlor epoxide-max | **9.72E+00** | **9.40E+02** | NC | NC |
| Heptachlor epoxide-mean | **2.28E+00** | **2.42E+02** | NC | NC |
| Methoxychlor-max | **5.23E+04** | **8.52E+03** | NC | NC |
| Methoxychlor-mean | **2.00E+03** | **3.26E+02** | NC | NC |
| 2,4-DB-max | NC | 3.95E-01 | NC | NC |
| 2,4-DB-mean | NC | 9.64E-02 | NC | NC |

For each COPEC, the top value was calculated using maximum media concentrations. The bottom value was calculated using mean media concentrations.
Bold values indicate the NOAEL-based hazard quotient is greater than or equal to one.

NC = Not Calculated, Chemical was eliminated during SERA

Table 7.4-2

Summary of Baseline Assessment LOAEL-Based Hazard Quotients
Site SS-63

| COPEC<br>(maximum concentration)<br>(mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| **Inorganic Analytes** | | | | |
| Aluminum-max | **1.00E+00** | **8.28E+01** | 6.75E-03 | 2.94E-01 |
| Aluminum-mean | 4.08E-01 | **3.38E+01** | 3.37E-03 | 1.20E-01 |
| Antimony-max | 5.63E-03 | 3.23E-03 | 1.65E-03 | 7.19E-04 |
| Antimony-mean | 8.26E-04 | 4.75E-04 | 7.51E-04 | 1.10E-04 |
| Arsenic-max | 9.31E-02 | **3.80E+00** | NC | 9.24E-02 |
| Arsenic-mean | 4.38E-02 | **1.86E+00** | NC | 4.52E-02 |
| Barium-max | NC | **1.16E+02** | NC | 1.52E-03 |
| Barium-mean | NC | **5.26E+01** | NC | 6.96E-04 |
| Beryllium-max | 1.42E-01 | 3.04E-02 | NC | NC |
| Beryllium-mean | 4.85E-02 | 1.04E-02 | NC | NC |
| Cadmium-max | 1.62E-01 | 2.30E-01 | NC | NC |
| Cadmium-mean | 2.21E-02 | 3.82E-02 | NC | NC |
| Chromium-max | 3.50E-01 | **3.69E+00** | NC | 8.34E-04 |
| Chromium-mean | 1.53E-01 | **1.57E+00** | NC | 3.65E-04 |
| Cobalt-max | 1.64E-01 | **3.32E+00** | NC | NC |
| Cobalt-mean | 6.18E-02 | **1.25E+00** | NC | NC |
| Copper-max | NC | **8.56E+00** | NC | NC |
| Copper-mean | NC | **2.35E+00** | NC | NC |
| Cyanide-max | 5.87E-01 | NC | NC | NC |
| Cyanide-mean | 1.42E-01 | NC | NC | NC |
| Iron-max | NC | **4.22E+02** | NC | NC |
| Iron-mean | NC | **1.86E+02** | NC | NC |
| Lead-max | **2.08E+00** | **5.35E+02** | NC | 6.37E-03 |
| Lead-mean | 4.78E-01 | **1.24E+02** | NC | 1.48E-03 |
| Magnesium-max | NC | **1.04E+02** | 1.55E-01 | 6.82E-02 |
| Magnesium-mean | NC | **5.59E+01** | 1.28E-01 | 4.47E-02 |
| Manganese-max | NC | **9.80E+00** | NC | NC |
| Manganese-mean | NC | **4.32E+00** | NC | NC |
| Mercury-max | 1.35E-01 | **3.42E+02** | 2.07E-01 | 3.77E-02 |
| Mercury-mean | 4.59E-02 | **1.23E+02** | 1.18E-01 | 1.39E-02 |
| Nickel-max | 1.39E-01 | **6.93E+01** | NC | NC |
| Nickel-mean | 6.04E-02 | **2.98E+01** | NC | NC |

Table 7.4-2

**Summary of Baseline Assessment LOAEL-Based Hazard Quotients**
**Site SS-63**

| COPEC (maximum concentration) (mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| Bis(2-ethylhexyl)phthalate-max | 8.17E-01 | NC | NC | NC |
| Bis(2-ethylhexyl)phthalate-mean | 1.49E-01 | NC | NC | NC |
| Carbazole-max | NC | **1.94E+01** | NC | NC |
| Carbazole-mean | NC | **2.32E+00** | NC | NC |
| Chrysene-max | **1.96E+01** | **1.06E+00** | NC | 4.27E-02 |
| Chrysene-mean | 9.00E-01 | 4.92E-02 | NC | 1.96E-03 |
| Dibenz(a,h)anthracene-max | **2.40E+01** | **1.26E+01** | NC | NC |
| Dibenz(a,h)anthracene-mean | **2.27E+00** | **1.19E+00** | NC | NC |
| Dibenzofuran-max | NC | **6.17E+00** | NC | **2.14E+02** |
| Dibenzofuran-mean | NC | **1.67E+00** | NC | **5.80E+01** |
| Fluoranthene-max | **2.10E+00** | **1.16E+02** | NC | NC |
| Fluoranthene-mean | 8.50E-02 | **4.70E+00** | NC | NC |
| Fluorene-max | **4.81E+00** | **1.77E+01** | NC | NC |
| Fluorene-mean | 9.77E-01 | **3.59E+00** | NC | NC |
| Indeno(1,2,3-cd)pyrene-max | **2.42E+00** | **1.77E+02** | NC | NC |
| Indeno(1,2,3-cd)pyrene-mean | 1.17E-01 | **8.55E+00** | NC | NC |
| Naphthalene-max | NC | **7.79E+00** | NC | NC |
| Naphthalene-mean | NC | **3.32E+00** | NC | NC |
| Phenanthrene-max | **2.42E+00** | **5.60E+02** | NC | 4.48E-02 |
| Phenanthrene-mean | 1.03E-01 | **2.41E+01** | NC | 1.90E-03 |
| Pyrene-max | **2.44E+00** | **1.20E+03** | NC | NC |
| Pyrene-mean | 1.02E-01 | **5.01E+01** | NC | NC |
| Phenol-max | NC | NC | **1.40E+01** | NC |
| Phenol-mean | NC | NC | **3.19E+00** | NC |
| 2-Methylphenol-max | NC | 4.27E-01 | NC | NC |
| 2-Methylphenol-mean | NC | 1.37E-01 | NC | NC |

Table 7.4-2

**Summary of Baseline Assessment LOAEL-Based Hazard Quotients**
**Site SS-63**

| COPEC<br>(maximum concentration)<br>(mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| **Pesticides & PCBs** | | | | |
| 4,4'-DDD-max | **1.60E+00** | NC | NC | NC |
| 4,4'-DDD-mean | 2.20E-01 | NC | NC | NC |
| 4,4'-DDE-max | 3.09E-01 | NC | NC | NC |
| 4,4'-DDE-mean | 6.22E-02 | NC | NC | NC |
| 4,4'-DDT-max | **3.31E+00** | NC | NC | NC |
| 4,4'-DDT-mean | 3.65E-01 | NC | NC | NC |
| Aldrin-max | 1.84E-01 | NC | NC | NC |
| Aldrin-mean | 3.37E-02 | NC | NC | NC |
| Arochlor 5432-max | **7.20E+01** | **2.65E+04** | NC | NC |
| Arochlor 5432-mean | **6.81E+00** | **2.55E+03** | NC | NC |
| Arochlor 6040-max | **3.80E+00** | **1.39E+03** | NC | NC |
| Arochlor 6040-mean | 6.12E-01 | **2.25E+02** | NC | NC |
| Arochlor 6062-max | **7.60E+00** | **2.79E+03** | NC | NC |
| Arochlor 6062-mean | 6.08E-01 | **2.23E+02** | NC | NC |
| Arochlor 6070-max | **1.50E+00** | **5.51E+02** | NC | NC |
| Arochlor 6070-mean | 3.88E-01 | **1.42E+02** | NC | NC |
| alpha-BHC-max | NC | **3.54E+02** | NC | NC |
| alpha-BHC-mean | NC | **8.17E+01** | NC | NC |
| beta-BHC-max | NC | 5.92E-01 | NC | NC |
| beta-BHC-mean | NC | 5.82E-02 | NC | NC |
| delta-BHC-max | NC | 3.93E-02 | NC | NC |
| delta-BHC-mean | NC | 6.45E-03 | NC | NC |
| gamma-BHC(Lindane)-max | NC | **7.33E+01** | NC | NC |
| gamma-BHC(Lindane)-mean | NC | **6.13E+01** | NC | NC |
| alpha-Chlordane-max | NC | **8.30E+01** | NC | NC |
| alpha-Chlordane-mean | NC | **2.29E+01** | NC | NC |
| Endosulfan I-max | **6.00E+00** | NC | NC | NC |

**Table 7.4-2**

**Summary of Baseline Assessment LOAEL-Based Hazard Quotients**
**Site SS-63**

| COPEC<br>(maximum concentration)<br>(mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| Endosulfan I-mean | **1.66E+00** | NC | NC | NC |
| Endosulfan II-max | **5.50E+01** | NC | NC | NC |
| Endosulfan II-mean | **4.91E+00** | NC | NC | NC |
| Endosulfan Sulfate-max | **6.50E+01** | NC | NC | NC |
| Endosulfan Sulfate-mean | **1.05E+01** | NC | NC | NC |
| Endrin-max | **4.34E+01** | 6.04E-04 | NC | NC |
| Endrin-mean | **1.43E+00** | 1.99E-05 | NC | NC |
| Endrin Ketone-max | **1.23E+01** | NC | NC | NC |
| Endrin Ketone-mean | 8.18E-01 | NC | NC | NC |
| Endrin Aldehyde-max | **1.02E+04** | NC | NC | NC |
| Endrin Aldehyde-mean | **5.95E+02** | NC | NC | NC |
| PCB-1248-max | NC | **2.56E+01** | NC | NC |
| PCB-1248-mean | NC | **7.23E+00** | NC | NC |
| PCB-1260-max | NC | **9.04E+02** | NC | NC |
| PCB-1260-mean | NC | **2.09E+02** | NC | NC |
| PCB-1254-max | **4.18E+01** | **1.57E+04** | NC | 5.67E-02 |
| PCB-1254-mean | **1.89E+00** | **8.75E+02** | NC | 3.18E-03 |
| MCPA-max | NC | **4.99E+00** | NC | 5.58E-02 |
| MCPA-mean | NC | 7.65E-01 | NC | 8.56E-03 |
| MCPP-max | NC | NC | **2.75E+02** | 1.38E-01 |
| MCPP-mean | NC | NC | **1.31E+02** | 6.61E-02 |

**Table 7.4-2**

**Summary of Baseline Assessment LOAEL-Based Hazard Quotients**
**Site SS-63**

| COPEC<br>(maximum concentration)<br>(mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| gamma-Chlordane-max | **2.84E+00** | **4.34E+03** | NC | NC |
| gamma-Chlordane-mean | 1.32E-01 | **2.02E+02** | NC | NC |
| Heptachlor-max | 6.00E-01 | **4.24E+01** | NC | NC |
| Heptachlor-mean | 2.84E-01 | **2.01E+01** | NC | NC |
| Heptachlor epoxide-max | 8.75E-01 | **9.40E+01** | NC | NC |
| Heptachlor epoxide-mean | 2.05E-01 | **2.42E+01** | NC | NC |
| Methoxychlor-max | **5.23E+03** | **8.52E+02** | NC | NC |
| Methoxychlor-mean | **2.00E+02** | **3.26E+01** | NC | NC |
| 2,4-DB-max | NC | 3.95E-02 | NC | NC |
| 2,4-DB-mean | NC | 9.64E-03 | NC | NC |

For each COPEC, the top value was calculated using maximum media concentrations. The bottom value was calculated using mean media concentrations.
Bold values indicate the LOAEL-based hazard quotient is greater than or equal to one.

NC =Not Calculated, Chemical was eliminated during SERA

Table 7.4-2

**Summary of Baseline Assessment LOAEL-Based Hazard Quotients**
**Site SS-63**

| COPEC<br>(maximum concentration)<br>(mean Concentration) | Benthic Invertebrate | Atlantic Croaker | Belted Kingfisher | Mink |
|---|---|---|---|---|
| Selenium-max | 2.43E-01 | 7.83E-01 | NC | 8.98E-03 |
| Selenium-mean | 1.03E-01 | 4.81E-01 | NC | 5.89E-03 |
| Silver-max | 2.09E-01 | **9.27E+00** | NC | NC |
| Silver-mean | 6.72E-02 | **3.10E+00** | NC | NC |
| Thallium-max | NC | 1.84E-01 | NC | 2.38E-02 |
| Thallium-mean | NC | 9.15E-02 | NC | 1.19E-02 |
| Vanadium-max | NC | 8.22E-01 | NC | 5.26E-03 |
| Vanadium-mean | NC | 3.64E-01 | NC | 2.34E-03 |
| Zinc-max | NC | 4.44E-01 | 3.12E-02 | NC |
| Zinc-mean | NC | 1.21E-01 | 2.43E-02 | NC |
| **Semivolatile Organic Compounds** | | | | |
| 2-Methylnaphthalene-max | NC | **1.34E+00** | NC | NC |
| 2-Methylnaphthalene-mean | NC | **1.34E+00** | NC | NC |
| Acenaphthene-max | NC | 2.24E-01 | NC | 1.79E-01 |
| Acenaphthene-mean | NC | 1.90E-02 | NC | 1.52E-02 |
| Acenaphthylene-max | 8.86E-01 | 4.93E-01 | NC | NC |
| Acenaphthylene-mean | 8.86E-01 | 4.93E-01 | NC | NC |
| Anthracene-max | **9.37E+02** | **8.80E+01** | NC | 1.87E-02 |
| Anthracene-mean | **4.31E+01** | **4.05E+00** | NC | 8.62E-04 |
| Benz(a)anthracene-max | **2.57E+00** | **9.44E+01** | NC | 1.10E-02 |
| Benz(a)anthracene-mean | 1.11E-01 | **4.13E+00** | NC | 4.75E-04 |
| Benzo(a)pyrene-max | **2.74E+00** | **3.36E+02** | NC | 1.69E-02 |
| Benzo(a)pyrene-mean | 1.23E-01 | **1.52E+01** | NC | 7.58E-04 |
| Benzo(b)fluoranthene-max | 9.95E-01 | **2.44E+02** | NC | 3.83E-02 |
| Benzo(b)fluoranthene-mean | 5.10E-02 | **1.27E+01** | NC | 1.97E-03 |
| Benzo(g,h,i)perylene-max | **2.27E+00** | **1.95E+02** | NC | 9.80E-03 |
| Benzo(g,h,i)perylene-mean | 1.06E-01 | **9.30E+00** | NC | 4.57E-04 |
| Benzo(k)fluoranthene-max | **1.19E+00** | **2.91E+02** | NC | 2.53E-02 |
| Benzo(k)fluoranthene-mean | 5.60E-02 | **1.37E+01** | NC | 1.19E-03 |

# APPENDIX B

# ARARs

**Table B.1**
**Summary of Federal and State ARARs**
**Langley Air Force Base, Virginia**
**ERP Site SS-63**

| **FEDERAL** | | |
|---|---|---|
| **Environmental Laws and Regulations** | **Requirement Synopsis** | **Status** |
| **National Environmental Policy Act of 1969** | | |
| **Procedure for Implementing the National Environmental Policy Act and Assessing the Environmental Effects Abroad of EPA Actions** | | |
| Federal Executive Order 11988<br>40 CFR Part 6, Appendix A<br>40 CFR 6.302 (b), (d), (g) and (h) | Any activity located in a floodplain must comply with the provisions of this Executive Order. The Order requires that Federal activities in floodplains must reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and preserve the natural and beneficial values served by floodplains. Most of Langley AFB is located in the 100-year floodplain. The remedy must comply with the substantive provisions of the Exec. Order; however, CERCLA actions are exempt from the permit provision. | A |
| **Federal Endangered Species Act of 1973: 16 U.S.C. § 1536 (a) (1) and (2)** | | |
| **Interagency Cooperation Endangered Species Act of 1973, As Amended** | | |
| 50 CFR Sections 402.10 (a) and (c) | Requires a determination as to whether any action is likely to jeopardize the continued existence of any endangered species or the critical habitat designated for such species. Endangered or threatened species have not been documented as roosting, nesting or living on Langley AFB, but the possibility of an incidental occurrence exists during the implementation of the remedial action at ERP Site SS-63 Southwest Branch. | R/A |
| **Clean Water Act (Federal Water Pollution Control Act): 33 U.S.C. § 1344 (Section 404)** | | |
| **Section 404(B)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material** | | |
| 40 CFR 230 | Regulates dredging and discharge of dredged materials (spoils) in navigable waters of the United States. The degradation Section requires that degradation or destruction of wetlands and other aquatic sites be avoided to the extent possible. Dredged or fill material must not be discharged to navigable waters if the activity contributes to the violation of Virginia water quality standards; violates any toxic effluent standard covered in CWA Sec. 307; jeopardizes endangered or threatened species; or violates requirements of Title III of the Marine Protection, Research, and Sanctuaries Act of 1972. In the case where a wetland has already been severely degraded due to prior discharges of waste, dredging activities conducted as part of the remedy would serve as an economic benefit and, therefore, the lead agency would not be obligated under Section 404 to mitigate the impacts which preceded the remedial fill operation. However, for those dredging actions that impact a wetland and cannot be avoided or minimized, enhancement, restoration, or creation of another wetland may be required. The remedy must comply with the substantive provisions of the Clean Water Act; however, CERCLA actions are exempt from the permit provision. | A |

**Table B.1 (continued)**
**Summary of Federal and State ARARs**
**Langley Air Force Base, Virginia**
**ERP Site SS-63**

| FEDERAL | | |
|---|---|---|
| **Environmental Laws and Regulations** | **Requirement Synopsis** | **Status** |
| **Toxic Substances Control Act** | | |
| **Polychlorinated Biphenols (PCBs) Manufacturing, Processing, Distribution in Commerce and Use Prohibitions** | | |
| 40 CFR 761.61<br>Sections (a)(5)(ii) and (c) | Allows for off-site disposal of PCB-contaminated waste, if the waste is dewatered onsite or transported offsite in appropriate containers. Establishes locations where PCB remediation waste may be disposed. | R/A |
| **Coastal Zone Management Act** | | |
| 15 CFR 930.30 and 930.34 | Ensures that all Federal agency activities are undertaken in a manner consistent to the maximum extent practicable with the enforceable policies of approved management programs. Requires Federal agencies to perform a consistency determination on activities affecting any coastal use or resource. Because the contaminated sediment is within a water body in the Virginia coastal zone, planned remedial activities will affect a coastal resource. | A |

| STATE | | |
|---|---|---|
| **Environmental Laws and Regulations** | **Requirement Synopsis** | **Status** |
| **Title 4 – Conservation and Natural Resources** | | |
| **Agency 15 – Department of Game and Inland Fisheries** | | |
| Chapter 20 – Definitions and Miscellaneous in General | | |
| 4 VAC 15-20-130 and -140 | These regulations adopt the federal list of endangered or threatened species and expand upon that list for purposes of actions in the Commonwealth of Virginia. Endangered or threatened species have not been documented as roosting, nesting or living on Langley AFB, but the possibility of an incidental occurrence exists during the implementation of the remedial action at ERP Site SS-63 Southwest Branch. | R/A |
| **Agency 20 – Marine Resources Commission** | | |
| Chapter 390 – Wetlands Mitigation Compensation Policy | | |
| 4 VAC 20-390-10, -30, -40, and -50 | Requires that any activity which would destroy tidal wetland be undertaken only if in the public interest and, then, the destroyed wetlands must be mitigated with creation of wetlands. This ARAR includes the substance of the requirement, not the requirement to procure a permit. Wetlands along the Southwest Branch shoreline may be impacted by the remedial action. | A |

# Table B.1 (continued)
# Summary of Federal and State ARARs
# Langley Air Force Base, Virginia
# ERP Site SS-63

| STATE | | |
|---|---|---|
| **Environmental Laws and Regulations** | **Requirement Synopsis** | **Status** |
| **Agency 50 – Virginia Soil and Water Conservation Board** | | |
| Chapter 30 – Erosion and Sediment Control Regulations | | |
| 4 VAC 50-30-10, -40, and -60 | Establishes minimum standards for the control of erosion, sediment deposition, and runoff, and requires that an erosion and sediment control plan be implemented and maintained. | R/A |
| **Title 9 – Environment** | | |
| **Agency 5 – State Air Pollution Control Board** | | |
| Chapter 30 – Ambient Air Quality Standards | | |
| 9 VAC 5-30-10, -60, -65, and -66 | These regulations are designed to ensure that ambient concentrations of air pollutants are consistent with established criteria, and, unless specified otherwise, apply throughout the Commonwealth of Virginia. Any air emissions from the remedial activities at the Site must meet these standards. | A |
| **Agency 10 – Chesapeake Bay Local Assistance Board** | | |
| Chapter 20 – Chesapeake Bay Preservation Act Designation and Management Regulations | | |
| 9 VAC 10-20-120 and -130 | Locally- designated tidal and non-tidal wetlands are subject to limitations regarding land-disturbing activities, removal of vegetation, use of impervious cover, erosion and sediment control, storm water management, and other aspects of land use that may have effects on water quality. The Back River, where ERP Site SS-63 is located, is a tributary of the Chesapeake Bay. | A |
| **Agency 20 –Virginia Waste Management Board** | | |
| Chapter 80 – Solid Waste Management Regulations | | |
| 9 VAC 20-80-140 | Defines a solid waste as any discarded material. This definition would apply to wastes generated by the ERP Site SS-63 Southwest Branch remedial action, including IDW. | A |
| 9 VAC 20-80-630 and -650 | Section 630 establishes procedures for the disposal of special wastes. Special wastes are defined as wastes that require special handling and precautions. Nonhazardous wastes generated during the ERP Site SS-63 remedial action, including IDW and materials containing PCBs, will be considered handled as a special waste. Section 650 clarifies PCB disposal requirements at 40 CFR 761, and makes clear that PCB remediation waste containing PCB concentrations between 1.0 ppm and 50 ppm are restricted to disposal in sanitary landfills or industrial waste landfills with leachate collection, liners, and appropriate ground water monitoring systems. | A |

**Table B.1 (continued)**
**Summary of Federal and State ARARs**
**Langley Air Force Base, Virginia**
**ERP Site SS-63**

| STATE | | |
|---|---|---|
| **Environmental Laws and Regulations** | **Requirement Synopsis** | **Status** |
| **Title 9 – Environment** | | |
| **Agency 25 – State Water Control Board** | | |
| Chapter 31 – Virginia Pollutant Discharge Elimination System (VPDES) Permit Regulation | | |
| 9 VAC 25-31-50, -100.G.7, -220.A.1, -220.B.1, -220.D, and -220.E | Regulates the discharge of wastes and deleterious substances into State waters. Prohibits discharges of wastes that would alter the physical, chemical, or biological properties of a State water and result in detrimental effects on the beneficial use of the water. Under CERCLA, an onsite discharge of waste water to a surface water must meet the substantive requirements of VPDES, but it is not necessary to obtain a permit or comply with the administrative requirements of the permitting process. For an offsite discharge, it would be necessary to comply with the administrative requirements of the regulation. | A |
| Chapter 32 – Virginia Pollution Abatement (VPA) Permit Regulation | | |
| 9 VAC 25-32-30, -80, and -100 | Prohibits direct discharges into water except in accordance with Virginia Pollution Abatement permits issued pursuant to the State Water Quality Control Law. While CERCLA does not require that permits be obtained for remedial activities, it is necessary for the remedial action to comply with effluent limitations that would be established under a permit and notification requirements in the event of exceedances of limits. | R/A |
| Chapter 210 – Virginia Water Protection Permit Program Regulation | | |
| 9 VAC 25-210-10, -50, -110 and -115 | Prohibition on discharging any pollutant into, or adjacent to surface waters that would alter the physical, chemical or biological properties of surface waters and make them detrimental to the public health, or to animal or aquatic life. Includes Section 115 for substantive requirements only and does not include administrative permitting requirements. | A |
| Chapter 260 – Water Quality Standards | | |
| 9 VAC 25-260-10, -20, -30, -50 (class II), -140, -160, -185 and -290. | Establishes water quality standards to protect surface waters. If contaminants are discharged to a surface water body, the cleanup level at the discharge point would be the more stringent of the established cleanup levels for the Virginia or Federal surface water standard or criterion for protection of aquatic life. | R/A |

**Table B.1 (continued)**
**Summary of Federal and State ARARs**
**Langley Air Force Base, Virginia**
**ERP Site SS-63**

| STATE | | |
|---|---|---|
| **Environmental Laws and Regulations** | **Requirement Synopsis** | **Status** |
| **Title 9 – Environment** | | |
| Chapter 380 – Wetlands Policy | | |
| 9 VAC 25-380-30 | This policy establishes the preservation and protection of wetlands ecosystems by: requiring proper control of any construction activities and of non-point sources to prevent discharges which would impair the quality of the wetland area; ensuring that wastewaters will be kept below a level that would not alter the natural, physical, chemical, or biological integrity of the wetland; minimizing the alteration of the quality and quantity of the natural flow of water to the ecosystem; protection of the wetlands from adverse dredging or filling practices, solid waste management practices, siltation, or the addition of contamination from non-point source wastes and through construction activities; and preventing violations of applicable water quality standards. | A |

Key: A = Applicable R/A = Relevant and Appropriate
Note: For offsite activities, all applicable regulations apply at the time of the remedial action.