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HUMAN HEALTH RISK ASSESSMENT UNEXPLODED ORNDANCE 32 (UXO 32) SCRAP YARD NSWC INDIAN HEAD MD
02/01/2012
TETRA TECH

Human Health Risk Assessment

UXO 32 – Scrap Yard

Naval Support Facility Indian Head
Indian Head, Maryland

Naval Facilities Engineering Command Washington

Contract No. N62472-03-0-0057
Contract Task Order 47

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HUMAN HEALTH RISK ASSESSMENT

UXO32-SCRAP YARD

NAVAL SUPPORT FACILITY INDIAN HEAD
INDIAN HEAD, MARYLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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ACRONYMS AND ABBREVIATIONS

ABS	absorption factor
ACH	air change per hour
ADAF	age-dependent adjustment factor
AF	adherence factor
AT	averaging time
ATSDR	Agency for Toxic Substances and Disease Registry
BRAC	Base Realignment and Closure
BW	body weight
C_{air}	concentration of chemical in air
Cal EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CF	conversion factor
COC	chemical of concern
COPC	chemical of potential concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
C_s	chemical concentration in soil
CSF	cancer slope factor
CSFo	oral cancer slope factor
CSM	conceptual site model
CTE	central tendency exposure
DAF	dilution attenuation factor
DAF_1	dilution attenuation factor of 1
DAF_{20}	dilution attenuation factor of 20
EC	exposure concentration
EF	exposure frequency
ED	exposure duration
EPC	exposure point concentration
ET	exposure time
EU	exposure unit
FAQ	frequently asked question
FI	fraction ingested
FS	Feasibility Study
HEAST	Health Effects Assessment Summary Table
HI	hazard index
HQ	hazard quotient

HHRA	human health risk assessment
IEUBK	Integrated Exposure Uptake Biokinetic
ILCR	incremental lifetime cancer risk
IR	ingestion rate
IRIS	Integrated Risk Information System
IUR	inhalation unit risk
LS	loamy sand
MCL	Maximum Contaminant Level
MRL	Minimal Risk Level
NCEA	National Center for Environmental Assessment
OPPTS	Office of Pollution Prevention and Toxics
OSWER	Office of Solid Waste and Emergency Response
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEF	particulate emission factor
PPRTV	Provisional Peer Reviewed Toxicity Value
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RDA	recommended daily allowance
RDI	recommended daily intake
RfC	reference concentration
RfD	reference dose
RME	reasonable maximum exposure
RSL	Regional Screening Level
SA	surface area
SCS	Soil Conservation Service
SDWA	Safe Drinking Water Act
SSL	soil screening level
SSL_{air}	soil screening level from transfers from soil to air
SVOC	semi-volatile organic chemical
TCE	trichloroethylene
TEF	toxicity equivalence factor
TRW	Technical Review Workgroup
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
UXO	unexploded ordnance
µg/dL	micrograms per deciliter

VDEQ	Virginia Department of Environmental Quality
VF	volatilization factor
VOC	volatile organic chemical

1.0 INTRODUCTION

The human health risk assessment (HHRA) evaluated whether detected concentrations of chemicals in soil and groundwater samples from unexploded ordnance (UXO) 32 pose a significant threat to potential human receptors under current and/or future land uses. Potential risks to human receptors were estimated based on the assumption that no actions are taken to control contaminant releases. The following current guidance and reports published by United States Environmental Protection Agency (USEPA) and USEPA Region 3 were considered in preparing this document:

- Soil Screening Guidance: Technical Background Document, Office of Solid Waste and Emergency Response (OSWER), Washington, D.C., EPA/540/R-95/128 (USEPA, 1996).

- Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER, Washington, D.C., OSWER 9355.4-24 (USEPA, 2002a).

- Exposure Factors Handbook, Office of Health and Environmental Assessment, Washington, D.C., EPA/600/P-95/002Fa (USEPA, 1997a).

- Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6 03, Washington, D.C. (USEPA, 1991).

- Distribution of Preliminary Review Draft: Superfund's Standard Default Exposure-Factors for Central Tendency and Reasonable Maximum Exposure, OSWER, Washington, D.C. (USEPA, 1993).

- Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites, Office of Emergency and Remedial Response, Washington, D.C. OSWER 9285.6-10 (USEPA, 2002b).

- Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part A) (USEPA, 1989).

- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final, Office of Superfund Remediation and Technology Innovation, Washington, D.C., EPA/540/R/99/005, OSWER 9285.7-02EP; PB99-963312 (USEPA, 2004a).

- Guidelines for Carcinogen Risk Assessment, EPA/630/P-03/001B, March 2005 (USEPA, 2005a).

- Supplemental Guidance for Assessing Susceptibility from Early Life Exposure to Carcinogens, EPA/630/R-03/003F (USEPA, 2005b).

- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final, Office of Superfund Remediation and Technology Innovation, Washington, D.C., EPA-540-R-070-002, OSWER 9285.7-82 (USEPA, 2009a).

- Updated Dermal Exposure Guidance, USEPA Region 3, Philadelphia, Pennsylvania, June 2003 (USEPA, 2003a).

This HHRA is structured and reported according to the guidelines of the RAGS, Human Health Evaluation Manual, and Part D: Standardized Planning, Reporting, and Review of Superfund Risk Assessments (RAGS Part D) (USEPA, 2001) and consists of the following six components (see Sections 4.1 through 4.6 for detailed discussions):

- Data evaluation
- Exposure assessment
- Toxicity assessment
- Risk characterization
- Uncertainty analysis
- Development of remedial goal options

Three major aspects of chemical contamination and environmental fate and transport must be considered to evaluate potential risks:

- Contaminants with toxic characteristics must be found in environmental media and must be released by either natural processes or human action.
- Potential exposure points must exist.
- Human receptors must be present at the point of exposure.

Risk is a function of both toxicity and exposure. If any one of these factors is absent for a site, the exposure route is incomplete, and no potential risks are considered to exist for human receptors.

2.0 DATA EVALUATION

Data evaluation, the first component of a baseline HHRA, is a medium-specific task involving compilation of analytical data as the first step. The second step and main objective of data evaluation is to develop a medium-specific list of chemicals of potential concern (COPCs) that will be used to quantitatively and/or qualitatively determine potential human health risks for site media. COPCs are selected based on a toxicity screen (i.e., a comparison of site contaminant concentrations to conservative toxicity screening values) and a background screen (i.e., a comparison of site contaminant concentrations to background concentrations). In the COPC selection process for UXO 32, if the results of the background comparison evaluation indicated that UXO 32 chemical concentrations did not exceed background concentrations, that chemical was not selected as a COPC and was not carried through the quantitative risk assessment. However, chemicals present at concentrations exceeding toxicity screening criteria but not selected as COPCs on the basis of background comparison evaluations are further discussed in the uncertainty section (Section 6). Chemicals with maximum concentrations less than the 95% upper tolerance limit from the background datasets for surface and subsurface soil presented in Background Soil Investigation Report for Indian Head and Stump Neck Annex (Tetra Tech, 2002) were considered statistically within background.

2.1 DATA USABILITY

Validated fixed-base analytical results (i.e., results from a fixed-base laboratory) collected during several environmental investigations were used to assess risks to potential human receptors. All data used in the HHRA were validated per Region III data validation guidelines. The samples specifically evaluated in the HHRA are included in tables in Attachment 1.

2.2 SELECTION OF CHEMICALS OF POTENTIAL CONCERN

The selection of COPCs is a qualitative screening process to limit the number of chemicals and exposure routes quantitatively evaluated in the baseline HHRA to those site-related constituents that dominate overall potential risks. Screening by risk-based concentrations focuses the risk assessment on meaningful chemicals and exposure routes. In general, a chemical is selected as a COPC and retained for further quantitative risk evaluation if the maximum detection in a sampled medium exceeds the lowest risk-based screening concentration. Chemicals eliminated from further evaluation are assumed to present minimal risks to potential human receptors. Chemicals were also eliminated from COPC selection if site chemical concentrations were within background concentrations.

The elimination of chemicals as site-related COPCs on the basis of background comparisons follows Navy Policy on the Use of Background Chemical Levels (DON, 2004). This document also presents the Navy's interpretation of USEPA guidance provided in the document titled Role of Background in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Cleanup Program (USEPA, 2002c) and details the methodology to be used in evaluating background under the Navy's Environmental Restoration and Base Realignment and Closure (BRAC) programs. Chemicals present at concentrations exceeding risk-based screening criteria but not selected as COPCs on the basis of background evaluations are further discussed in the uncertainty section (Section 6).

Medium-specific tables summarizing the selection of COPCs are referenced in the following text.

2.2.1 Derivation of Screening Criteria

The screening criteria used to select COPCs for soil and groundwater are listed in Tables 2-1 and 2-2, respectively, and summarized below.

Screening Levels for Soil - Screening levels used to select COPCs for direct human contact exposures to surface and subsurface soil were based on the following criteria:

- Regional Screening Levels (RSLs) for residential soil (USEPA, 2011a)
- Protection of groundwater soil screening levels (SSLs) (USEPA, 2011a)

Chemicals detected at concentrations exceeding the protection of groundwater SSLs but at concentrations less than COPC screening levels for direct contact risk were not evaluated quantitatively in this HHRA but were qualitatively evaluated in Section 2.3.

Screening Levels for Groundwater - To be conservative, groundwater at the site was evaluated assuming potential residential groundwater use. Screening levels used to select COPCs for direct human contact exposures to groundwater were based on the following criteria:

- RSLs for tap water (USEPA, 2011a).
- Primary federal Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) (USEPA, 2011b).
- Screening levels for evaluating vapor intrusion into indoor air (USEPA, 2004b)

Federal SDWA MCLs for public drinking water supplies are enforceable standards designed to protect human health and promulgated under the federal SDWA. Primary MCLs are based on laboratory or epidemiological studies and apply to public water systems. A public water system is defined as a system providing water to the public for human consumption that either has at least 15 service connections or regularly serves an average of 25 individuals daily for at least 60 days per year. Primary MCLs are designed to prevent adverse human health effects, but also reflect the technical feasibility of removing a contaminant from water.

Groundwater screening levels for evaluating the vapor intrusion to indoor air are published in Table 2c of the draft USEPA guidance titled: Evaluating the Vapor Intrusion into Indoor Air (USEPA, 2002b). The criteria were derived in 2002 and the toxicity criteria for a number of chemicals have changed since the criteria were originally derived. Consequently, new criteria were derived using the methodology presented in Appendix D of the guidance and the residential air USEPA RSLs presented in the November 2011 RSL table. Criteria were derived for those chemicals which are listed to be sufficiently volatile and sufficiently toxic in Appendix A of the DOD Vapor Intrusion Handbook (2009a). The values correspond to a target cancer risk level of 1×10^{-6}, or a hazard index of 1 for carcinogens and noncarcinogens, respectively. The values also assume a subsurface attenuation factor of 0.001 from groundwater concentrations to indoor air concentrations. Methodology for calculating the criteria and a copy of the calculated screening criteria are included in Attachment 2.

The RSLs for direct contact with soil and tapwater and vapor intrusion screening levels correspond to an incremental lifetime cancer risk of 1×10^{-6} (i.e., the one-in-one million cancer risk level) for carcinogens or a hazard quotient (HQ) of 1 for non-carcinogens (i.e., a no-adverse-effect concentration for a non-carcinogenic chemical). However, the RSLs and vapor intrusion screening levels for noncarcinogens have been adjusted to represent a HQ of 0.1 to account for the potential cumulative effects of several chemicals affecting the same target organ or producing the same adverse non-carcinogenic effect.

Screening Levels for Lead - Guidance from the USEPA Office of Pollution Prevention and Toxics (OPPTS) and OSWER recommend 400 mg/kg as the lowest screening level for lead-contaminated soil in a residential setting where children are frequently present (USEPA, 1994). To be conservative, 400 mg/kg was used as the screening level for soil COPC selection. However, guidance from the USEPA Technical Review Workgroup for Lead indicates that “a reasonable screening level for soil lead at commercial/industrial (i.e., non residential) sites is 800 mg/kg” for a typical non-contact-intensive worker (2010a), and this value is also the current USEPA RSL for soil assuming an industrial land use scenario (2011a).

2.2.2 Decision Rules for Establishing COPC

The following decision rules were used to select human health COPCs for UXO 32:

- A chemical detected in soil was selected as a COPC if any detected concentration exceeded the minimum screening level and exceeded background concentrations.

- A chemical detected in groundwater was selected as a COPC if any detected concentration exceeded the minimum screening level.

- Essential nutrients were not selected as COPCs. USEPA guidance (1989) states that "Chemicals that are (1) essential human nutrients, (2) present at low concentrations (i.e., only slightly elevated above natural occurring levels), and (3) toxic at very high doses (i.e., much higher than those that could be associated with contact at the site) need not be considered further in the quantitative risk assessment." Examples of such chemicals are magnesium, calcium, potassium, and sodium. Historical information available for UXO 32 indicates that no unusual use or disposal of these constituents occurred at the site. Soil concentrations greater than 1,000,000 mg/kg (i.e., pure mineral intake) would be required before receptor intake would exceed recommended daily allowance (RDA) and recommended daily intake (RDI) values. A review of current analytical data for UXO 32 indicates that such concentrations have not been detected in environmental media at the site.

- Surrogate COPC screening levels were used for some chemicals. Risk-based COPC screening levels are not available for some chemicals [i.e., acenaphthylene, benzo(g,h,i)perylene, phenanthrene] detected in environmental media at UXO 32 due to the lack of toxicity criteria. In the COPC screening, acenaphthene was used as a surrogate for acenaphthylene, and pyrene was used as a surrogate for benzo(g,h,i)perylene and phenanthrene.

- Concentrations of carcinogenic polycyclic aromatic hydrocarbons (cPAHs) were represented by calculated benzo(a)pyrene equivalents concentrations of these chemicals. For the cPAHs (i.e., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene), a toxicity equivalence factor (TEF) approach was used. TEFs are based on the relative potency of each cPAH compound relative to that of benzo(a)pyrene, and TEFs are used to convert each individual cPAH concentration into an equivalent concentration of benzo(a)pyrene. One-half of the detection limit was used to represent non-detected concentrations in the calculation. If all cPAHs were non-detected in a sample, the sample quantitation limit for benzo(a)pyrene was used as the equivalent concentration for that sample.

- Background data for surface and subsurface soil obtained from Background Soil Investigation Report for Indian Head and Stump Neck Annex (Tetra Tech, 2002). The surface soil data was compared to the 95% upper tolerance limit for surface soil background data set. Two sets of background data were available for subsurface soil: clay-like and non-clay-like. The subsurface soil data was compared to the 95% upper tolerance limit for clay-like subsurface soil background data set because the site soils are clay-like.

Chemicals without COPC screening levels or appropriate surrogate chemical COPC screening levels were evaluated qualitatively considering the number of times the chemical was detected and the magnitudes of the observed concentrations.

2.3 COPCS SELECTED FOR THE HHRA

COPCs at UXO 32 were selected for surface and subsurface soil and groundwater using the COPC screening levels described in Section 2.2.1. A discussion of the chemicals identified as COPCs and the rationale for their selection as COPCs are provided in the following subsections. COPC selection tables for each medium are presented as Tables 2-3 through 2-8, respectively, and chemicals retained as COPCs for UXO 32 are presented in Table 2-9. The RAGS Part D tables for COPC selection are included in Attachment 3.

2.3.1 Surface Soil - 0 to 2 Feet Below Grade

Sixteen polycyclic aromatic hydrocarbons (PAHs), one polychlorinated biphenyl (PCB), 14 dioxins/furans (not including total parameters), and eight inorganics were detected in surface soil samples collected at UXO 32. A comparison of maximum detected surface soil concentrations to screening levels (based on direct contact RSLs) is presented in Table 2-3. The following chemicals were detected in surface soil at maximum concentrations exceeding the COPC screening levels for direct contact and background concentrations, and were retained as COPCs for surface soil at UXO 32:

- PAHs - benzo(a)pyrene and benzo(a)pyrene equivalents.
- PCBs - Aroclor-1260.
- Dioxins/Furans - 1,2,3,4,7,8-HXCDF, 2,3,4,7,8-PECDF, 2,3,7,8-TCDF, 2,3,7,8-TCDD equivalents.
- Metals - arsenic, cadmium, lead, mercury, and zinc.

No concentrations of chemicals exceeding direct contact COPC screening levels were within the range of background concentrations. Therefore, no chemicals were eliminated as COPCs based on site data to background data comparisons.

A comparison of maximum detected surface soil concentrations to protection of groundwater SSLs is presented in Table 2-4. The following chemicals were detected in surface soil at maximum concentrations exceeding the COPC screening levels for protection of groundwater and background concentrations, and were retained as COPCs for surface soil at UXO 32:

- PAHs - benzo(a)pyrene.
- PCBs - Aroclor-1260.
- Dioxins/Furans - 1,2,3,4,6,7,8,9-OCDD, 1,2,3,4,6,7,8-HPCDD, 1,2,3,4,6,7,8-HPCDF, 1,2,3,4,7,8,9-HPCDF, 1,2,3,4,7,8-HXCDF, 1,2,3,6,7,8-HXCDD, 1,2,3,6,7,8-HXCDF, 1,2,3,7,8,9-HXCDD, 1,2,3,7,8-PECDF, 2,3,4,6,7,8-HXCDF, 2,3,4,7,8-PECDF, 2,3,7,8-TCDD, 2,3,7,8-TCDF, and 2,3,7,8-TCDD equivalents.
- Inorganics - arsenic, barium, cadmium, lead, mercury, and zinc.

Concentrations of benzo(a)anthracene, benzo(b)fluoranthene, naphthalene, and selenium in surface soil exceeded the groundwater protection screening levels but were within the background levels. The potential for chemical migration from soil to groundwater is more fully evaluated in Section 5.3.4.

2.3.2 Subsurface Soil - Greater than 2 to 22 Feet Below Grade

Two volatile organic chemicals (VOCs), 17 PAHs/semi-volatile organic chemicals (SVOCs), seven pesticides, one PCB, 20 metals, and total petroleum hydrocarbons were detected in subsurface soil samples from UXO 32. A comparison of maximum detected subsurface soil concentrations to screening levels (based on direct contact USEPA RSLs) is presented in Table 2-5. The following chemicals were detected in subsurface soil at maximum concentrations exceeding the direct contact risk based COPC screening levels, and were retained as COPCs for subsurface soil at UXO 32:

- PAHs/SVOCs - benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and benzo(a)pyrene equivalents.
- Metals - arsenic.

The PAH COPCs were detected in, at most, 2 of 22 samples. Concentrations of aluminum, cobalt, iron, manganese, and vanadium exceeded direct contact COPC screening levels, but were within the range of background concentrations. Therefore, aluminum, cobalt, iron, manganese, and vanadium were eliminated as COPCs based on site data to background data comparisons.

Table 2-6 compares the maximum detected subsurface soil concentrations to protection of groundwater SSLs for chemical migration from soil to groundwater. The following chemicals were detected in subsurface soil at maximum concentrations exceeding the COPC screening levels for protection of groundwater and were retained as COPCs for subsurface soil at UXO 32:

- PAHs/SVOCs - benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, diethyl phthalate, di-n-butyl phthalate, and naphthalene.
- Pesticides - 4,4'-DDE, 4,4'-DDT, and heptachlor epoxide.
- PCBs - Aroclor-1260.
- Metals - arsenic, cadmium, copper, lead, and nickel.

Concentrations of cobalt, iron, manganese, mercury, selenium, silver, and vanadium in subsurface soil exceeded the groundwater protection screening levels but were within the background levels. A more refined evaluation of the potential for chemical migration from soil to groundwater is provided in Section 5.3.4.

2.3.3 Groundwater

Three VOCs, and three metals were detected in groundwater samples from UXO 32. A comparison of maximum detected groundwater concentrations to screening levels (based on USEPA RSLs for tapwater) is presented in Table 2-7. The following chemicals were detected in groundwater at maximum concentrations exceeding the direct contact risk based COPC screening levels, and were retained as COPCs for groundwater at UXO 32:

- VOCs - tetrachloroethene and trichloroethene.
- Metals – arsenic, beryllium, and cobalt.

Table 2-8 compares maximum detected groundwater concentrations to vapor intrusion screening levels for chemical migration from groundwater through building foundations and into indoor air. Tetrachloroethene and trichloroethene were selected as COPCs for the vapor intrusion pathway.

2.3.4 Summary

Table 2-9 summarizes the chemicals retained as COPCs for soil and groundwater at UXO 32. RAGS Part D tables for COPC selection are included in Attachment 3.

TABLE 2-1

HUMAN HEALTH SCREENING CRITERIA FOR SOIL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical	CAS Number	USEPA RSL[1] Adjusted Residential Soil		USEPA RSL[1] Protection of Groundwater SSL
DIOXINS/FURANS (NG/KG)				
1,2,3,4,6,7,8,9-OCDD	3268-87-9	15000	C	870
1,2,3,4,6,7,8,9-OCDF	39001-02-0	15000	C	870
1,2,3,4,6,7,8-HPCDD	35822-46-9	450	C	26
1,2,3,4,6,7,8-HPCDF	67562-39-4	450	C	26
1,2,3,4,7,8,9-HPCDF	55673-89-7	450	C	26
1,2,3,4,7,8-HXCDF	70648-26-9	45	C	2.6
1,2,3,6,7,8-HXCDD	57653-85-7	45	C	2.6
1,2,3,6,7,8-HXCDF	57117-44-9	45	C	2.6
1,2,3,7,8,9-HXCDD	19408-74-3	45	C	2.6
1,2,3,7,8-PECDF	57117-41-6	150	C	8.7
2,3,4,6,7,8-HXCDF	60851-34-5	45	C	2.6
2,3,4,7,8-PECDF	57117-31-4	15	C	0.87
2,3,7,8-TCDD	1746-01-6	4.5	C	0.26
2,3,7,8-TCDF	51207-31-9	45	C	2.6
2,3,7,8-TCDD EQUIVALENTS	NA	4.5	C	0.26
METALS (MG/KG)				
ALUMINUM	7429-90-5	7700	N	23000
ARSENIC	7440-38-2	0.39	C	0.0013
BARIUM	7440-39-3	1500	N	120
BERYLLIUM	7440-41-7	16	N	13
CADMIUM	7440-43-9	7	N	0.52
CALCIUM	7440-70-2	NC		NC
CHROMIUM	7440-47-3	12000	N[2]	28000000 [2]
COBALT	7440-48-4	2.3	N	0.21
COPPER	7440-50-8	310	N	22
IRON	7439-89-6	5500	N	270
LEAD	7439-92-1	400		14 [3]
MAGNESIUM	7439-95-4	NC		NC
MANGANESE	7439-96-5	180	N	21
MERCURY	7439-97-6	2.3	N[4]	0.033
NICKEL	7440-02-0	150	N	20
POTASSIUM	7440-09-7	NC		NC
SELENIUM	7782-49-2	39	N	0.4
SILVER	7440-22-4	39	N	0.6
VANADIUM	7440-62-2	39	N	78
ZINC	7440-66-6	2300	N	290
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)				
2-METHYLNAPHTHALENE	91-57-6	31000	N	140
ACENAPHTHYLENE	208-96-8	340000	N[5]	4100 [5]
ANTHRACENE	120-12-7	1700000	N	42000
BAP EQUIVALENTS	NA	15	C	NC
BENZO(A)ANTHRACENE	56-55-3	150	C	10
BENZO(A)PYRENE	50-32-8	15	C	3.5
BENZO(B)FLUORANTHENE	205-99-2	150	C	35
BENZO(G,H,I)PERYLENE	191-24-2	170000	N[6]	9500 [6]
BENZO(K)FLUORANTHENE	207-08-9	1500	C	350
CARBAZOLE	86-74-8	NC		NC
CHRYSENE	218-01-9	15000	C	1100
DIBENZO(A,H)ANTHRACENE	53-70-3	15	C	11
DIBENZOFURAN	132-64-9	7800	N	110
DIETHYL PHTHALATE	84-66-2	4900000	N	4700
DI-N-BUTYL PHTHALATE	84-74-2	610000	N	1700
FLUORANTHENE	206-44-0	230000	N	70000
FLUORENE	86-73-7	230000	N	4000
INDENO(1,2,3-CD)PYRENE	193-39-5	150	C	120
NAPHTHALENE	91-20-3	3600	C	0.47
PHENANTHRENE	85-01-8	170000	N[6]	9500 [6]
PYRENE	129-00-0	170000	N	9500

TABLE 2-1

HUMAN HEALTH SCREENING CRITERIA FOR SOIL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical	CAS Number	USEPA RSL[1]	
		Adjusted Residential Soil	Protection of Groundwater SSL
VOLATILES (UG/KG)			
ACETONE	67-64-1	6100000 N	2400
CARBON DISULFIDE	75-15-0	82000 N	210
PCBS (UG/KG)			
AROCLOR-1260	11096-82-5	220 C	24
PCBS (UG/KG)			
4,4'-DDD	72-54-8	2000 C	66
4,4'-DDE	72-55-9	1400 C	46
4,4'-DDT	50-29-3	1700 C	67
ENDOSULFAN II	33213-65-9	37000 N[7]	1100 [7]
ENDRIN	72-20-8	1800 N	68
GAMMA-CHLORDANE	5103-74-2	1600 C[8]	13 [8]
HEPTACHLOR EPOXIDE	1024-57-3	53 C	0.068
PETROLEUM HYDROCARBONS (MG/KG)			
TOTAL PETROLEUM HYDROCARBONS	NA	NC	NC

Footnotes:
1 - USEPA RSLs for Chemicals at Superfund Sites, November 2011. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
2 - The value is for trivalent chromium.
3 - MCL-based SSL.
4 - The value is for mercuric chloride (and other mercury salts).
5 - The value for acenaphthene is used as a surrogate.
6 - The value for pyrene is used as a surrogate.
7 - The value for endosulfan is used as a surrogate.
8 - The value for chlordane is used as a surrogate.

Definitions:
BAP = Benzo(a)pyrene
C = Carcinogen
CAS = Chemical Abstracts Service
MCL = Maximum Contaminant Level
N = Noncarcinogen
NC = No Criteria
NA = Not Available
RSL = Regional Screening Level
SSL = Soil Screening Level
USEPA = United States Environmental Protection Agency

TABLE 2-2

HUMAN HEALTH SCREENING CRITERIA FOR GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Parameter	USEPA Regional Screening Level - Tap Water(1)	USEPA Maximum Contaminant Level(2)	Groundwater Volatilization Criteria(3)
METALS (UG/L)			
ARSENIC	0.045 C	10	NA
BERYLLIUM	1.6 N	4	NA
COBALT	0.47 N	NA	NA
VOLATILES (UG/L)			
CIS-1,2-DICHLOROETHENE	2.8 N	70	38 N(4)
TETRACHLOROETHENE	0.072 C	5	0.57 C
TRICHLOROETHENE	0.26 N(5)	5	0.52 N

1 - USEPA Regional Screening Level, November 2011. Carcinogenic values represent an incremental cancer risk of 1E-06. The noncarcinogenic values are the RSL divided by 10 to correspond to a Target Hazard Quotient of 0.1.

2 - 2011 Edition of the Drinking Water Standards and Health Advisories.

3 - Calculated using methodology presented in Appendix D of USEPA's Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November 2002. EPA530-F-02-052. Values correspond to a target cancer risk level of 1E-6 or HQ = 0.1 and an attenuation factor of 0.001.

4 - Value is for trans-1,2-dichloroethene.

5 - Ten percent of non-cancer RSL is less than cancer RSL; therefore, presented non-cancer RSL.

TABLE 2-3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	Adjusted USEPA RSL Residential(5)	COPC Flag	Rationale for Contaminant Deletion or Selection(6)
DIOXINS/FURANS (NG/KG)											
3268-87-9	1,2,3,4,6,7,8,9-OCDD	1/1	6400	6400	U32SOS180601	-	6400	NA	15000 C	NO	BSL
39001-02-0	1,2,3,4,6,7,8,9-OCDF	1/1	530	530	U32SOS180601	-	530	NA	15000 C	NO	BSL
35822-46-9	1,2,3,4,6,7,8-HPCDD	1/1	450 J	450 J	U32SOS180601	-	450	NA	450 C	NO	BSL
67562-39-4	1,2,3,4,6,7,8-HPCDF	1/1	190 J	190 J	U32SOS180601	-	190	NA	450 C	NO	BSL
55673-89-7	1,2,3,4,7,8,9-HPCDF	1/1	62	62	U32SOS180601	-	62	NA	450 C	NO	BSL
70648-26-9	**1,2,3,4,7,8-HXCDF**	1/1	220	220	U32SOS180601	-	220	NA	**45 C**	YES	ASL
57653-85-7	1,2,3,6,7,8-HXCDD	1/1	9.1	9.1	U32SOS180601	-	9.1	NA	45 C	NO	BSL
57117-44-9	1,2,3,6,7,8-HXCDF	1/1	44	44	U32SOS180601	-	44	NA	45 C	NO	BSL
19408-74-3	1,2,3,7,8,9-HXCDD	1/1	5.9	5.9	U32SOS180601	-	5.9	NA	45 C	NO	BSL
57117-41-6	1,2,3,7,8-PECDF	1/1	48	48	U32SOS180601	-	48	NA	150 C	NO	BSL
60851-34-5	2,3,4,6,7,8-HXCDF	1/1	25	25	U32SOS180601	-	25	NA	45 C	NO	BSL
57117-31-4	**2,3,4,7,8-PECDF**	1/1	110	110	U32SOS180601	-	110	NA	**15 C**	YES	ASL
1746-01-6	2,3,7,8-TCDD	1/1	0.74 J	0.74 J	U32SOS180601	-	0.74	NA	4.5 C	NO	BSL
51207-31-9	**2,3,7,8-TCDF**	1/1	130	130	U32SOS180601	-	130	NA	**45 C**	YES	ASL
NA	**2,3,7,8-TCDD EQUIVALENTS(7)**	1/1	89.2	89.2	U32SOS180601	-	89.2	NA	**4.5 C**	YES	ASL
METALS (MG/KG)											
7440-38-2	**ARSENIC**	50/50	3.24 J	423 J	U32SO020101	-	423	14.9	**0.39 C**	YES	ASL
7440-39-3	BARIUM	1/1	150	150	U32SOS180601	-	150	80.4	1500 N	NO	BSL
7440-43-9	**CADMIUM**	6/16	0.0213 J	69	U32SOS180601	0.0313-0.552	69	2.5	**7 N**	YES	ASL
7440-47-3	CHROMIUM	1/1	75	75	U32SOS180601	-	75	33.4	12000 N(8)	NO	BSL
7439-92-1	**LEAD**	22/22	5.3	9800	U32SOS180601	-	9800	62.5	**400**	YES	ASL
7439-97-6	**MERCURY**	1/1	3.3 J	3.3 J	U32SOS180601	-	3.3	0.16	**2.3 N(9)**	YES	ASL
7782-49-2	SELENIUM	1/1	0.91	0.91	U32SOS180601	-	0.91	1.2	39 N	NO	BSL, BKG
7440-66-6	**ZINC**	1/1	3500	3500	U32SOS180601	-	3500	37.5	**2300 N**	YES	ASL
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
91-57-6	2-METHYLNAPHTHALENE	2/2	3.55 J	20.7	U32SA05SB0101-D	-	20.7	73	31000 N	NO	BSL, BKG
208-96-8	ACENAPHTHYLENE	1/2	5.91 J	5.91 J	U32SA05SB0201	7.78-7.81	5.91	NA	340000 N(10)	NO	BSL
120-12-7	ANTHRACENE	2/2	9.72	10.6	U32SA05SB0201	7.81	10.6	260	1700000 N	NO	BSL, BKG
NA	**BAP EQUIVALENTS(7)**	9/17	23.71	1200	U32SO050101	360-400	1200	NA	**15 C**	YES	ASL
56-55-3	BENZO(A)ANTHRACENE	2/2	18	20.2	U32SA05SB0101	-	20.2	480	150 C	NO	BSL, BKG
50-32-8	**BENZO(A)PYRENE**	9/17	12.5	1200	U32SO050101	360-400	1200	390	**15 C**	YES	ASL
205-99-2	BENZO(B)FLUORANTHENE	2/2	30.1	49	U32SA05SB0101	-	49	420	150 C	NO	BSL, BKG
191-24-2	BENZO(G,H,I)PERYLENE	2/2	12.1 J	15 J	U32SA05SB0201	-	15	130	170000 N(11)	NO	BSL, BKG
207-08-9	BENZO(K)FLUORANTHENE	2/2	8.98 J	62.2 J	U32SA05SB0101	-	62.2	360	1500 C	NO	BSL, BKG
218-01-9	CHRYSENE	2/2	28	64.8	U32SA05SB0101-D	-	64.8	440	15000 C	NO	BSL, BKG
53-70-3	DIBENZO(A,H)ANTHRACENE	1/17	4.28 J	5.46 J	U32SA05SB0101-D	7.88-400	5.46	NA	15 C	NO	BSL
206-44-0	FLUORANTHENE	2/2	28.9	39.3	U32SA05SB0101	-	39.3	1100	230000 N	NO	BSL, BKG
86-73-7	FLUORENE	1/2	3.89 J	3.89 J	U32SA05SB0101	7.81-7.88	3.89	150	230000 N	NO	BSL, BKG
193-39-5	INDENO(1,2,3-CD)PYRENE	2/2	7.81 J	14.2	U32SA05SB0201	-	14.2	100	150 C	NO	BSL, BKG
91-20-3	NAPHTHALENE	2/2	5.12 J	6.63 J	U32SA05SB0101-D	-	6.63	110	3600 C	NO	BSL, BKG

TABLE 2-3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Background Concentration[4]	Adjusted USEPA RSL Residential[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
85-01-8	PHENANTHRENE	2/2	14.6	82.3	U32SA05SB0101-D	-	82.3	1100	170000 N[11]	NO	BSL, BKG
129-00-0	PYRENE	2/2	21.1	28.4	U32SA05SB0101	-	28.4	880	170000 N	NO	BSL, BKG
PCBS (UG/KG)											
11096-82-5	**AROCLOR-1260**	25/31	5.8 J	11000	U32SBS090101	38-44.3	11000	NA	**220 C**	YES	ASL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - 95% UTL for surface soil from Background Soil Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland (Tetra Tech, 2002).
5 - USEPA RSLs for Chemicals at Superfund Sites, November 2011. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and background.
8 - The value is for trivalent chromium.
9 - The value is for mercuric chloride (and other mercury salts).
10 - The value for acenaphthene is used as a surrogate.
11 - The value for pyrene is used as a surrogate.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Rationale Codes:
For selection as a COPC:
ASL = Above screening level and background

For elimination as a COPC:
BSL = Below screening level
BKG = Below background concentration

Definitions:
BAP = Benzo(a)pyrene
CAS = Chemical Abstracts Service
COPC = Chemical of potential concern
J = Estimated value
NA = Not Available
NC = No Criteria
RSL = Regional Screening Level
USEPA = United States Environmental Protection Agency
UTL - Upper Tolerance Limit

TABLE 2-4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

CAS Number	Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	USEPA Protection of Groundwater SSL (5)	COPC Flag	Rationale for Contaminant Deletion or Selection(6)
DIOXINS/FURANS (NG/KG)											
3268-87-9	**1,2,3,4,6,7,8,9-OCDD**	1/1	6400	6400	U32SOS180601	-	6400	NA	**870**	YES	ASL
39001-02-0	1,2,3,4,6,7,8,9-OCDF	1/1	530	530	U32SOS180601	-	530	NA	870	NO	BSL
35822-46-9	**1,2,3,4,6,7,8-HPCDD**	1/1	450 J	450 J	U32SOS180601	-	450	NA	**26**	YES	ASL
67562-39-4	**1,2,3,4,6,7,8-HPCDF**	1/1	190 J	190 J	U32SOS180601	-	190	NA	**26**	YES	ASL
55673-89-7	**1,2,3,4,7,8,9-HPCDF**	1/1	62	62	U32SOS180601	-	62	NA	**26**	YES	ASL
70648-26-9	**1,2,3,4,7,8-HXCDF**	1/1	220	220	U32SOS180601	-	220	NA	**2.6**	YES	ASL
57653-85-7	**1,2,3,6,7,8-HXCDD**	1/1	9.1	9.1	U32SOS180601	-	9.1	NA	**2.6**	YES	ASL
57117-44-9	**1,2,3,6,7,8-HXCDF**	1/1	44	44	U32SOS180601	-	44	NA	**2.6**	YES	ASL
19408-74-3	**1,2,3,7,8,9-HXCDD**	1/1	5.9	5.9	U32SOS180601	-	5.9	NA	**2.6**	YES	ASL
57117-41-6	**1,2,3,7,8-PECDF**	1/1	48	48	U32SOS180601	-	48	NA	**8.7**	YES	ASL
60851-34-5	**2,3,4,6,7,8-HXCDF**	1/1	25	25	U32SOS180601	-	25	NA	**2.6**	YES	ASL
57117-31-4	**2,3,4,7,8-PECDF**	1/1	110	110	U32SOS180601	-	110	NA	**0.87**	YES	ASL
1746-01-6	**2,3,7,8-TCDD**	1/1	0.74 J	0.74 J	U32SOS180601	-	0.74	NA	**0.26**	YES	ASL
51207-31-9	**2,3,7,8-TCDF**	1/1	130	130	U32SOS180601	-	130	NA	**2.6**	YES	ASL
NA	**2,3,7,8-TCDD EQUIVALENTS(7)**	1/1	89.2	89.2	U32SOS180601	-	89.2	NA	**0.26**	YES	ASL
METALS (MG/KG)											
7440-38-2	**ARSENIC**	50/50	3.24 J	423 J	U32SO020101	-	423	14.9	**0.0013**	YES	ASL
7440-39-3	**BARIUM**	1/1	150	150	U32SOS180601	-	150	80.4	**120**	YES	ASL
7440-43-9	**CADMIUM**	6/16	0.0213 J	69	U32SOS180601	0.0313-0.552	69	2.5	**0.52**	YES	ASL
7440-47-3	CHROMIUM	1/1	75	75	U32SOS180601	-	75	33.4	28000000 (8)	NO	BSL
7439-92-1	**LEAD**	22/22	5.3	9800	U32SOS180601	-	9800	62.5	**14** (9)	YES	ASL
7439-97-6	**MERCURY**	1/1	3.3 J	3.3 J	U32SOS180601	-	3.3	0.16	**0.033**	YES	ASL
7782-49-2	SELENIUM	1/1	0.91	0.91	U32SOS180601	-	0.91	1.2	**0.4**	NO	BKG
7440-66-6	**ZINC**	1/1	3500	3500	U32SOS180601	-	3500	37.5	**290**	YES	ASL
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
91-57-6	2-METHYLNAPHTHALENE	2/2	3.55 J	20.7	U32SA05SB0101-D	-	20.7	73	140	NO	BSL, BKG
208-96-8	ACENAPHTHYLENE	1/2	5.91 J	5.91 J	U32SA05SB0201	7.78-7.81	5.91	NA	4100 (10)	NO	BSL
120-12-7	ANTHRACENE	2/2	9.72	10.6	U32SA05SB0201	7.81	10.6	260	42000	NO	BSL, BKG
NA	BAP EQUIVALENTS(7)	9/17	23.71	1200	U32SO050101	360-400	1200	NA	NC	NO	NTX
56-55-3	BENZO(A)ANTHRACENE	2/2	18	20.2	U32SA05SB0101	-	20.2	480	**10**	NO	BKG
50-32-8	**BENZO(A)PYRENE**	9/17	12.5	1200	U32SO050101	360-400	1200	390	**3.5**	YES	ASL
205-99-2	BENZO(B)FLUORANTHENE	2/2	30.1	49	U32SA05SB0101	-	49	420	**35**	NO	BKG
191-24-2	BENZO(G,H,I)PERYLENE	2/2	12.1 J	15 J	U32SA05SB0201	-	15	130	9500 (11)	NO	BSL, BKG
207-08-9	BENZO(K)FLUORANTHENE	2/2	8.98 J	62.2 J	U32SA05SB0101	-	62.2	360	350	NO	BSL, BKG
218-01-9	CHRYSENE	2/2	28	64.8	U32SA05SB0101-D	-	64.8	440	1100	NO	BSL, BKG
53-70-3	DIBENZO(A,H)ANTHRACENE	1/17	4.28 J	5.46 J	U32SA05SB0101-D	7.88-400	5.46	NA	11	NO	BSL
206-44-0	FLUORANTHENE	2/2	28.9	39.3	U32SA05SB0101	-	39.3	1100	70000	NO	BSL, BKG
86-73-7	FLUORENE	1/2	3.89 J	3.89 J	U32SA05SB0101	7.81-7.88	3.89	150	4000	NO	BSL, BKG

TABLE 2-4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Background Concentration[4]	USEPA Protection of Groundwater SSL [5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
193-39-5	INDENO(1,2,3-CD)PYRENE	2/2	7.81 J	14.2	U32SA05SB0201	-	14.2	100	120	NO	BSL, BKG
91-20-3	NAPHTHALENE	2/2	5.12 J	6.63 J	U32SA05SB0101-D	-	6.63	110	0.47	NO	BKG
85-01-8	PHENANTHRENE	2/2	14.6	82.3	U32SA05SB0101-D	-	82.3	1100	9500 [11]	NO	BSL, BKG
129-00-0	PYRENE	2/2	21.1	28.4	U32SA05SB0101	-	28.4	880	9500	NO	BSL, BKG
PCBS (UG/KG)											
11096-82-5	**AROCLOR-1260**	25/31	5.8 J	11000	U32SBS090101	38-44.3	11000	NA	24	YES	ASL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - 95% UTL for surface soil from Background Soil Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland (Tetra Tech, 2002).
5 - USEPA RSLs for Chemicals at Superfund Sites (November 2011). Dilution attenuation factor = 1. Risk-based SSLs.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and background.
7 - Calculated using half the value of the detection limit for nondetects.
8 - The value is for trivalent chromium.
9 - MCL- based SSL.
10 - The value for acenaphthene is used as a surrogate.
11 - The value for pyrene is used as a surrogate.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Rationale Codes:
For selection as a COPC:
ASL = Above screening level and background

For elimination as a COPC:
BSL = Below screening level
BKG = Below background concentration
NTX = No toxicity criteria

Definitions:
BAP = Benzo(a)pyrene
C = Carcinogen
CAS = Chemical Abstracts Service
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum Contaminant Level
NA = Not Available
RSL = Regional Screening Level
SSL = Soil Screening Level
USEPA = United States Environmental Protection Agency
UTL - Upper Tolerance Limit

TABLE 2-5

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	Adjusted USEPA RSL Residential(5)	COPC Flag	Rationale for Contaminant Deletion or Selection(6)
METALS (MG/KG)											
7429-90-5	ALUMINUM	22/22	415	11900	41SB0504	-	11900	35400	7700 N	NO	BKG
7440-38-2	ARSENIC	36/49	0.965 J	328 J	41SB0201	0.5-0.78	328	18.9	0.39 C	YES	ASL
7440-39-3	BARIUM	7/22	54.4	93.9	41SB0105	7.2-43.3	93.9	134	1500 N	NO	BSL, BKG
7440-41-7	BERYLLIUM	5/22	0.3	4.6	41SB0105	0.23-1	4.6	3.3	16 N	NO	BSL
7440-43-9	CADMIUM	2/22	1.2	2	41SB0201	1.2-1.3	2	0.61	7 N	NO	BSL
7440-70-2	CALCIUM	6/22	1430	3480	41SB0504	74.9-1200	3480	2590	NC	NO	NUT
7440-47-3	CHROMIUM	16/22	2.6	27.7	41SB0504	2.5-2.6	27.7	60.1	12000 N(8)	NO	BSL, BKG
7440-48-4	COBALT	8/22	15.9	71.7	41SB0704	3.5-10.4	71.7	133	2.3 N	NO	BKG
7440-50-8	COPPER	15/22	6.6	62.9	41SB0304	2.5-5.9	62.9	48.6	310 N	NO	BSL
7439-89-6	IRON	22/22	481	79600	41SB0504	-	79600	83100	5500 N	NO	BKG
7439-92-1	LEAD	26/26	1.7	46 J	41SB0201	2.5	46	40.5	400	NO	BSL
7439-95-4	MAGNESIUM	5/22	1650	3180	41SB0504	29.2-1150	3180	2640	NC	NO	NUT
7439-96-5	MANGANESE	19/22	4.1	369	41SB0503	1.3-3.3	369	4130	180 N	NO	BKG
7439-97-6	MERCURY	1/22	0.18	0.18	41SB0201	0.1-0.26	0.18	0.18	2.3 N(9)	NO	BSL, BKG
7440-02-0	NICKEL	5/22	13.7	53.1	41SB0704	3.5-7.2	53.1	18.2	150 N	NO	BSL
7440-09-7	POTASSIUM	5/22	1290	3320	41SB0504	213-1170	3320	2610	NC	NO	NUT
7782-49-2	SELENIUM	1/22	0.7 J	0.7 J	41SB0201	0.3-0.7	0.7	13.3	39 N	NO	BSL, BKG
7440-22-4	SILVER	4/22	4.1	10.1	41SB0404	1.2-2	10.1	11.4	39 N	NO	BSL, BKG
7440-62-2	VANADIUM	11/22	11.8	125	41SB0504	3.4-11.1	125	194	39 N	NO	BKG
7440-66-6	ZINC	22/22	4.7	97.2	41SB0504	2.6	97.2	70.4	2300 N	NO	BSL
SEMIVOLATILES (UG/KG)											
91-57-6	2-METHYLNAPHTHALENE	1/22	38 J	38 J	41SB0201	370-470	38	NA	31000 N	NO	BSL
208-96-8	ACENAPHTHYLENE	1/22	82 J	82 J	41SB0402	380-470	82	NA	340000 N(10)	NO	BSL
120-12-7	ANTHRACENE	1/22	90 J	90 J	41SB0402	380-470	90	NA	1700000 N	NO	BSL
NA	BAP EQUIVALENTS(7)	2/22	346	480	41SB0402	390-470	480	NA	15 C	YES	ASL
56-55-3	BENZO(A)ANTHRACENE	1/22	320 J	320 J	41SB0402	380-470	320	NA	150 C	YES	ASL
50-32-8	BENZO(A)PYRENE	2/22	100 J	190 J	41SB0402	390-470	190	NA	15 C	YES	ASL
205-99-2	BENZO(B)FLUORANTHENE	2/22	160 J	560	41SB0402	390-470	560	NA	150 C	YES	ASL
207-08-9	BENZO(K)FLUORANTHENE	1/22	420	420	41SB0402	380-470	420	NA	1500 C	NO	BSL
86-74-8	CARBAZOLE	2/22	48 J	250 J	41SB0201	390-470	250	NA	NC	NO	NTX
218-01-9	CHRYSENE	1/22	520	520	41SB0402	380-470	520	NA	15000 C	NO	BSL
132-64-9	DIBENZOFURAN	1/22	42 J	42 J	41SB0402	380-470	42	NA	7800 N	NO	BSL
84-66-2	DIETHYL PHTHALATE	1/22	12000	12000	41SB0201	370-470	12000	NA	4900000 N	NO	BSL
84-74-2	DI-N-BUTYL PHTHALATE	1/22	3300	3300	41SB0201	370-470	3300	NA	610000 N	NO	BSL
206-44-0	FLUORANTHENE	1/22	640	640	41SB0402	380-470	640	NA	230000 N	NO	BSL
193-39-5	INDENO(1,2,3-CD)PYRENE	1/22	120 J	120 J	41SB0402	380-470	120	NA	150 C	NO	BSL
91-20-3	NAPHTHALENE	1/22	56 J	56 J	41SB0402	380-470	56	NA	3600 C	NO	BSL
85-01-8	PHENANTHRENE	2/22	140 J	350 J	41SB0402	390-470	350	NA	170000 N(11)	NO	BSL
129-00-0	PYRENE	1/22	520	520	41SB0402	380-470	520	NA	170000 N	NO	BSL

TABLE 2-5

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	Adjusted USEPA RSL Residential(5)	COPC Flag	Rationale for Contaminant Deletion or Selection(6)
VOLATILES (UG/KG)											
67-64-1	ACETONE	2/22	490	1200	41SB0203	9-220	1200	NA	6100000 N	NO	BSL
75-15-0	CARBON DISULFIDE	6/22	2 J	6 J	41SB0103, 41SB0403	11-13	6	NA	82000 N	NO	BSL
PCBS (UG/KG)											
11096-82-5	AROCLOR-1260	2/26	11 J	67	U32SBS133401	37-47	67	NA	220 C	NO	BSL
PESTICIDES/PCBS (UG/KG)											
72-54-8	4,4'-DDD	2/22	0.86 J	53	41SB0201	3.7-4.7	53	NA	2000 C	NO	BSL
72-55-9	4,4'-DDE	1/22	160	160	41SB0201	3.7-4.7	160	0.68	1400 C	NO	BSL
50-29-3	4,4'-DDT	3/22	5.9	980	41SB0201	3.8-4.7	980	3.9	1700 C	NO	BSL
33213-65-9	ENDOSULFAN II	1/22	1.5 J	1.5 J	41SB0503	3.7-4.7	1.5	NA	37000 N(12)	NO	BSL
72-20-8	ENDRIN	2/22	15	20	41SB0402	3.8-4.7	20	NA	1800 N	NO	BSL
5103-74-2	GAMMA-CHLORDANE	1/22	1.4 J	1.4 J	41SB0201	1.9-2.4	1.4	NA	1600 C(13)	NO	BSL
1024-57-3	HEPTACHLOR EPOXIDE	1/22	2.9	2.9	41SB0503	1.9-2.4	2.9	NA	53 C	NO	BSL
PETROLEUM HYDROCARBONS (MG/KG)											
NA	TOTAL PETROLEUM HYDROCARBONS	5/22	12.5	143	41SB0201	10-12.9	143	39.1	NC	NO	NTX

Footnotes:

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - 95% UTL for clay-like subsurface soil from Background Soil Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland (Tetra Tech, 2002)
5 - USEPA RSLs for Chemicals at Superfund Sites, November 2011. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and background.
7 - Calculated using half the value of the detection limit for nondetects.
8 - The value is for trivalent chromium.
9 - The value is for mercuric chloride (and other mercury salts).
10 - The value for acenaphthene is used as a surrogate.
11 - The value for pyrene is used as a surrogate.
12 - The value for endosulfan is used as a surrogate.
13 - The value for chlordane is used as a surrogate.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Rationale Codes:

For selection as a COPC:
ASL = Above screening level and background

For elimination as a COPC:
BSL = Below screening level
BKG = Below background concentration
NUT = Essential nutrient
NTX = No toxicity criteria

Definitions:

BAP = Benzo(a)pyrene
C = Carcinogen
CAS = Chemical Abstracts Service
COPC = Chemical of potential concern
J = Estimated value
NA = Not Available
NC = No Criteria
RSL = Regional Screening Level
USEPA = United States Environmental Protection Agency
UTL - Upper Tolerance Limit

TABLE 2-6

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Background Concentration[4]	USEPA Protection of Groundwater SSL [5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
METALS (MG/KG)											
7429-90-5	ALUMINUM	22/22	415	11900	41SB0504	-	11900	35400	23000	NO	BSL, BKG
7440-38-2	**ARSENIC**	36/49	0.965 J	328 J	41SB0201	0.5-0.78	328	18.9	**0.0013**	YES	ASL
7440-39-3	BARIUM	7/22	54.4	93.9	41SB0105	7.2-43.3	93.9	134	120	NO	BSL, BKG
7440-41-7	BERYLLIUM	5/22	0.3	4.6	41SB0105	0.23-1	4.6	3.3	13	NO	BSL
7440-43-9	**CADMIUM**	2/22	1.2	2	41SB0201	1.2-1.3	2	0.61	**0.52**	YES	ASL
7440-70-2	CALCIUM	6/22	1430	3480	41SB0504	74.9-1200	3480	2590	NC	NO	NUT
7440-47-3	CHROMIUM	16/22	2.6	27.7	41SB0504	2.5-2.6	27.7	60.1	28000000 [8]	NO	BSL, BKG
7440-48-4	COBALT	8/22	15.9	71.7	41SB0704	3.5-10.4	71.7	133	**0.21**	NO	BKG
7440-50-8	**COPPER**	15/22	6.6	62.9	41SB0304	2.5-5.9	62.9	48.6	**22**	YES	ASL
7439-89-6	IRON	22/22	481	79600	41SB0504	-	79600	83100	**270**	NO	BKG
7439-92-1	**LEAD**	26/26	1.7	46 J	41SB0201	2.5	46	40.5	**14** [9]	YES	ASL
7439-95-4	MAGNESIUM	5/22	1650	3180	41SB0504	29.2-1150	3180	2640	NC	NO	NUT
7439-96-5	MANGANESE	19/22	4.1	369	41SB0503	1.3-3.3	369	4130	**21**	NO	BKG
7439-97-6	MERCURY	1/22	0.18	0.18	41SB0201	0.1-0.26	0.18	0.18	**0.033**	NO	BKG
7440-02-0	**NICKEL**	5/22	13.7	53.1	41SB0704	3.5-7.2	53.1	18.2	**20**	YES	ASL
7440-09-7	POTASSIUM	5/22	1290	3320	41SB0504	213-1170	3320	2610	NC	NO	NUT
7782-49-2	SELENIUM	1/22	0.7 J	0.7 J	41SB0201	0.3-0.7	0.7	13.3	**0.4**	NO	BKG
7440-22-4	SILVER	4/22	4.1	10.1	41SB0404	1.2-2	10.1	11.4	**0.6**	NO	BKG
7440-62-2	VANADIUM	11/22	11.8	125	41SB0504	3.4-11.1	125	194	**78**	NO	BKG
7440-66-6	ZINC	22/22	4.7	97.2	41SB0504	2.6	97.2	70.4	290	NO	BSL
SEMIVOLATILES (UG/KG)											
91-57-6	2-METHYLNAPHTHALENE	1/22	38 J	38 J	41SB0201	370-470	38	NA	140	NO	BSL
208-96-8	ACENAPHTHYLENE	1/22	82 J	82 J	41SB0402	380-470	82	NA	4100 [10]	NO	BSL
120-12-7	ANTHRACENE	1/22	90 J	90 J	41SB0402	380-470	90	NA	42000	NO	BSL
NA	BAP EQUIVALENTS[7]	2/22	346	480	41SB0402	390-470	480	NA	NC	NO	NTX
56-55-3	**BENZO(A)ANTHRACENE**	1/22	320 J	320 J	41SB0402	380-470	320	NA	**10**	YES	ASL
50-32-8	**BENZO(A)PYRENE**	2/22	100 J	190 J	41SB0402	390-470	190	NA	**3.5**	YES	ASL
205-99-2	**BENZO(B)FLUORANTHENE**	2/22	160 J	560	41SB0402	390-470	560	NA	**35**	YES	ASL
207-08-9	**BENZO(K)FLUORANTHENE**	1/22	420	420	41SB0402	380-470	420	NA	**350**	YES	ASL
86-74-8	CARBAZOLE	2/22	48 J	250 J	41SB0201	390-470	250	NA	NC	NO	NTX
218-01-9	CHRYSENE	1/22	520	520	41SB0402	380-470	520	NA	1100	NO	BSL
132-64-9	DIBENZOFURAN	1/22	42 J	42 J	41SB0402	380-470	42	NA	110	NO	BSL
84-66-2	**DIETHYL PHTHALATE**	1/22	12000	12000	41SB0201	370-470	12000	NA	**4700**	YES	ASL
84-74-2	**DI-N-BUTYL PHTHALATE**	1/22	3300	3300	41SB0201	370-470	3300	NA	**1700**	YES	ASL
206-44-0	FLUORANTHENE	1/22	640	640	41SB0402	380-470	640	NA	70000	NO	BSL
193-39-5	INDENO(1,2,3-CD)PYRENE	1/22	120 J	120 J	41SB0402	380-470	120	NA	120	NO	BSL
91-20-3	**NAPHTHALENE**	1/22	56 J	56 J	41SB0402	380-470	56	NA	**0.47**	YES	ASL
85-01-8	PHENANTHRENE	2/22	140 J	350 J	41SB0402	390-470	350	NA	9500 [11]	NO	BSL
129-00-0	PYRENE	1/22	520	520	41SB0402	380-470	520	NA	9500	NO	BSL

TABLE 2-6

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Background Concentration[4]	USEPA Protection of Groundwater SSL [5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
VOLATILES (UG/KG)											
67-64-1	ACETONE	2/22	490	1200	41SB0203	9-220	1200	NA	2400	NO	BSL
75-15-0	CARBON DISULFIDE	6/22	2 J	6 J	41SB0103, 41SB0403	11-13	6	NA	210	NO	BSL
PCBS (UG/KG)											
11096-82-5	**AROCLOR-1260**	2/26	11 J	67	U32SBS133401	37-47	67	NA	**24**	YES	ASL
PESTICIDES/PCBS (UG/KG)											
72-54-8	4,4'-DDD	2/22	0.86 J	53	41SB0201	3.7-4.7	53	NA	66	NO	BSL
72-55-9	**4,4'-DDE**	1/22	160	160	41SB0201	3.7-4.7	160	0.68	**46**	YES	ASL
50-29-3	**4,4'-DDT**	3/22	5.9	980	41SB0201	3.8-4.7	980	3.9	**67**	YES	ASL
33213-65-9	ENDOSULFAN II	1/22	1.5 J	1.5 J	41SB0503	3.7-4.7	1.5	NA	1100 [12]	NO	BSL
72-20-8	ENDRIN	2/22	15	20	41SB0402	3.8-4.7	20	NA	68	NO	BSL
5103-74-2	GAMMA-CHLORDANE	1/22	1.4 J	1.4 J	41SB0201	1.9-2.4	1.4	NA	13 [13]	NO	BSL
1024-57-3	**HEPTACHLOR EPOXIDE**	1/22	2.9	2.9	41SB0503	1.9-2.4	2.9	NA	**0.068**	YES	ASL
PETROLEUM HYDROCARBONS (MG/KG)											
NA	TOTAL PETROLEUM HYDROCARBONS	5/22	12.5	143	41SB0201	10-12.9	143	39.1	NC	NO	NTX

Footnotes:

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - 95% UTL for clay-like subsurface soil from Background Soil Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland (Tetra Tech, 2002)
5 - USEPA RSLs for Chemicals at Superfund Sites (November 2011). Dilution attenuation factor = 1. Risk-based SSLs.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and background.
7 - Calculated using half the value of the detection limit for nondetects.
8 - The value is for trivalent chromium.
9 - MCL-based SSL.
10 - The value for acenaphthene is used as a surrogate.
11 - The value for pyrene is used as a surrogate.
12 - The value for endosulfan is used as a surrogate.
13 - The value for chlordane is used as a surrogate.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Rationale Codes:

For selection as a COPC:
ASL = Above screening level and background

For elimination as a COPC:
BSL = Below screening level
BKG = Below background concentration
NTX = No toxicity criteria

Definitions:

BAP = Benzo(a)pyrene
C = Carcinogen
CAS = Chemical Abstracts Service
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum Contaminant Level
NA = Not Available
RSL = Regional Screening Level
SSL = Soil Screening Level
USEPA = United States Environmental Protection Agency
UTL - Upper Tolerance Limit

TABLE 2-7

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN -DIRECT CONTACT WITH GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	Adjusted USEPA Tapwater(5)		USEPA MCL(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)
Metals (ug/L)												
ARSENIC	8/10	1.16 J	15.5	S32GW05-0611	1.5	15.5	NA	0.045	C	10	YES	ASL
BERYLLIUM	10/10	0.563 J	10.5	S32GW08-0611	-	10.5	NA	1.6	N	4	YES	ASL
COBALT	10/10	39.9	779	S32GW09-0611	-	779	NA	0.47	N	NC	YES	ASL
Volatile Organic Compounds (ug/L)												
CIS-1,2-DICHLOROETHENE	2/10	0.47 J	0.877 J	S32GW09-0611	0.5-2.5	0.877	NA	2.8	N	70	NO	BSL
TETRACHLOROETHENE	2/10	0.285 J	0.73 J	S32GW09-0611	0.5-2.5	0.73	NA	0.072	C	5	YES	ASL
TRICHLOROETHENE	10/10	1.31	75	S32GW09-0611	-	75	NA	0.26	N(8)	5	YES	ASL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background concentrations are not available.
5 - USEPA RSLs for Chemicals at Superfund Sites, November 2011. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - 2011 Edition of the Drinking Water Standards and Health Advisories (USEPA, January 2011).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Ten percent of non-cancer RSL is less than cancer RSL; therefore, presented non-cancer RSL.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum contaminant level
N = Non-carcinogen
NA = Not Available
NC = No Criteria
RSL = Regional Screening Level
USEPA = United States Environmental Protection Agency

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For elimination as a COPC:
BSL = Below COPC screening level

TABLE 2-8

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - VAPOR INTRUSION
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	Is Chemical Sufficiently Volatile and Toxic?(5)	Vapor Intrusion Criteria(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)
Metals (ug/L)											
ARSENIC	8/10	1.16 J	15.5	S32GW05-0611	1.5	15.5	NA	No	NA	NO	NTX
BERYLLIUM	10/10	0.563 J	10.5	S32GW08-0611	-	10.5	NA	No	NA	NO	NTX
COBALT	10/10	39.9	779	S32GW09-0611	-	779	NA	No	NA	NO	NTX
Volatile Organic Compounds (ug/L)											
CIS-1,2-DICHLOROETHENE	2/10	0.47 J	0.877 J	S32GW09-0611	0.5-2.5	0.877	NA	Yes	38 N(8)	NO	BSL
TETRACHLOROETHENE	2/10	0.285 J	0.73 J	S32GW09-0611	0.5-2.5	0.73	NA	Yes	**0.57 C**	YES	ASL
TRICHLOROETHENE	10/10	1.31	75	S32GW09-0611	-	75	NA	Yes	**0.52 N**	YES	ASL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background concentrations are not available.
5 - Appendix A of DoD Vapor Intrusion Handbook, January 2009.
6 - Calculated using methodology presented in Appendix D of USEPA's Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November 2002. EPA530-F-02-052. Values correspond to a target cancer risk level of 1E-6 or HQ = 0.1 and an attenuation factor of 0.001.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Value is for trans-1,2-dichloroethene.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value

N = Non-carcinogen
NA = Not Available
USEPA = United States Environmental Protection Agency

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For elimination as a COPC:
BSL = Below COPC screening level
NTX = No toxicity criteria

TABLE 2-9

CHEMICALS RETAINED AS COPCs
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Parameter	Surface Soil		Subsurface Soil		Groundwater	
	Direct Contact	Soil to Groundwater	Direct Contact	Soil to Groundwater	Direct Contact	Vapor Intrusion
DIOXINS/FURANS						
1,2,3,4,6,7,8,9-OCDD		X				
1,2,3,4,6,7,8-HPCDD		X				
1,2,3,4,6,7,8-HPCDF		X				
1,2,3,4,7,8,9-HPCDF		X				
1,2,3,4,7,8-HXCDF	X	X				
1,2,3,6,7,8-HXCDD		X				
1,2,3,6,7,8-HXCDF		X				
1,2,3,7,8,9-HXCDD		X				
1,2,3,7,8-PECDF		X				
2,3,4,6,7,8-HXCDF		X				
2,3,4,7,8-PECDF	X	X				
2,3,7,8-TCDD		X				
2,3,7,8-TCDF	X	X				
2,3,7,8-TCDD EQUIVALENTS	X	X				
METALS						
ARSENIC	X	X	X	X	X	
BARIUM		X				
BERYLLIUM					X	
CADMIUM	X	X		X		
COBALT					X	
COPPER				X		
LEAD	X	X		X		
MERCURY	X	X				
NICKEL				X		
ZINC	X	X				
SEMIVOLATILES						
BAP EQUIVALENT	X		X			
BENZO(A)ANTHRACENE			X	X		
BENZO(A)PYRENE	X	X	X	X		
BENZO(B)FLUORANTHENE			X	X		
BENZO(K)FLUORANTHENE				X		
DIETHYL PHTHALATE				X		
DI-N-BUTYL PHTHALATE				X		
NAPHTHALENE				X		
VOLATILES						
TETRACHLOROETHENE					X	X
TRICHLOROETHENE					X	X
PCBS						
AROCLOR-1260	X	X		X		
PESTICIDES						
4,4'-DDE				X		
4,4'-DDT				X		
HEPTACHLOR EPOXIDE				X		

Notes:
X - Chemical was retained as a chemical of potential concern (COPC).

3.0 EXPOSURE ASSESSMENT

The exposure assessment phase of the risk assessment defines and evaluates, either quantitatively or qualitatively, the type and magnitude of human exposure to the chemicals present at or migrating from the site. The exposure assessment is designed to depict the physical setting of the site, to identify potentially exposed populations and applicable exposure pathways, to calculate concentrations of COPCs to which receptors might be exposed, and to estimate chemical intakes under the identified exposure scenarios.

Actual or potential exposures at UXO 32 are based on the most likely pathways of contaminant release and transport, as well as on patterns of human activity. A complete exposure pathway has three components: a source of chemicals that can be released to the environment, a route of contaminant transport through an environmental medium, and an exposure or contact point for a human receptor.

3.1 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) facilitates consistent and comprehensive evaluation of potential risks to human health by creating a framework for identifying pathways by which human receptors may come in contact with environmental media contaminated by site activities. A CSM depicts relationships among the following elements, which are necessary to define complete exposure pathways:

- Site sources of contamination
- Contaminant release mechanisms and transport/migration pathways
- Exposure routes
- Potential receptors

The elements of the CSM establish the manner and degree to which a potential receptor may be exposed to chemicals present at the site. The degree of risk incurred by a potential receptor varies according to the means of exposure, duration of exposure, and specific chemical(s) to which the receptor is exposed. An exposure, however long in duration, does not necessarily result in an “unacceptable” health or environmental risk, although risks generally increase with increased frequency and/or duration of exposure.

Section 3.1.1 discusses the identified sources of possible contamination, Section 3.1.2 discusses contaminant release mechanisms and transport and migration pathways, and Section 3.1.3 and Table 3-1 provide site-specific summaries of potential receptors and exposure pathways evaluated for UXO 32. A summary of the exposure routes (addressed quantitatively for each human receptor) is provided in Table 3-2. Figure 3-1 illustrates the CSM for UXO 32.

3.1.1 Site Sources of Contamination

UXO 32 is a fenced scrap yard that is approximately 750 feet long and 100 feet wide. A concrete pad covers a large portion of the site. Potential sources of contamination are electrical transformers and lead batteries stored at the site. The transformers are believed to have leaked and contaminated soil in the northwestern portion of UXO 32. UXO 32 is adjacent to Mattawoman Creek. Runoff from the site flows toward Mattawoman Creek.

3.1.2 Potential Contaminant Release Mechanisms and Transport Pathways

The soil data collected at UXO 32 indicate that past activities have released contaminants to the surrounding environment. Once chemicals have been released to an environmental medium (e.g., soil), they may migrate within that medium or migrate to another environmental medium (e.g., air). This section summarizes potential containment release mechanisms and transport pathways.

Contaminants in surface soil could migrate to air through wind erosion or through volatile emissions. Contaminant migration from surface soil is mitigated by the concrete pad covering surface soil over a portion of the site. Subsurface soil is not currently exposed at the site; however, if future construction occurs and brings subsurface soil to the surface, contaminants in subsurface soil could be transported into the air through wind erosion or through volatile emissions.

Contaminants can migrate from both surface and subsurface soil to groundwater through leaching. Depth to groundwater at UXO 32 is approximately 4 feet bgs. Surface water runoff from UXO 32 flows southwest into Mattawoman Creek.

3.1.3 Potential Current and Future Receptors of Concern and Exposure Pathways

UXO 32 is an active scrap yard surrounded by a fence. Current land use at the site is commercial/industrial and is expected to remain so for the foreseeable future. The facility maintenance workers are the only current receptors potentially contacting environmental media at UXO 32. Groundwater is not currently used as a source of potable or industrial water at the site, and such uses are not anticipated in the future. Therefore, this HHRA focuses on receptor exposure under non residential (e.g., industrial) land use scenarios. Although the site is unlikely to be used for recreational purposes and residential purposes, recreational and residential land uses are also evaluated for purposes of completeness and to add in risk-management decision making.

Under current and potential/hypothetical future land uses, the following potential receptors could be exposed to contaminated environmental media at UXO 32:

- Construction workers - Construction workers are plausible on site receptors under current and future land uses. Construction workers could be exposed to chemicals in surface and subsurface soil through incidental ingestion and dermal contact, to chemicals in groundwater through incidental ingestion and dermal contact, and to airborne contaminants emanating from soil through inhalation.

- Industrial workers - Industrial workers are plausible on site receptors under current and future land uses. These receptors could be directly exposed to chemicals in surface soil through incidental ingestion, dermal contact, and inhalation of airborne particulates and to vapors emitted from the soil. Industrial worker exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to aid in risk management decisions. This receptor is expected to be exposed to soil equally as often (but less intensely) than the construction worker. Industrial workers are not expected to be exposed to chemicals in groundwater because groundwater is not used as a source of either drinking water or process water and because industrial workers are not expected to directly contact groundwater in their day-to-day work activities. If this receptor were to work in an on-site structure, this receptor could be exposed to VOCs migrating to the indoor air of a building from contaminated subsurface soil or groundwater via vapor intrusion.

- Future child and adult recreational users - Because the anticipated future land use for UXO 32 is not excepted to differ from current uses (i.e., commercial/industrial), a recreational land use scenario is very unlikely. However, hypothetical future recreational users are evaluated to facilitate risk management decisions. It was assumed a recreational user may be exposed to potentially contaminated surface soil through incidental ingestion, dermal contact, and inhalation of chemicals emitted from soil to the air. Because future construction activities could redistribute subsurface soil at the surface, recreational users were evaluated for exposure to subsurface soil to aid in risk management decisions. Recreational user direct contact with groundwater is unlikely and therefore was not evaluated in this HHRA.

- Future child and adult residents - Because the anticipated future land use for UXO 32 is not expected to differ from current uses (i.e., commercial/industrial), a residential land use scenario is very unlikely. However, the hypothetical future residential scenario is typically evaluated in a risk assessment to facilitate risk management decisions. It was assumed that a hypothetical resident may be exposed to chemicals in surface soil through ingestion, dermal contact, and inhalation of chemicals emitted from soil to air. Because future construction could potentially redistribute subsurface soil to the surface, residents were also evaluated for risks associated with subsurface soil to aid in risk management decisions. Although unlikely because a local utility supplies potable water to UXO 32, hypothetical future residents could use site groundwater as their drinking water source. Potential exposures to chemicals in groundwater for child and adult residents include ingestion and dermal contact, and inhalation of chemicals volatilized into the air during showering or bathing (evaluated for the adult resident only). Hypothetical residents could also be exposed via inhalation to VOCs migrating to the indoor air of a home from contaminated subsurface soil or groundwater via vapor intrusion.

3.2 CENTRAL TENDENCY EXPOSURE AND REASONABLE MAXIMUM EXPOSURE

Traditionally, exposures evaluated in a HHRA were based on the concept of a reasonable maximum exposure (RME) only, defined as “the maximum exposure that is reasonably expected to occur at a site” (USEPA, 1989). Subsequent risk assessment guidance (USEPA, 1992) stipulates the need to address an average case, or central tendency exposure (CTE). However, in this HHRA, only the RME scenario was evaluated because the RME scenario is more conservative than the CTE scenario and is typically the basis of risk management decisions.

3.3 EXPOSURE POINT CONCENTRATIONS

The exposure point concentration (EPC), calculated for each COPC only, is an estimate of chemical concentrations in an exposure unit (EU) and is used to estimate exposure intakes. An EU is the area over which receptor activity is expected. The following paragraphs discuss the EUs evaluated in this HHRA and the guidelines for calculating EPCs.

UXO 32 is considered a single EU for soil data. Groundwater data was evaluated as two separate EUs for monitoring wells upgradient and downgradient of the site. The following guidelines were used to calculate EPCs for the evaluation of COPC concentrations in this EU:

- For soil and groundwater data sets containing at least five samples, the 95-percent upper confidence limit (UCL) on the arithmetic mean, which is based on the distribution of the data set, was selected as the EPC unless the UCL exceeded the maximum detected concentration. In this case, the maximum detected concentration was used as the EPC. The maximum concentration was also used as the EPC in the event of an insufficient number of detections in a data set (i.e., less than four), in accordance with USEPA guidance (2010b). Using the maximum value is recommended for small data sets because defining the distribution of a data set having fewer than five samples is difficult. EPCs were calculated following USEPA’s Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (2002b) and using USEPA’s ProUCL Version 4.1.00 (2010b) (see Attachment 4).

- The sample quantitation limit was used for non-detects to calculate the 95-percent UCL, in accordance with ProUCL guidance (USEPA, 2010b). Duplicates were averaged to calculate the EPCs for COPCs in environmental media at UXO 32.

EPCs were calculated for 6 datasets:

- Surface soil (current) - Surface soil (0-2 ft bgs), currently exposed
- Surface soil (under cap) – Soil (0-2 ft bgs), currently under concrete slab
- Surface soil (future) – Surface soil currently exposed plus soil (0-2 bgs) under concrete slab
- Subsurface soil – Soil (>2-9 ft bgs).
- Groundwater (upgradient) - Groundwater from wells S32GW07, S32GW08, S32GW09, S32GW10, S57GW23, and S57GW35.
- Groundwater (downgradient) - Groundwater from wells S32GW01, S32GW02, S32GW05, and S32GW06.

Only subsurface soil with a starting depth of greater than or equal to 5 feet bgs was included in the exposure assessment. Soil samples at greater depths would be completely saturated with groundwater.

In accordance with USEPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model (1994, 2010c) and their Technical Review Workgroup (TRW) Adult Lead Model (USEPA, 2003b, 2009b), average lead concentrations were used to estimate blood-lead levels from exposure to lead. This is because the first step in the model calculations is to develop a central estimate of blood-lead concentrations, which requires an "appropriate average concentration" for an individual.

Table 3-3 summarizes EPCs used in this HHRA. The RAGS Part D Tables for the EPCs are presented in Attachment 3.

3.4 CHEMICAL INTAKE ESTIMATION

Methodologies and techniques for estimating exposure intakes are presented in this section. Intakes for the identified potential receptor groups were calculated using current USEPA risk assessment guidance and are presented in the risk assessment spreadsheets. Risk assessment results are presented using the USEPA RAGS Part D Table format. Exposure assumptions are presented in Table 3-4.

Non-carcinogenic intakes were estimated using the concept of an average annual exposure, and carcinogenic intakes were calculated as an incremental lifetime exposure, which assumes a life expectancy of 70 years. The exposure assumptions reflect current USEPA guidance. Most of the exposure assumptions used to estimate chemical intakes are based on default assumptions described in several USEPA guidance documents (e.g., 1989, 1991, 1993, 1997a, and 2004a). The following paragraphs discuss the non default receptor-specific exposure assumptions used in the risk assessment.

3.4.1 Incidental Ingestion of Soil

Direct physical contact with soil at UXO 32 may result in the incidental ingestion of chemicals. Chemical intake for the incidental ingestion of soil is estimated in the following manner (USEPA, 1989):

$$\text{Intake} = \frac{(C_s)(IR)(FI)(EF)(ED)(CF)}{(BW)(AT)}$$

where:

Intake	=	chemical intake from soil (mg/kg/day)
C_s	=	chemical concentration in soil (mg/kg)
IR	=	ingestion rate (mg/day)
FI	=	fraction ingested from contaminated source (dimensionless)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (year)
CF	=	conversion factor (1×10^{-6} kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
		for non-carcinogens, AT = ED×365 days/year
		for carcinogens, AT = 70 yr×365 days/year

Most of the exposure assumptions used to estimate chemical intakes from incidental ingestion of soil are based on default assumptions described in standard USEPA guidance. These assumptions are summarized in Table 3-4. The following paragraph briefly discusses the non default receptor-specific exposure assumptions for incidental ingestion of soil used in the HHRA.

The selected exposure frequency assumptions consider anticipated receptor activities at UXO 32. It was assumed that construction workers assigned to future excavation projects at UXO 32 would be exposed to soil for 250 days per year for 1 year. It was also assumed that site recreational users would be exposed to soil an average of 1 day per week, or 52 days per year.

3.4.2 Dermal Contact with Soil

Direct physical contact with soil may result in dermal absorption of chemicals. Exposure associated with dermal contact with soil is estimated as follows (USEPA, 2004a):

$$\text{Intake} = \frac{(C_s)(SA)(AF)(ABS)(CF)(EF)(ED)}{(BW)(AT)}$$

where:

Intake	=	amount of chemical absorbed during contact with soil (mg/kg/day)
C_s	=	chemical concentration in soil (mg/kg)
SA	=	skin surface area available for contact (cm^2)
AF	=	skin adherence factor (mg/cm^2 event)
ABS	=	absorption factor (dimensionless)
CF	=	conversion factor (1×10^{-6} kg/mg)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (year)
BW	=	body weight (kg)
AT	=	averaging time (days) for non-carcinogens, AT = ED×365 days/year for carcinogens, AT = 70 yr×365 days/year

Most of the exposure assumptions used to estimate chemical intakes from dermal contact with soil are based on the default assumptions described in the standard USEPA guidance and are summarized in Table 3-4. The following paragraphs briefly discuss the non default receptor-specific exposure assumptions for dermal contact with soil used in the HHRA.

The same exposure frequencies and durations recommended for evaluating incidental ingestion of soil were used to estimate chemical intakes for dermal contact with soil. The soil adherence factors presented are from Exhibits 3.3 and 3.5 of RAGS Part E.

For chemicals identified as COPCs in soil, the chemical-specific dermal absorption factors in RAGS Part E were used to evaluate the COPCs for soil. USEPA Region 3 dermal guidance (2003a) was consulted if chemical-specific absorption factors were not available in RAGS Part E. Values used in this risk assessment are presented in Table 3-5.

3.4.3 Inhalation of Air Containing Fugitive Dust/Volatiles Emitted from Soil

Intakes of both particulates and vapors/gases are calculated using the same equation, as follows (USEPA, 2009a):

$$EC = \frac{(C_{air})(ET)(EF)(ED)}{(AT)(24\ hrs/day)}$$

where:

EC	=	exposure concentration (mg/m^3)
C_{air}	=	concentration of chemical in air (mg/m^3)
ET	=	exposure time (hours/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (year)
AT	=	averaging time (days);
	=	for non-carcinogens, AT = ED x 365 days/year
	=	for carcinogens, AT = 70 yr x 365 days/year

Most of the exposure assumptions used to estimate chemical intakes from inhalation of fugitive dusts/volatile emissions from surface and subsurface soil were based on default assumptions described in standard USEPA guidance and are summarized in Table 3-4. The same exposure frequencies and durations used to estimate incidental ingestion of soil intakes were used to estimate exposure via inhalation of fugitive dust/volatile emissions for surface and subsurface soil.

The concentrations of chemicals in air resulting from emissions from soil are developed following procedures presented in USEPA Soil Screening Guidance (2002a). Chemical concentrations in air are calculated as follows:

$$C_{air} = C_{soil} \times \left[\frac{1}{PEF} + \frac{1}{VF}\right]$$

where:

C_{air}	=	chemical concentration in air (mg/m^3)
C_s	=	chemical concentration in soil (mg/kg)
PEF	=	particulate emission factor (m^3/kg)
VF	=	volatilization factor (m^3/kg)

No VOCs were identified as COPCs in soil; therefore, the above equation reduces to:

$$C_{air} = C_{soil} \times \frac{1}{PEF}$$

The particulate emission factor (PEF) relates the concentration of a chemical in soil to the concentration of dust particles in air. A PEF value of 3.23 x 10^{+9} m^3/kg was obtained from USEPA's Soil Screening Internet site at http://rais.ornl.gov/epa/ssl1.shtml. This is the default value for Philadelphia, Pennsylvania, which is the closest city to Indian Head, Maryland listed on the Internet site. Because air emissions resulting from fugitive dust emissions settings will be different than dust emissions generated during construction activities, a separate PEF was used for construction activities. The PEF for construction workers (1.43 x 10^{+6} m^3/kg) was calculated using the equations presented in the supplemental SSL guidance document (USEPA, 2002a). Sample PEF calculations were calculated are presented in Attachment 5.

3.4.4 Direct/Incidental Ingestion of Groundwater

Direct ingestion of groundwater at UXO 32 is likely limited to exposure that would occur under a future residential scenario. Incidental ingestion of groundwater by construction workers may occur during construction or excavations. Intakes associated with groundwater ingestion were evaluated using the following equation (USEPA, 1989):

$$\text{Intake} = \frac{(C_w)(IR_w)(EF)(ED)}{(BW)(AT)}$$

where:

Intake	=	chemical intake from groundwater (mg/kg/day)
C_w	=	chemical concentration in groundwater (mg/L)
IR_w	=	groundwater ingestion rate (L/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (year)
BW	=	body weight (kg)
AT	=	averaging time (days)
		for non-carcinogens, AT = ED×365 days/year
		for carcinogens, AT = 70 yr×365 days/year

USEPA standard default exposure assumptions were used to evaluate residential exposures to groundwater. For construction workers, an ingestion rate of 0.01 L/day was assumed for 90 days per year for an exposure duration of 1 year (USEPA, 2000). An exposure frequency of 90 days per year assumes that construction workers contact groundwater approximately 3 months per year. A summary of the receptor-specific input values used to estimate chemical intakes from direct and incidental ingestion of groundwater is presented in Table 3-4.

3.4.5 Dermal Contact with Groundwater

Dermal contact with groundwater at UXO 32 is limited to exposure that would occur under residential and construction scenarios. Hypothetical future site residential receptors are assumed to use groundwater for domestic purposes (e.g., bathing, showering, and dish washing) that could result in dermal exposure. Short-term dermal exposure is assumed to occur for the construction worker during excavation activities.

The following equation was used to assess exposures from dermal contact with groundwater (USEPA, 2004a):

$$DAD = \frac{(DA_{event})(EV)(ED)(EF)(SA)}{(BW)(AT)}$$

where:

DAD	=	dermally absorbed chemical dose from water (mg/kg/day)
DA_{event}	=	dermally absorbed dose per event (mg/cm^2-event)
EV	=	event frequency (events/day)
ED	=	exposure duration (year)
EF	=	exposure frequency (days/year)
SA	=	skin surface area available for contact (cm^2)
BW	=	body weight (kg)
AT	=	averaging time (days)
		for non-carcinogens, AT = ED×365 days/year
		for carcinogens, AT = 70 yr×365 days/year

Most of the exposure assumptions used to estimate chemical intakes from dermal contact with groundwater are based on default assumptions described in standard USEPA guidance and are summarized in Table 3-4.

Dermal intakes for residents assume daily total body exposure. Child and adult surface area values are based on USEPA guidance. For construction workers, the exposed surface area of the body available for contact is based on assumed activities and is similar to the assumptions outlined for dermal contact with soil.

USEPA has not established default exposure frequency assumptions for a construction worker exposed to groundwater. Consequently, it was assumed that a construction worker would be exposed to groundwater for 4 hours per day for 90 days per year. A shorter exposure frequency is recommended for a construction worker exposed to groundwater than that recommended for exposure to soil because it is unlikely that a construction worker would have direct contact with groundwater on a daily basis for the entire duration of a construction project.

The absorbed dose per event (DA_{event}) was estimated using a non-steady-state approach for organic compounds and a traditional steady-state approach for inorganics. For organics, the following equations apply:

$$\text{If } t_{event} < t^{*}, \text{ then: } DA_{event} = (2)(K_p)(FA)(C_w)(CF)\left(\sqrt{\frac{6\,\tau\,t_{event}}{\pi}}\right)$$

$$\text{If } t_{event} > t^{*}, \text{ then: } DA_{event} = (K_p)(FA)(C_w)(CF)\left(\frac{t_{event}}{1+B} + 2\,\tau\left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right)$$

where:

t_{event}	=	event duration (hour/event)
t^*	=	time to reach steady-state conditions (hour)
K_p	=	permeability coefficient of water through skin (cm/hour)
FA	=	chemical-specific fraction absorbed (dimensionless)
C_w	=	chemical concentration in water (mg/L)
τ	=	lag time (hour)
π	=	pi (dimensionless; equal to 3.1416)
CF	=	conversion factor (0.001 L/cm^3)
B	=	dimensionless ratio of the permeability of the stratum corneum relative to permeability across the viable epidermis.

Values for the chemical-specific parameters (t^*, K_p, FA, τ, and B) were obtained from the current dermal guidance (USEPA, 2004a, Exhibit B-3) and are presented in Table 3-5. If published values were not available for a particular compound, they were calculated using equations provided in the USEPA dermal guidance.

The following steady-state equation was used to estimate DA_{event} for inorganics:

$$DA_{event} = (K_p)(C_w)(t_{event})$$

The dermal permeability (K_p) values recommended in the USEPA dermal guidance (2004a) were used to calculate DA_{event} values for inorganic COPCs.

3.4.6 Inhalation of Volatiles in Groundwater

If VOCs are present, groundwater exposure may also result in chemical intake through inhalation if groundwater is used as a domestic water supply or is exposed during construction activities. This exposure route is plausible for residential receptors that may be exposed while showering, bathing, washing dishes, etc. and for construction workers contacting shallow groundwater during excavation activities. For residential receptors, chemical intakes from inhalation exposure while showering due to volatilization of COPCs in groundwater were estimated using a mass transfer model, developed specifically for this exposure route, in combination with an air intake estimation model. The mass transfer model accounts for inhalation during and after a shower while the receptor remains in a closed bathroom. The method used is as follows (USEPA, 1989; Foster and Chrostowski, 1987; USEPA, 2009a):

$$EC = (S)(ET)(K)(EF)(ED)/(AT)(R_a)(CFs)$$

$$K = D_s + \frac{\exp(-R_a \times D_t)}{R_a} - \frac{\exp\left[R_a \times (D_s - D_t)\right]}{R_a}$$

where:

EC	=	exposure concentration (mg/m^3)
S	=	volatile chemical generation rate ($\mu g/m^3$-min-shower)
ET	=	exposure time (hours/day)
EF	=	exposure frequency (showers/year)
ED	=	exposure duration (year)
AT	=	averaging time or period of exposure (hours) for non-carcinogens, AT = ED×365 days/year; for carcinogens, AT = 70 yr×365 days/year
R_a	=	air-exchange rate ($minute^{-1}$)
K	=	mass-transfer coefficient (minutes)
D_s	=	shower duration (minutes)
D_t	=	total time in bathroom (minutes)
CFs	=	conversion factors ($1x10^{+3}$ µg/mg, 1,440 min/day, and 24 hr/day)

The estimated volatile chemical generation rate is based on two-phase film theory. The model uses contaminant-specific mass transfer coefficients, Henry's Law constants, droplet diameter, drop time, viscosity, temperature, etc. A sample calculation is provided in Attachment 5. The same exposure frequencies and durations used to estimate intake for dermal contact with groundwater were used to evaluate chemical intakes for inhalation of VOCs from domestic groundwater use.

Inhalation exposures for the construction worker were estimated using an air intake estimation model, as follows (USEPA, 2009a):

$$EC = \frac{(C_{air})(ET)(EF)(ED)}{(AT)(24hrs/day)}$$

where:

EC	=	exposure concentration (mg/m^3)
C_{air}	=	chemical concentration in air (mg/m^3)
ET	=	exposure time (hours/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (year)
AT	=	averaging time (days)
		for non-carcinogens, AT = ED×365 days/year
		for carcinogens, AT = 70 yr×365 days/year

Construction workers may be exposed to COPCs that have volatilized from groundwater when an excavation exposes the shallow water table. The same exposure frequencies and times used to estimate intake from dermal contact with groundwater were used to evaluate intake from inhalation of VOCs from groundwater during construction.

No well-established models are available for estimating migration of volatiles from groundwater into a construction or utility trench. To estimate EPCs for air in a construction trench, the HHRA used an approach suggested by the Virginia Department of Environmental Quality (VDEQ) (2007), which is based on a combination of a vadose zone model (to estimate volatilization of gases from contaminated groundwater into a trench) and a box model (to estimate contaminant dispersion from the air inside the trench to the above ground atmosphere). The VDEQ methodology is described in the following paragraphs.

The airborne concentration of a contaminant in a trench can be estimated using the following equation:

$$C_{air} = C_{GW} \times VF$$

where:

C_{air}	=	contaminant concentration in air in the trench (µg/m^3)
C_{GW}	=	concentration of contaminant in groundwater (µg/L)
VF	=	volatilization factor (L/m^3)

It was assumed that a construction project could excavate to 15 feet bgs or less. If the depth to groundwater at a site is less than 15 feet, the VDEQ model assumes that a worker would encounter groundwater when digging an excavation or trench. The depth to groundwater at UXO 32 is approximately 4 feet bgs. The worker would then be directly exposed to the groundwater and would also be exposed to contaminants in the air inside the trench due to volatilization from groundwater pooling in the trench bottom.

The following equation is used to calculate the volatilization factor (VF) for a trench less than 15 feet deep:

$$VF = (Ki \times A \times F \times 10^{-3} \times 10^{4} \times 3{,}600)/(ACH \times V)$$

where:

Ki	=	contaminant's overall mass-transfer coefficient (cm/s)
A	=	trench area (m^2)
F	=	fraction of floor through which contaminant can enter (unitless)
ACH	=	air changes per hour (h^{-1}) = 360 h^{-1}
V	=	trench volume (m^3)
10^{-3}	=	conversion factor (L/cm^3)
10^{4}	=	conversion factor (cm^2/m^2)
3,600	=	conversion factor (seconds/hour)

Studies of urban canyons suggest that if the ratio of trench width, relative to wind direction and trench depth, is less than or equal to one, a circulation cell(s) will be created in the trench, limiting the degree of gas exchanged with the atmosphere. Thus, measured building ventilation rates lead to an assumption of two air changes per hour (ACHs). If the width-to-depth ratio of the trench is greater than one, the air exchange between the trench and above-ground atmosphere is unrestricted, based on the ratio of trench depth to average wind speed, so ACHs are assumed to be 360. The exposure assessment in this HHRA assumes that the width-to-trench depth ratio is greater than one; thus, ACHs are set at 360.

K_i is calculated using the following equation:

$$K_i = 1/\{(1/k_iL) + [(RT)/(H_i\ k_iG)]\}$$

where:

K_i	=	containment's overall mass-transfer coefficient (cm/s)
k_iL	=	liquid-phase mass-transfer coefficient of i (cm/s)
R	=	ideal gas-constant (atm-m^3/mole-°K) = 8.2×10^{-5}
T	=	average system absolute-temperature (°K) (Default = 298°K)
H_i	=	Henry's Law constant of i (atm-m^3/mole)
k_iG	=	gas-phase mass-transfer coefficient of i (cm/s)

Formulae for calculating k_iL and k_iG are as follows:

$$k_iL = (MWO_2/MW_i)^{0.5}\times(T/298)\times kL,O_2$$

where:

k_iL	=	liquid-phase mass-transfer coefficient of component i (cm/s)
MWO_2	=	molecular weight of oxygen (g/mole)
MW_i	=	molecular weight of component i (g/mole)
kL,O_2	=	liquid-phase mass-transfer coefficient of oxygen at 25°C (cm/s) = 0.002 cm/s

$$k_iG = (MWH_2O/MW_i)^{0.335}\times(T/298)^{1.005\times}kG,H_2O$$

where:

k_iG	=	gas-phase mass-transfer coefficient of component i (cm/s)
MWH_2O	=	molecular weight of water (g/mole)
kG,H_2O	=	gas-phase mass-transfer coefficient of water vapor at 25°C (cm/s) = 0.833 cm/s (Superfund Exposure Assessment Manual, USEPA, 1988)

Chemical properties were obtained from the USEPA RSL table (2011a) and are presented in Table 3-6.

3.4.7 Exposure to Lead

The equations and methodology presented in the previous section cannot be used to evaluate exposure to lead because of the absence of published dose response parameters. Thus, exposure to lead was assessed using the following models:

- USEPA's IEUBK Model for Lead, Version 1.1 Build 11 (2010c). This model is typically used to evaluate lead exposure assuming a residential land use scenario.

- USEPA's TRW Model for Lead (2003b and 2009b). This model is typically used to evaluate lead exposure assuming a non residential land use scenario.

The IEUBK model for lead (USEPA, 1994 and 2010c) is designed to estimate blood levels of lead in children under 7 years old based on either default or site specific input values for air, drinking water, diet, dust, and soil exposure. Studies indicate that infants and young children are extremely susceptible to adverse effects from exposure to lead. Considerable behavioral and developmental impairments have been noted in children with elevated blood lead levels. The threshold for toxic effects from this chemical is believed to be in the range of 10 to 15 micrograms per deciliter (µg/dL). Blood lead levels greater than 10 µg/dL are considered a "concern."

The IEUBK model for lead was used to address exposure to lead in children when detected soil concentrations exceeded the OSWER SSL of 400 mg/kg for residential land use (USEPA, 1994). Average chemical concentrations, as well as default parameters for some input parameters, were used in the evaluation. Estimated blood lead levels and probability density histograms are presented to support this analysis and are included in Attachment 5.

Non residential adult exposure to lead in soil was evaluated using USEPA's TRW model for lead (2003b and 2009b). In this model, adult exposure to lead in soil is addressed by evaluating the relationship between lead concentrations in site soil and the blood lead concentrations in the developing fetuses of adult women. The Adult Lead Model generates a spreadsheet for each exposure scenario evaluated (i.e., industrial and recreational). Model outputs are the probabilities that blood lead concentrations in fetuses will exceed 10 µg/L. These probabilities were calculated in accordance with the following USEPA guidelines:

- Use of the TRW Interim Adult Lead Methodology in Risk Assessment (1999)
- Frequently Asked Questions (FAQs) on the Adult Lead Model (2010a)

No models are currently available to evaluate periodic exposure of child recreational users to lead; therefore, the results of the IEUBK model for children were used to qualitatively assess this receptor's exposure risk. Potential adverse effects from exposure to lead are expected to be of lesser magnitude for child recreational users than for young children based on less frequent exposures.

3.4.8 Assessing Cancer Risks from Early Life Exposures

USEPA's Supplemental Guidance for Assessing Susceptibility from Early Life Exposure to Carcinogens (2005b) recommends adjusting the toxicity of carcinogenic chemicals that act via the mutagenic mode of action when evaluating early-life exposures to contaminants. The guidance recommends using age-dependent adjustment factors (ADAFs) in concert with age-specific exposure estimates when assessing cancer risks. Absent chemical-specific data, the supplemental guidance recommends the following default adjustments, which reflect that cancer risks are generally higher from early-life exposures than from similar exposures later in life:

- For exposures before two years of age (i.e., spanning a two-year interval from the first day of birth until a child's second birthday), a 10-fold adjustment.

- For exposures between two and less than 16 years of age (i.e., spanning a 14-year time interval from a child's second birthday until a child's sixteenth birthday), a three-fold adjustment.

- For exposures after reaching 16 years of age, no adjustment.

These adjustments were applied using the same method as that used by USEPA to develop the RSLs. Children were evaluated in two age groups, ages 0–2 and 2–6 years old. Adults were evaluated as two age groups (6-16 and 16–30 years old). Using this approach, the intakes for child and adult recreational users and hypothetical residents were calculated as follows:

$$\text{Intake}_{\text{Child}} = \text{Intake}_{(\text{ages 0 to 2 years})}\times 10 + \text{Intake}_{(\text{ages 2 to 6 years})}\times 3$$
$$\text{Intake}_{\text{Adult}} = \text{Intake}_{(\text{age 6 to 16 years})}\times 3 + \text{Intake}_{(\text{ages 16 to 30 years})}\times 1$$

This approach was used only for chemicals identified as mutagenic in the USEPA RSL table (e.g., cPAHs). In addition, risks to lifelong recreational users and lifelong resident receptors were evaluated. Risks to these receptors are sums of the cancer risks calculated for individual children and adult receptors. Therefore, lifelong cancer risks from chemicals that act via the mutagenic pathway (e.g., carcinogenic PAHs, trichloroethene) are assessed through the lifelong recreational user and lifelong resident receptor scenarios. Cancer risks for mutagenic chemicals are presented in the RAGS Part D tables in Attachment 3.

3.4.9 Vapor Intrusion into Buildings

Future industrial workers and hypothetical residents may be exposed to COPCs that have volatilized from groundwater and migrated through building foundations into indoor air. Indoor air concentrations resulting from vapor intrusion from groundwater were estimated using the Johnson and Ettinger volatilization model (USEPA, 2004b). The model assumes that vapors of volatile chemicals are emitted from groundwater, migrate through subsurface soil, through cracks in the building foundation, and accumulate in air inside a building. The vapor intrusion pathway was evaluated for those chemicals detected at concentrations in groundwater exceeding the screening levels, which were discussed in Section 2.1.1. There are currently no buildings on UXO 32. Therefore, the evaluation considered a hypothetical scenario where a residential building was constructed at UXO 32.

Slab-on-grade construction was assumed for hypothetical building. Based on the RI (Tetra Tech, 1999), the Soil Conservation Services (SCS) soil type was determined to be loamy sand (LS). The depth to groundwater was assumed to be 3 feet below ground surface based on the depth to groundwater reported for the site was between 2 and 4 feet in the Groundwater Sampling and Analysis Plan (Tetra Tech, 2011). The average groundwater temperature was assumed to be 14 °C (USEPA, 2004b). Default values were used for the remaining model input parameters. Table 3-7 lists the input parameters used in the vapor intrusion modeling. Printouts of the vapor intrusion model are included in Attachment 7.

There are no default input parameters for evaluating industrial exposures from vapor intrusion. The risks for industrial exposures to vapor intrusion will depend on several factors including the building size, building layout, and air exchange rate. Without knowing these factors there will be high uncertainty associated with any estimated risks. Therefore, industrial exposures from vapor intrusion were not quantitatively evaluated in this HHRA. Risks for industrial workers are expected to be less than those estimated for hypothetical residents since industrial workers would be exposed to volatiles in indoor air on a less frequent basis than residential receptors. In addition, industrial facilities are typically larger than residential housing units and have larger air exchange rates which would result in lower indoor air concentrations.

3.4.10 Summary of Exposure Parameters

Table 3-4 summarizes exposure input parameters for all exposure pathways for identified potential receptor groups at UXO 32. In general, standard default parameters (e.g., USEPA, 1989, 1991, 1997a, 2004a), which combine mid range and upper end exposure factors, were used to assess RME conditions. As discussed previously, CTE conditions were not assessed in this HHRA.

TABLE 3-1

SELECTION OF EXPOSURE PATHWAYS
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	UXO 32	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with surface soil during excavation activities.
				Industrial Workers	Adult	Ingestion Dermal	Quant Quant	Industrial workers may contact surface soil during normal work activities.
		Air		Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Workers	Adult	Inhalation	Quant	Industrial workers may be exposed to fugitive dust and volatile emissions during normal work activities.
	Subsurface Soil	Subsurface Soil		Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with subsurface soil during excavation activities.
				Industrial Workers	Adult	Ingestion Dermal	Quant Quant	Although exposures to subsurface soil by industrial workers are considered unlikely at the site, this scenario was included to aid in future risk management decisions.
		Air		Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Workers	Adult	Inhalation	Quant	Although exposures to subsurface soil by industrial workers are considered unlikely at the site, this scenario was included to aid in future risk management decisions.
	Groundwater	Groundwater		Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with groundwater during excavation activities.
				Industrial Workers	Adult	Ingestion Dermal	None None	Industrial workers are not expected to have contact with groundwater under current site conditions.
		Air		Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to COPCs that have volatilized from groundwater during excavation activities.
				Industrial Workers	Adult	Inhalation	None	Industrial workers are not expected to be exposed to COPCs that have volatilized from groundwater.
			Vapor Intrusion	Industrial Workers	Adult	Inhalation	Qual	Industrial workers may be exposed to COPCs that have volatilized from groundwater and migrated through building foundations into indoor air.
Future	Surface Soil	Surface Soil	UXO 32	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may contact surface soil while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	
		Air		Recreational Users	Child	Inhalation	Quant	Recreational users may be exposed to fugitive dust and volatile emissions while at the site.
					Adult	Inhalation	Quant	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Inhalation	Quant	

TABLE 3-1

SELECTION OF EXPOSURE PATHWAYS
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND
PAGE 2 OF 2

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Subsurface Soil	Subsurface Soil	UXO 32	Recreational Users	Child	Ingestion	Quant	Although exposures to subsurface soil by recreational users are considered unlikely at the site, this scenario was included to aid in future risk management decisions.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
				Residents	Child	Ingestion	Quant	Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
		Air		Recreational Users	Child	Inhalation	Quant	Although exposures to subsurface soil by recreational users are considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
	Groundwater	Groundwater		Recreational Users	Child	Ingestion	None	Child recreational users are not expected to be exposed to groundwater.
						Dermal	None	
					Adult	Ingestion	None	Adult recreational users are not expected to be exposed to groundwater.
						Dermal	None	
				Residents	Child	Ingestion	Quant	Although a future residential scenario is considered unlikely at the site, these scenarios were included to aid in future risk management decisions.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
		Air		Recreational Users	Child	Ingestion	None	Child recreational users are not expected to be exposed to COPCs that have volatilized from groundwater.
						Dermal	None	
					Adult	Ingestion	None	Adult recreational users are not expected to be exposed to COPCs that have volatilized from groundwater.
						Dermal	None	
				Residents	Child	Inhalation	None	Exposure to bathroom air was evaluated for adult residents only. Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
			Vapor Intrusion	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Inhalation	Quant	

Notes:
Quant - Quantitative.
Qual - Qualitative.

TABLE 3-2

RECEPTORS AND EXPOSURE ROUTES FOR QUANTITATIVE EVALUATION
HUMAN HEALTH RISK ASSESSMENT – UXO 32
INDIAN HEAD, MARYLAND

Receptors	Exposure Routes
Construction Workers (current/future land use)	• Soil dermal contact (surface/subsurface) • Soil incidental ingestion (surface/subsurface) • Inhalation of air/dust/emissions (surface/subsurface) • Groundwater dermal contact (during excavation) • Groundwater inhalation of volatile organics (during excavation)
Industrial Workers (current/future land use)	• Soil dermal contact (surface/subsurface[(1)]) • Soil ingestion (surface/subsurface[(1)]) • Inhalation of air/dust/emissions (surface/subsurface[(1)]) • Inhalation of vapors intruding into a building from the groundwater
Recreational Users (children and adults) (future land use)	• Soil dermal contact (surface/subsurface[(1)]) • Soil ingestion (surface/subsurface[(1)]) • Inhalation of air/dust/emissions (surface/subsurface[(1)])
Hypothetical Residents (children and adults) (future land use)	• Soil dermal contact (surface/subsurface[(1)]) • Soil ingestion (surface/subsurface[(1)]) • Groundwater ingestion • Groundwater dermal contact (showering/bathing) • Inhalation of volatiles in groundwater (showering/bathing) • Inhalation of vapors intruding into a building from the groundwater

1 – These receptors are not expected to be exposed to subsurface soil, but exposure to subsurface was evaluated to aid in risk management decisions.

TABLE 3-3

EXPOSURE POINT CONCENTRATIONS
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Parameter	Surface Soil Current (mg/kg)	Surface Soil Under Cap (mg/kg)	Surface Soil Future (mg/kg)	Subsurface Soil (mg/kg)	Upgradient Groundwater (µg/L)	Downgradient Groundwater (µg/L)
VOLATILE ORGANIC COMPOUNDS						
TETRACHLOROETHENE	NA	NA	NA	NA	0.73 (1)	0.29 (1)
TRICHLOROETHENE	NA	NA	NA	NA	54.6 (2)	28.2 (1)
POLYCYCLIC AROMATIC HYDROCARBONS						
BAP EQUIVALENT	0.35 (3)	NA	0.36 (3)	0.48 (1)	NA	NA
PCBS						
AROCLOR-1260	0.25 (4)	8 (5)	4.4 (6)	NA	NA	NA
DIOXINS/FURANS						
2,3,7,8-TCDD EQUIVALENTS	NA	8.9E-05 (1)	9E-05 (1)	NA	NA	NA
METALS						
ARSENIC	114 (7)	68.1 (2)	143 (8)	110 (9)	3.9 (5)	15.5 (1)
BERYLLIUM	NA	NA	NA	NA	8.2 (2)	3.9 (1)
CADMIUM	1.8 (5)	69 (1)	13.1 (5)	NA	NA	NA
COBALT	NA	NA	NA	NA	612 (2)	219 (1)
LEAD	65.1 (10)	1672 (10)	503 (10)	NA	NA	NA
MERCURY	NA	3.3 (1)	3.3 (1)	NA	NA	NA
ZINC	NA	3500 (1)	3500 (1)	NA	NA	NA

Notes:
NA - Not applicable. Not a COPC for this medium.
1 -Maximum detected concentration
2 - 95% Student's-t UCL
3 - 95% KM (BCA) UCL
4 - 95% KM (Chebyshev) UCL
5 - 95% KM (t) UCL
6 - 99% KM (Chebshev) UCL
7 - 95% Approximate Gamma UCL
8 - 95% H-UCL
9 - 97.5% KM (Chebyshev) UCL
10 - Arithmetic Mean

Risk Assessment Guidance for Superfund (RAGS) Part D tables for the exposure point concentrations and ProUCL printouts are included in Attachment 3.
See ProUCL guidance (USEPA, 2010b) for statistics listed above.

TABLE 3-4

SUMMARY OF EXPOSURE INPUT PARAMETERS
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Exposure Parameter	Construction Worker	Industrial Worker	Recreational Users		Future On-Property Residents	
			Child	Adult	Child	Adult
All Exposures						
C_{soil} (mg/kg)	Maximum or 95% UCL(1)	Maximum or 95% UCL(1)	Maximum or 95% UCL(1)	Maximum or 95% UCL(1)	Maximum or 95% UCL(1)	Maximum or 95% UCL(1)
ED (years)	1(2)	25(2)	6(3)	24(3)	6(3)	24(3)
BW (kg)	70(3)	70(3)	15(3)	70(3)	15(3)	70(3)
AT_n (days)	ED x 365(3)	ED x 365(3)	ED x 365(3)	ED x 365(3)	ED x 365(3)	ED x 365(3)
AT_c (days)	25,550(3)	25,550(3)	25,550(3)	25,550(3)	25,550(3)	25,550(3)
Incidental Ingestion/Dermal Contact with Soil						
IR (mg/day)	330(2)	100(2)	200(4)	100(4)	200(4)	100(4)
EF-Soil (days/year)	250(2)	250(2)	52(5)	52(5)	350(4)	350(4)
FI (unitless)	1(2)	1(2)	1(4)	1(4)	1(4)	1(4)
SA (cm^2)	3,300(6)	3,300(6)	2,800(6)	5700(6)	2,800(6)	5,700(6)
AF (mg/cm^2-event)	0.3(6)	0.2(6)	0.2(6)	0.07(6)	0.2(6)	0.07(6)
EV (events/day)	1(6)	1(6)	1(6)	1(6)	1(6)	1(6)
ABS (unitless)	Chemical Specific	Chemical Specific	Chemical Specific	Chemical Specific	Chemical Specific	Chemical Specific
CF (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06
Inhalation Fugitive Dust/Volatile Emissions from Soil						
C_{air} (mg/m^3)	Calculated	Calculated	Calculated	Calculated	Calculated	Calculated
ET (hours/day)	8(2)	8(2)	4(5)	4(5)	24(4)	24(4)
PEF (m^3/kg)	1.43E+06(2)	3.23E+09(7)	3.23E+09(7)	3.23E+09(7)	3.23E+09(7)	3.23E+09(7)
Ingestion/Dermal Contact with Groundwater						
IR (L/day)	0.01(8)	-	-	-	1(4)	2(4)
EF (days/year)	90(9)	-	-	-	350(4)	350(4)
ET (hours/day) and t_{event} (hours/event)	4(9)	-	-	-	1(6)	0.58(6)
EV (events/day)	1(9)	-	-	-	1(6)	1(6)
SA (cm^2)	3,300(6)	-	-	-	6,600(6)	18,000(6)
K_p (cm/hour)	Chemical Specific	-	-	-	Chemical Specific	Chemical Specific
t* (hour/event), τ (hour), and B (unitless)	Chemical Specific	-	-	-	Chemical Specific	Chemical Specific
CF (L/cm^3)	1E-03	-	-	-	1E-03	1E-03
Inhalation of Volatiles from Groundwater						
C_{air} (mg/m^3)	Calculated	-	-	-	-	Calculated
ET (hours/day)	4(9)	-	-	-	-	1(10)
EF (days/year)	90(9)	-	-	-	-	350(4)
VF (L/m^3)	Calculated(11)	-	-	-	-	Calculated(12)

Notes:

ABS Absorption factor
AF Soil-to-skin adherence factor
AT_c Averaging time for carcinogenic effects
AT_n Averaging time for noncarcinogenic effects
B Bunge Model partitioning coefficient
BW Body weight
CF Conversion factor
CR Contact rate
$C_{soil/air}$ Exposure concentration for soil/air
ED Exposure duration
EF Exposure frequency
ET Exposure time
EV Event frequency
FI Fraction ingested from contaminated source
IR Ingestion rate

TABLE 3-4

SUMMARY OF EXPOSURE INPUT PARAMETERS
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

K_p	Permeability coefficient from water through skin
PEF	Particulate Emission Factor
Q/C	Inverse of mean concentration at the center of the source
SA	Skin surface area available for contact
τ	Lag time
t*	Time it takes to reach steady-state conditions
t_{event}	Duration of event
Um	Mean annual wind speed
Ut	Equivalent threshold of wind velocity at 7 m.
V	Fraction of vegetative cover
VF	Volatilization Factor

1 - USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
2 - USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.
3 - USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
4 - USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.
5 - Professional judgment, assumed on site for 4 hours per day 1 day per week.
6 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final.
7 - USEPA, 2010: Soil Screening Guidance calculation Internet site at http://rais.ornl.gov/epa/ssl1.shtml.
Site-specific values for Philadelphia, Pennsylvania.
8 - USEPA Region IV, 2000:USEPA Region IV Human Health Risk Assessment Bulletins -- Supplement to RAGS, 2000
9 - Professional judgment, assumes construction worker is exposed to groundwater for three months during the construction period.
10 - Professional judgment.
11 - Virginia Department of Environmental Quality (VDEQ), 2004: VDEQ, online- http://www.deq.state.va.us/vrprisk/homepage.html.
12 - Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.

TABLE 3-5

INTERMEDIATE VARIABLES FOR CALCULATING $DA_{(EVENT)}$
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	K_p		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Semivolatile Organics												
Tetrachloroethene	Groundwater	NA	1	3.34E-02	cm/hr	(1)	hr	9.06E-01	hr	2.18E+00	hr	1.66E-01
Trichloroethene	Groundwater	NA	1	1.16E-02	cm/hr	(1)	hr	5.81E-01	hr	1.39E+00	hr	5.13E-02
Semivolatile Organics												
BAP Equivalent	Soil	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxins/Furans												
2,3,7,8-TCDD Equivalents	Soil	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs												
Aroclor-1260	Soil	0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics												
Arsenic	Groundwater, Soil	0.03	1	1.00E-03	cm/hr	(1)	hr	NA	NA	NA	NA	NA
Beryllium	Groundwater	NA	1	1.00E-03	cm/hr	(1)	hr	NA	NA	NA	NA	NA
Cadmium	Soil	0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	Groundwater	NA	1	1.00E-03	cm/hr	(1)	hr	NA	NA	NA	NA	NA
Mercury	Soil	0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	Soil	0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
All values from USEPA's Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, July 2004.
1 - $T_{(event)}$ is 4 hours for construction workers; 1 hour for hypothetical child residents, and 0.58 hours for hypothetical adult residents.
FA = Fraction absorbed water.
K_p = Dermal permeability coefficient of compound in water.
$T_{(event)}$ = Event duration.
Tau = Lag time.
T* = Time to reach steady state.
B = Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis.
NA = Not applicable.

TABLE 3-6

CHEMICAL PROPERTIES FOR VOLATILIZATION FROM SOIL/GROUNDWATER TO OUTDOOR AIR MODELS
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical	Molecular Weight (g/mole)	Organic Carbon Partition Coefficient (cm^3/g)	Air Diffusivity (cm^2/sec)	Water Diffusivity (cm^2/sec)	Solubility Limit (mg/L)	Henry's Law Constant (Dimensionless)	Henry's Law Constant (atm-m^3/mol)
Tetrachloroethene	1.66E+02	9.49E+01	5.00E-02	9.50E-06	2.06E+02	7.20E-01	1.77E-02
Trichloroethene	1.31E+02	6.07E+01	6.90E-02	1.00E-05	1.28E+03	4.00E-01	9.85E-03

Source:
USEPA 2011: USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November.

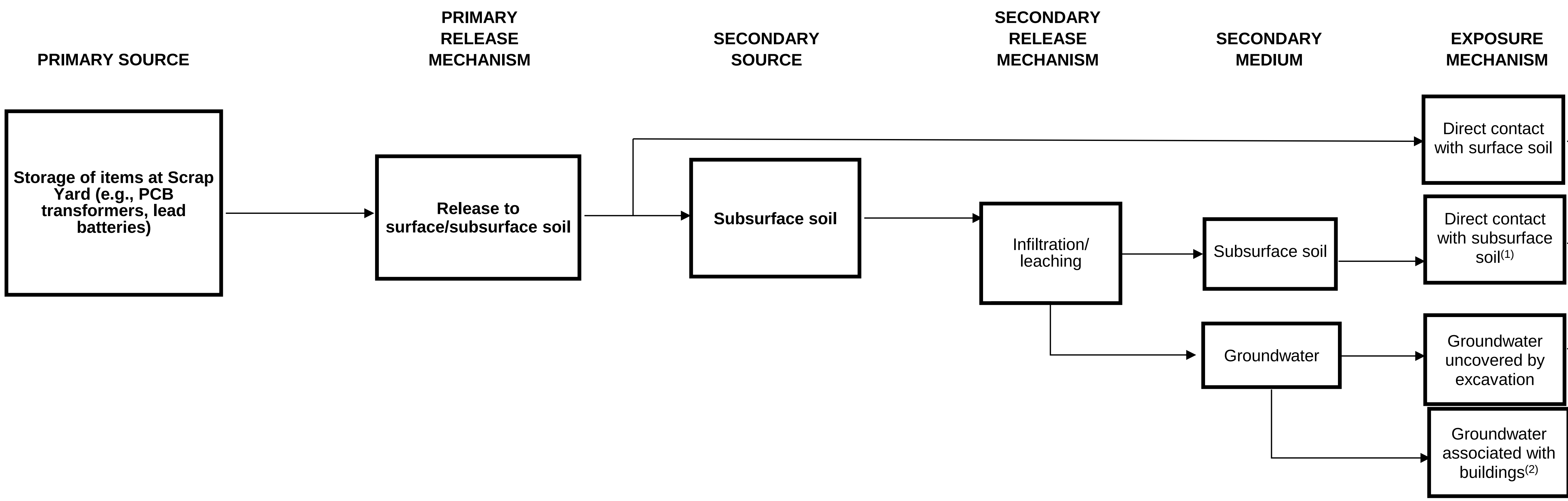
TABLE 3-7

INPUT PARAMETERS FOR VAPOR INTRUSION MODEL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Parameter	Definition	Value	Reference
T_S	Average groundwater temperature (^oC)	14	Site-specific (USEPA, 2004)
L_F	Depth below grade to bottom of enclosed floor space (cm)	15	Default[(1)]
L_{WT}	Depth below grade to water table (cm)	91	Site-specific
h_A	Thickness of soil stratum A (cm)	91	Site-specific
- -	Stratum A SCS soil type	LS	Site-specific
$\rho_b{}^A$	Stratum A soil dry bulk density (g/cm^3)	1.62	Default
n^A	soil total porosity (unitless)	0.39	Default
$\theta_W{}^A$	Stratum A soil water-filled porosity (cm^3/cm^3)	0.076	Default
AT_C	Average time for carcinogens (years)	70	Default
AT_N	Average time for noncarcinogens (years)	30	Default
ED	Exposure duration (years)	30	Default
EF	Exposure Frequency (days/year)	350	Default

Notes:
USEPA, 2004: User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings.
1 - Assumes slab-on-grade construction.

FIGURE 3-1
HUMAN HEALTH CONCEPTUAL SITE MODEL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND



POTENTIAL HUMAN HEALTH RECEPTORS

EXPOSURE ROUTE	Construction Worker	Industrial Worker	Recreational User	Future Resident
Dermal Contact	■	■	■	■
Incidental Ingestion	■	■	■	■
Inhalation (Outdoor Air)	□	□	□	□
Dermal Contact	■	■	■	■
Incidental Ingestion	■	■	■	■
Inhalation (Outdoor Air)	□	□	□	□
Dermal Contact	■			
Incidental Ingestion	■			
Inhalation (Outdoor Air)	□			
Dermal Contact				■
Ingestion				■
Inhalation (Bathroom Air)				□

■ = Potentially complete exposure pathway.
□ = Incomplete, no COPCs were identified from this exposure pathway.

1 Direct contact with subsurface soil (greater than 2 feet below ground surface) is not expected for industrial workers, recreational users, and hypothetical residents. Direct exposure to subsurface soil would not be likely unless future construction activities brought subsurface soil to the surface. However, this pathway was evaluated to aid in risk-management decisions.
2 Exposure to bathroom air was evaluated for adult residents only.

4.0 TOXICITY ASSESSMENT

The toxicity assessment seeks to identify potential adverse health effects in exposed populations. Quantitative estimates of the relationship between the magnitude and type of exposures and the severity or probability of human health effects are defined for the identified constituents of concern. Quantitative toxicity values determined during this component of the risk assessment are integrated with exposure assessment outputs to characterize the potential occurrence of adverse health effects for each receptor group.

The reference dose (RfD) is the toxicity value used to evaluate non-carcinogenic health effects for ingestion and dermal exposures. The reference concentration (RfC) is used to evaluate non-carcinogenic health effects for inhalation exposures. The RfD and RfC estimate a daily exposure level for a human population that is unlikely to pose an appreciable risk during a portion or all of a human lifetime. It is based on a review of animal and/or human toxicity data, with adjustments for various data uncertainties. Carcinogenic effects are quantified using the cancer slope factor (CSF) for ingestion and dermal exposures and using inhalation unit risks (IURs) for inhalation exposure that are plausible upper bound estimates of the probability of the development of cancer per unit intake of the chemical over a lifetime. These are typically based on dose response data from human and/or animal studies.

4.1 TOXICITY CRITERIA FOR ORAL AND INHALATION EXPOSURES

Oral RfDs and CSFs and inhalation RfCs and IURs used in the UXO 32 risk assessment were obtained from the following primary USEPA literature sources selected per USEPA guidance (2003c):

- Tier 1 - Integrated Risk Information System (IRIS).

- Tier 2 - USEPA's Provisional Peer Reviewed Toxicity Values (PPRTVs) - The Office of Research and Development/National Center for Environmental Assessment (NCEA) Superfund Health Risk Technical Support Center develops chemical specific PPRTVs when requested by USEPA's Superfund program.

- Tier 3 - Other toxicity values - These sources include, but are not limited to, California Environmental Protection Agency (Cal EPA) toxicity values, Agency for Toxic Substances and Disease Registry (ATSDR) values, and the Annual Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997b).

Although toxicity criteria can be found in several toxicological sources, USEPA's IRIS online database is the preferred source of toxicity values. This database is continuously updated, and its values are verified by USEPA. Toxicity criteria for UXO 32 COPCs are presented in Tables 4-1 through 4-4.

4.2 TOXICITY CRITERIA FOR DERMAL EXPOSURE

RfDs and CSFs in the scientific literature are typically expressed as "administered" (i.e., not absorbed) doses; therefore, these values are considered inappropriate for estimating risks associated with dermal exposures. Oral dose response parameters based on administered doses must be adjusted to absorbed doses before they can be compared to estimated dermal exposure intakes.

When oral absorption is essentially complete (i.e., 100 percent), an absorbed dose is equivalent to the administered dose and therefore no toxicity adjustment is necessary. Conversely, when the gastrointestinal absorption of a chemical is poor (e.g., 1 percent), the absorbed dose is smaller than the administered dose, and toxicity factors based on absorbed dose should be adjusted to account for the difference in the absorbed dose relative to the administered dose. USEPA (2004a) recommends a 50-percent absorption cut off to reflect the intrinsic variability in analyzing absorption studies. Therefore, the adjustment from administered to absorbed dose was only performed when the chemical specific gastrointestinal absorption efficiency was less than 50 percent. The adjustment from administered to absorbed dose was made using chemical specific gastrointestinal absorption efficiencies published in numerous sources of guidance (e.g., USEPA 2004a [the primary reference], IRIS, ATSDR toxicological profiles, etc), using the following equations:

$$RfD_{dermal} = (RfD_{oral})(ABS_{GI})$$

$$CSF_{dermal} = (CSF_{oral}) / (ABS_{GI})$$

where:

ABS_{GI}	=	absorption efficiency in the gastrointestinal tract
RfD_{dermal}	=	reference dose for dermal exposures
RfD_{oral}	=	reference dose for oral exposures
CSF_{dermal}	=	cancer slope factor for dermal exposures
CSF_{oral}	=	cancer slope factor for oral exposures

As noted, the preceding adjustment of the oral toxicity criteria (i.e., RfDs and CSFs) is necessary so that the dermal route of exposure may be quantitatively evaluated in the baseline risk assessment. Further explanation of this procedure and its necessity are presented in Appendix A of USEPA RAGS Part A.

4.3 CHROMIUM TOXICITY

Toxicity criteria are available for different forms of chromium, which is considered more toxic in the hexavalent state. Chromium speciation was not performed for the soil and groundwater samples collected at UXO 32. Based on the known site history, chromium was not used at the site, and there is no reason to expect hexavalent chromium to be present. Therefore chromium was evaluated as trivalent chromium in this HHRA.

4.4 TOXICITY CRITERIA FOR TRICHLOROETHYLENE (TCE)

The toxicity factors for trichloroethylene (TCE) were finalized by USEPA in September 2011. TCE has toxicity factors that address both carcinogenic and noncarcinogenic effects. Toxicological studies indicated that exposure to TCE increases the risk of kidney cancer, liver cancer, and non-Hodgkin's lymphoma. There is a sufficient weight of evidence to suggest that TCE-induced kidney tumors are a result of a mutagenic mode of action. USEPA Guidelines for Carcinogen Risk Assessment (2005a) and Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005b) specify the use of ADAFs for carcinogens that act via a mutagenic mode of action. However, the ADAFs will only be applied to a portion of the cancer slope factor and inhalation unit risk that is attributable to kidney-induced tumors.

The oral cancer slope factor (CSFo) for TCE is 4.6×10^{-2} $(mg/kg\text{-}day)^{-1}$ and the inhalation unit risk (IUR) is 4.1×10^{-6} $(\mu g/m^3)^{-1}$. For the kidney mutagenic endpoint, the CSFo is 9.3×10^{-3} $(mg/kg\text{-}day)^{-1}$ and the IUR is 1 x 10-6 $(\mu g/m^3)^{-1}$. There are no chemical-specific ADAFs for the kidney mutagenic endpoint; therefore, the EPA's default ADAFs are applied to the carcinogenic toxicity factors for the kidney-related component of TCE's carcinogenic toxicity factors. The following default ADAFs should be applied: 10 for ages 0 to 2, 3 for ages 2 to 16, and 1 (no adjustment) for ages 16 to 70. For the liver cancer and non-Hodgkin's lymphoma endpoints, the CSFo is 3.7×10^{-2} $(mg/kg\text{-}day)^{-1}$ and the IUR is 3×10^{-6} $(\mu g/m^3)^{-1}$. No ADAFs are applied to these values.

Noncarcinogenic effects are evaluated like all noncarcinogens in accordance with USEPA's risk assessment guidance (1989).

TABLE 4-1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal[1]	Absorbed RfD for Dermal[2]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds										
Tetrachloroethene	Subchronic	1.0E-01	mg/kg/day	1	1.0E-01	mg/kg/day	Liver	100/1	HEAST	7/1997
	Chronic	1.0E-02	mg/kg/day	1	1.0E-02	mg/kg/day	Liver	1000/1	IRIS	11/30/2011
Trichloroethene	Chronic	5.0E-04	mg/kg/day	1	5.0E-04	mg/kg/day	Liver, Kidney	10 to 100/1	IRIS	11/30/2011
Semivolatile Organic Compounds										
Benzo(a)pyrene Equivalents	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs										
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxins/Furans										
2,3,7,8-TCDD Equivalents	Chronic	1.0E-09	mg/kg/day	1	1.0E-09	mg/kg/day	NA	NA	Cal EPA	9/2009
Inorganics										
Arsenic	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Skin, CVS	3/1	IRIS	3/14/2011
Beryllium	Subchronic	5.0E-03	mg/kg/day	0.007	3.5E-05	mg/kg/day	GS	NA	HEAST	7/1997
	Chronic	2.0E-03	mg/kg/day	0.007	1.4E-05	mg/kg/day	GS	300/1	IRIS	11/30/2011
Cadmium	Chronic	1.0E-03	mg/kg/day	0.025	2.5E-05	mg/kg/day	Kidney	10/1	IRIS	3/14/2011
Cobalt	Subchronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day	Thyroid	300/1	PPRTV	8/25/2008
	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Thyroid	3000/1	PPRTV	8/25/2008
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury[3]	Chronic	3.0E-04	mg/kg/day	0.07	2.1E-05	mg/kg/day	Autoimmune	1000/1	IRIS	3/14/2011
Zinc	Chronic	3.0E-01	mg/kg/day	1	3.0E-01	mg/kg/day	Blood	3/1	IRIS	3/14/2011

Notes:

1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.

3 - Values for mercuric chloride and other mercury salts.

Definitions:

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

CVS = Cardiovascular system

IRIS = Integrated Risk Information System

NA = Not Available.

TABLE 4-2

NON-CANCER TOXICITY DATA -- INHALATION
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD[1]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds									
Tetrachloroethene	Chronic	2.7E-01	mg/m^3	7.7E-02	(mg/kg/day)	CNS	100/1	ATSDR	9/97
Trichloroethene	Subchronic	5.4E-01	mg/m^3	1.5E-01	(mg/kg/day)	Liver, Kidney	300/1	ATSDR	9/1997
	Chronic	2.0E-03	mg/m^3	5.7E-04	(mg/kg/day)	Liver, Kidney	10 to 100/1	IRIS	11/30/2011
Semivolatile Organic Compounds									
Benzo(a)pyrene Equivalents	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs									
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxins/Furans									
2,3,7,8-TCDD Equivalents	Chronic	4.0E-08	mg/m3	1.1E-08	(mg/kg/day)	NA	NA	Cal EPA	9/2009
Inorganics									
Arsenic	Chronic	1.5E-05	mg/m3	4.3E-06	(mg/kg/day)	NA	NA	Cal EPA	9/2009
Beryllium	Chronic	2.0E-05	mg/m^3	5.7E-06	(mg/kg/day)	Respiratory	10/1	IRIS	11/30/2011
Cadmium	Chronic	1.0E-05	mg/m3	2.9E-06	(mg/kg/day)	Kidney	9/1	ATSDR	9/2008
Cobalt	Subchronic	2.0E-05	mg/m3	5.7E-06	(mg/kg/day)	Respiratory	100/1	PPRTV	8/25/2008
	Chronic	6.0E-06	mg/m^3	1.7E-06	(mg/kg/day)	Respiratory	300/1	PPRTV	8/25/2008
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury[2]	Chronic	3.0E-05	mg/m^3	8.6E-06	(mg/kg/day)	CNS, Kidney	NA	Cal EPA	9/2009
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

2 - Adjusted IRIS value in accordance with recommendations on IRIS.

2 - Values for mercuric chloride and other mercury salts.

Definitions:

ATSDR = Agency for Toxic Substances and Disease Registry.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

IRIS = Integrated Risk Information System

PPRTV = Provisional Peer Reviewed Toxicity Value.

TABLE 4-3

CANCER TOXICITY DATA -- ORAL/DERMAL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds								
Tetrachloroethene	5.4E-01	$(mg/kg/day)^{-1}$	1	5.4E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Trichloroethene - non-mutagen	3.7E-02	$(mg/kg/day)^{-1}$	1	3.7E-02	$(mg/kg/day)^{-1}$	Carcinogenic to humans	IRIS	12/30/2011
Trichloroethene - mutagen	9.3E-03	$(mg/kg/day)^{-1}$	1	9.3E-03	$(mg/kg/day)^{-1}$	Carcinogenic to humans	IRIS	12/30/2011
Semivolatile Organic Compounds								
Benzo(a)pyrene Equivalents	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	3/14/2011
PCBs								
Aroclor-1260	2.00E+00	$(mg/kg/day)^{-1}$	1	2.00E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	9/1996
Dioxins/Furans								
2,3,7,8-TCDD Equivalents	1.30E+05	$(mg/kg/day)^{-1}$	1	1.3E+05	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	Cal EPA	9/2009
Inorganics								
Arsenic	1.5E+00	$(mg/kg/day)^{-1}$	1	1.5E+00	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	3/14/2011
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	B1 / Probable human carcinogen	IRIS	3/14/2011
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	B2 / Probable human carcinogen	IRIS	3/14/2011
Mercury	NA	NA	NA	NA	NA	C / Possible human carcinogen	IRIS	3/14/2011
Zinc	NA	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	3/14/2011

Notes:
1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral absorption efficiency for dermal.
Definitions:

IRIS = Integrated Risk Information System.

NA = Not Available.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

USEPA(1) = U.S. EPA, PCBs: Cancer Dose-Response Assessment and Applications to Environmental Mixtures, September 1996, EPA/600/P-96/001F.

TABLE 4-4

CANCER TOXICITY DATA -- INHALATION
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor[1]		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds							
Tetrachloroethene	5.9E-06	$(ug/m^3)^{-1}$	2.1E-02	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Trichloroethene - non-mutagen	3.0E-06	$(ug/m^3)^{-1}$	1.1E-02	$(mg/kg/day)^{-1}$	Carcinogenic to humans	IRIS	12/30/2011
Trichloroethene - mutagen	1.0E-06	$(ug/m^3)^{-1}$	3.5E-03	$(mg/kg/day)^{-1}$	Carcinogenic to humans	IRIS	12/30/2011
Semivolatile Organic Compounds							
Benzo(a)pyrene Equivalents	1.1E-03	$(ug/m^3)^{-1}$	3.9E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
PCBs							
Aroclor-1260	5.7E-04	$(ug/m^3)^{-1}$	2.0E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	9/1996
Dioxins/Furans							
2,3,7,8-TCDD Equivalents	3.80E+01	$(ug/m^3)^{-1}$	1.3E+05	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	Cal EPA	9/2009
Inorganics							
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	1.5E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	3/14/2011
Beryllium	2.4E-03	$(ug/m^3)^{-1}$	8.4E+00	$(mg/kg/day)^{-1}$	B1 / Probable human carcinogen	IRIS	12/30/2011
Cadmium	1.8E-03	$(ug/m^3)^{-1}$	6.3E+00	$(mg/kg/day)^{-1}$	B1 / Probable human carcinogen	IRIS	3/14/2011
Cobalt	9.0E-03	$(ug/m^3)^{-1}$	3.2E+01	$(mg/kg/day)^{-1}$	NA	PPRTV	8/25/2008
Lead	NA	NA	NA	NA	B2 / Probable human carcinogen	IRIS	3/14/2011
Mercury	NA	NA	NA	NA	C / Possible human carcinogen	IRIS	3/14/2011
Zinc	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	NA	NA

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

Definitions:

IRIS = Integrated Risk Information System.

NA = Not Available.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

PPRTV = Provisional Peer Reviewed Toxicity Value.

USEPA(1) = U.S. EPA, PCBs: Cancer Dose-Response Assessment and Applications to Environmental Mixtures, September 1996, EPA/600/P-96/001F.

5.0 RISK CHARACTERIZATION

This section characterizes the potential human health risks associated with exposures to COPCs at UXO 32. Potential risks (non-carcinogenic and carcinogenic) for human receptors from exposures as outlined in the exposure assessment were quantitatively determined during the risk characterization component of this HHRA. Sections 5.1 and 5.2 outline the methods used to quantitatively estimate the type and magnitude of potential risks to human receptors. Summaries of the risk characterization for UXO 32 are provided in Section 5.3.

5.1 QUANTITATIVE ANALYSIS OF CONSTITUENTS OTHER THAN LEAD

Quantitative estimates of risk for chemicals were calculated according to risk assessment methods outlined in USEPA guidance (1989). Lifetime cancer risks are expressed in the form of dimensionless probabilities referred to as incremental lifetime cancer risks (ILCRs), based on CSFs and IURs. Non-carcinogenic risk estimates are presented in the form of hazard quotients (HQs), which are determined by comparing intakes to published RfDs and RfCs.

ILCR estimates for ingestion and dermal exposures were generated for each COPC using estimated exposure intakes and published CSFs, as follows:

$$\text{ILCR} = (\text{Estimated Exposure Intake})(\text{CSF})$$

If the equation above results in an ILCR greater than 0.01, the following equation is used:

$$\text{ILCR} = 1\text{-}[\exp(\text{-Estimated Exposure Intake})(\text{CSF})]$$

ILCR estimates of inhalation exposures are generated for each COPC using estimated exposure concentrations and published IURs, as follows:

$$\text{ILCR} = (\text{IUR})(\text{Exposure Concentration})(1{,}000\ \mu\text{g/mg})$$

An ILCR of 1×10^{-6} indicates that the exposed receptor has a one-in-one-million chance of developing cancer under the defined exposure scenario. Alternatively, such a risk may be interpreted as representing one additional case of cancer in an exposed population of one million persons.

Non-carcinogenic risks were assessed using the concepts of HQ and hazard index (HI). The HQ for a COPC is the ratio of the estimated intake to the RfD and is calculated for ingestion and dermal exposures as follows:

HQ = (Estimated Exposure Intake)/(RfD)

For inhalation exposures, the HQ is calculated as follows:

HQ = (Exposure Concentration)/(RfC)

An HI is generated by summing the individual HQs for all COPCs. The HI is not a mathematical prediction of the severity of toxic effects and therefore is not a true “risk”; it is simply a numerical indicator of the possibility of the occurrence of non-carcinogenic (threshold) effects.

5.2 INTERPRETATION OF RISK ASSESSMENT RESULTS

To interpret the quantitative risk estimates and aid risk managers in determining the need for remediation, quantitative risk estimates are compared to typical USEPA risk benchmarks. Calculated ILCRs are interpreted using USEPA’s target cancer risk range (1×10^{-4} to 1×10^{-6}), and HIs are evaluated using a value of 1.0. Current USEPA policy regarding lead exposures is to limit the childhood risk of exceeding a 10 µg/dL blood-lead level to 5 percent.

USEPA defines 1×10^{-4} to 1×10^{-6} as the ILCR target range for hazardous waste facilities addressed under CERCLA and Resource Conservation and Recovery Act (RCRA). Individual or cumulative ILCRs greater than 1×10^{-4} are generally considered “unacceptable” by USEPA. Risk management decisions are necessary when the ILCR is within 1×10^{-4} to 1×10^{-6}. USEPA typically does not require remediation when the cumulative ILCR is less than 1×10^{-6}.

An HI exceeding unity (1.0) indicates that non-carcinogenic health risks may be associated with exposure. If an HI exceeds unity, target organ effects associated with exposure to COPCs are considered. Only those HQs for chemicals affecting the same target organ(s) or exhibiting a similar critical effect(s) are regarded as truly additive. Consequently, the cumulative HI could exceed 1.0, but no adverse health effects would be anticipated unless the COPCs affected the same target organ or exhibited the same critical effect (i.e., unless target organ/critical effect-specific HIs exceeded 1).

As a general guideline, a “no further action” recommendation will be forwarded to USEPA Region 3 whenever the cancer risk estimates and total HIs (estimated on a target organ/target effect basis) for receptors of concern are less than 1×10^{-4} and 1, respectively, and when risks associated with lead exposure are less than the USEPA risk benchmark. Otherwise, in most cases, the need for remedial action (including institutional controls) will be evaluated in a Feasibility Study (FS). However, the 1×10^{-4} risk benchmark should not be viewed as a discrete limit. Risks slightly greater than 1×10^{-4} may be considered "acceptable" (i.e., protective) if justified by site-specific conditions, including any uncertainties about the nature and extent of contamination and associated risks. Consequently, a "no further action" recommendation may be forwarded to USEPA risk managers for review and discussion when the 1×10^{-4} risk benchmark is exceeded. Those reviews and discussions may affect the analyses presented in the FS. The following factors will be considered in this determination:

- The magnitude of the medium-specific risk estimates.
- Significant uncertainties in the baseline HHRA that would overestimate baseline risk assessment results.
- Significant uncertainties in EPC estimates that would overestimate baseline risk assessment results.

5.3 RISK CHARACTERIZATION RESULTS

This section summarizes the risk characterization for UXO 32. Quantitative risk estimates for potential human receptors were developed for chemicals identified as COPCs. Uncertainties associated with these risk estimates are discussed in Section 6.0. The methodology to calculate the risks presented in this section was discussed in Sections 3.0 and 4.0. Potential risks from direct contact exposures to soil and groundwater are discussed in Sections 5.3.1 and 5.3.2. Potential risks associated with exposures to lead are discussed in Section 5.3.3. A refined evaluation of the potential for chemical migration from soil to groundwater is presented in Section 5.3.4.

Potential cancer risks and HIs were calculated for current and future construction workers, industrial workers, hypothetical recreational users, and hypothetical residents. These calculated potential cancer risks and HIs are summarized in Table 5-1. Cumulative cancer risks and HIs are presented on Figures 5-1 and 5-2, respectively, while Figures 5-3 and 5-4 present media specific cancer risks and HIs, respectively. The worker receptors are the most relevant receptors evaluated in this HHRA because workers are more likely to be present at the site than future recreational users or residents. Risk estimates for hypothetical future recreational users and residents are included primarily for completeness and to support risk management decisions.

Sample calculations are presented in Attachment 5, and the results of the risk assessment in RAGS Part D format are included in Attachment 3.

5.3.1 Non-Carcinogenic Risks

Cumulative HIs for the construction worker, industrial worker, recreational user, and resident hypothetically exposed to surface soil and subsurface soil and groundwater at UXO 32 are summarized below. Chemicals contributing to target organ-specific HIs greater than 1.0 (i.e., chemicals of concern [COC]) are listed by environmental medium in Table 5-2. Chemicals are considered primary risk drivers if the cumulative HIs for the environmental medium exceed 1. The primary risk drivers listed in the following table are the predominant COPCs contributing to the medium-specific cumulative risk estimates.

Receptor	Environmental Medium	Hazard Index	Primary Risk Driver
Construction worker	Surface soil (current)	*3*[(1)]	No COCs[(2)]
	Surface soil (under cap)	*2*	No COCs
	Surface soil (future)	***3***[(3)]	Arsenic
	Subsurface soil	*2*	No COCs
	Groundwater (upgradient)	*0.1*	No COCs
	Groundwater (downgradient)	*0.05*	No COCs
Industrial worker	Surface soil (current)	0.4	No COCs
	Surface soil (under cap)	0.5	No COCs
	Surface soil (future)	0.7	No COCs
	Subsurface soil	0.4	No COCs
Child Recreational User	Surface soil (current)	0.8	No COCs
	Surface soil (under cap)	0.8	No COCs
	Surface soil (future)	1	No COCs
	Subsurface soil	0.8	No COCs
Adult Recreational User	Surface soil (current)	0.09	No COCs
	Surface soil (under cap)	0.09	No COCs
	Surface soil (future)	0.1	No COCs
	Subsurface soil	0.08	No COCs
Child Resident	Surface soil (current)	**5**	Arsenic
	Surface soil (under cap)	**6**	Arsenic
	Surface soil (future)	**8**	Arsenic
	Subsurface soil	**5**	Arsenic
	Groundwater (upgradient)	**140**	Arsenic, Trichloroethene, Cobalt
	Groundwater (downgradient)	**55**	Arsenic, Trichloroethene, Cobalt

Receptor	Environmental Medium	Hazard Index	Primary Risk Driver
Adult Resident	Surface soil (current)	0.6	No COCs
	Surface soil (under cap)	0.6	No COCs
	Surface soil (future)	0.9	No COCs
	Subsurface soil	0.6	No COCs
	Groundwater (upgradient)	**60**(3)	Arsenic, Trichloroethene, Cobalt
	Groundwater (downgradient)	**23**	Arsenic, Trichloroethene, Cobalt

1 The total receptor- or medium-specific HI exceeds 1, but target organ-specific HIs do not exceed 1. (HIs are italicized).
2 HIs calculated on a target organ-specific basis do not exceed 1; therefore, no primary risk drivers were identified for this medium
3 The total receptor- or medium-specific HI exceeds 1 *and* target organ-specific HIs exceed 1. (HIs are bolded.)

HIs calculated on a target organ basis for the industrial worker, child recreational user, and adult recreational user are less than 1, indicating no adverse non-carcinogenic health effects under the conditions established in the exposure assessment.

HIs for construction workers exposed to COPCs in surface soil (future), HIs for child residents exposed to COPCs in all media, and HIs for adult residents exposed to COPCs in groundwater exceed 1 and target organ-specific HIs exceed 1. Arsenic was the major contributor to the elevated HIs in soil. Arsenic, trichloroethene, and cobalt were the major contributors to the elevated HIs in groundwater.

The HI for hypothetical child and adult residents exposed to chemicals that have migrated from upgradient and downgradient groundwater through building foundations into indoor air were less than or equal to unity (Attachment 7).

5.3.2 Carcinogenic Risks

Cancer risk estimates for the hypothetical construction worker, industrial worker, recreational user, and resident hypothetically exposed to surface soil and subsurface soil are summarized in the following table. Chemicals contributing an ILCR greater than 1×10^{-6} are listed by environmental medium in Table 5-2. Chemicals are considered primary risk drivers if the cumulative risk estimate for the environmental medium exceeds 1×10^{-4}. The primary risk drivers in the following table are the predominant COPCs contributing to the medium-specific cancer risk estimates.

Receptor	Environmental Medium	Cancer Risk Estimates	Primary Risk Driver
Construction worker	Surface soil (current)	1.E-05	No COCs(1)
	Surface soil (under cap)	8.E-06	No COCs
	Surface soil (future)	1.E-05	No COCs
	Subsurface soil	1.E-05	No COCs
	Groundwater (upgradient)	4.E-08	No COCs
	Groundwater (downgradient)	5.E-08	No COCs
Industrial worker	Surface soil (current)	7.E-05	No COCs
	Surface soil (under cap)	6.E-05	No COCs
	Surface soil (future)	1.E-04	No COCs
	Subsurface soil	7.E-05	No COCs
Lifelong recreational user	Surface soil (current)	5.E-05	No COCs
	Surface soil (under cap)	3.E-05	No COCs
	Surface soil (future)	6.E-05	No COCs
	Subsurface soil	5.E-05	No COCs
Lifelong resident	Surface soil (current)	**3.E-04**(2)	Arsenic, cPAHs
	Surface soil (under cap)	**2.E-04**	Arsenic, Aroclor-1260, 2,3,7,8-TCDD equivalents
	Surface soil (future)	**4.E-04**	Arsenic, cPAHs, Aroclor-1260, 2,3,7,8-TCDD equivalents
	Subsurface soil	**3.E-04**	Arsenic, cPAHs
	Groundwater (upgradient)	**2.E-04**	Arsenic, Trichloroethene, Tetrachloroethene
	Groundwater (downgradient)	**4.E-04**	Arsenic, Trichloroethene, Tetrachloroethene

1 ILCRs do not exceed 1×10^{-4}; therefore, no primary risk drivers were identified for this medium.
2 The total receptor- or medium-specific ILCR exceeds 1×10^{-4} (ILCRs are bolded).

Cumulative cancer risk estimates for all receptors are less than or within USEPA's target cancer risk range with the exception of lifelong residents. Arsenic, cPAHs, Aroclor-1260, and 2,3,7,8-TCDD equivalents were the major contributors to the elevated ILCRs for exposure of lifelong residents to soil. 2,3,7,8-TCDD equivalents were only analyzed in one surface soil sample. Arsenic, trichloroethene, and tetrachloroethene were the major contributors to the elevated ILCRs for exposure of lifelong residents to groundwater.

ILCRs for hypothetical child, adult, and lifelong residents exposed to chemicals that have migrated from upgradient and downgradient groundwater through building foundations into indoor air (i.e., exposure via the vapor intrusion pathway) were below or within USEPA's target risk range (Attachment 7).

5.3.3 Lead Risks

Lead was identified as a COPC in surface soil at UXO 32. The maximum detected concentration in surface soil (9800 mg/kg) exceeded the OSWER soil screening level of 400 mg/kg for residential land use.

Hypothetical residential exposures to lead in surface soil were evaluated using USEPA's IEUBK lead model (USEPA, 1994 and 2010c). The most recent version of this model (version 1.1, build 11) was used for the analysis. As recommended in the model's documentation, the average lead concentrations of 65 for surface soil (current), 1672 mg/kg for surface soil (under cap) and 503 mg/kg for surface soil (future) were used as the EPCs. A groundwater concentration was not available; therefore the default value of 4 µg/L was used. Default values were used for the remaining model input parameters. IEUBK model outputs are included in Attachment 6. A young child resident (0 to 6 years of age) is the receptor of concern. The lead concentrations of 65 mg/kg in surface soil (current) and 4 µg/L in groundwater result in 0.002 percent of future on-site child residents having a blood-lead level greater than 10 µg/dL and results in a geometric mean blood-lead level of 1.47 µg/dL. This result is not at variance with the USEPA goal as described in the 1994 OSWER Directive of no more than 5 percent of children exceeding a 10 µg/dL blood-lead level. The lead concentrations of 1672 mg/kg in surface soil (under cap) and 4 µg/L in groundwater result in 71 percent of future on-site child residents having a blood-lead level greater than 10 µg/dL and results in a geometric mean blood-lead level of 13 µg/dL. The lead concentrations of 503 mg/kg in surface soil (future) and 4 µg/L in groundwater result in 8.9 percent of future on-site child residents having a blood-lead level greater than 10 µg/dL and results in a geometric mean blood-lead level of 5.3 µg/dL. The results for surface soil (under cap) and surface soil (future) exceed the USEPA goal of no more than 5 percent of children exceeding a 10 µg/dL blood-lead level.

Risks to construction workers, industrial workers, and adult recreational users exposed to lead in soil were evaluated using a slope factor approach developed by the USEPA TRW for lead (USEPA, 2003b, 2009b). As the model (often referred to as the Adult Lead Model) recommends, average lead concentrations in surface soil were used as the EPCs, and CTE assumptions were used to estimate receptor intake (USEPA, 2003b and 2009b). Based on this information, the incidental soil ingestion rate was assumed to be 100 mg/day for the construction worker and 50 mg/day for industrial workers and adult recreational users (USEPA, 2003b and 2009b). An exposure frequency of 219 days per year was assumed for the construction worker and industrial worker, and an exposure frequency of 52 days per year was assumed for the adult recreational user. Values of 1.8 and 1.0 µg/dL were used for the standard deviation and baseline blood-lead concentration, respectively, (USEPA, 2009b). Default parameters were used for the remaining model input parameters. Results of the model runs are included in Attachment 6.

The fetus of a pregnant worker is the ultimate receptor of concern for the TRW model. Results of the modeling are shown below.

Receptor	Medium	Blood-Lead Geometric Mean Concentration (µg/dL)	Percent of Receptors with Blood-Lead Level Exceeding 10 µg/dL
Construction Workers	Surface Soil (current)	1.2	0.007
	Surface Soil (under cap)	5.8	13.5
	Surface Soil (future)	2.4	0.50
Industrial Workers	Surface Soil (current)	1.1	0.004
	Surface Soil (under cap)	3.4	2.2
	Surface Soil (future)	1.7	0.076
Adult Recreational Users	Surface Soil (current)	1.0	0.002
	Surface Soil (under cap)	1.6	0.044
	Surface Soil (future)	1.2	0.006

Except for construction workers exposed to surface soil (under cap), the results for construction workers, industrial workers, and adult recreational users are not at variance with the USEPA goal of no more than 5 percent of children (fetuses of exposed women) exceeding a 10 µg/dL blood-lead level.

5.3.4 Refined Evaluation of Chemical Migration from Soil to Groundwater

COPCs for migration from soil to groundwater were selected in Section 2.3. This section presents a more refined evaluation of the potential for such migration based primarily on the following considerations:

- Does the maximum detected soil concentration exceed the risk-based SSL at a dilution attenuation factor (DAF) of 20 (DAF_{20})?
- What is the frequency of detection of the chemical?
- Does the maximum detected soil concentration exceed the MCL-based SSL at a DAF_{20}?

These factors were used to select COCs for groundwater protection. Chemicals selected as migration-to-groundwater COPCs in the initial screening were not retained as COCs if any of the following were true:

- The maximum soil concentration is less than the protection of groundwater risk-based SSL calculated using a DAF_{20}.

  ***Rationale*:** A DAF of 1 (DAF_1) is conservative; a DAF_{20} is assumed to be more accurate at most sites.

- The frequency of detection is less than 5 percent (when at least 20 samples are included in the data set and no contaminant "hot spot" is present). A hot spot in soil is defined as a concentration that exceeds twice the SSL at a DAF_{20}.

  ***Rationale*:** Chemicals are unlikely to pose risks to water quality through leaching from soil to groundwater if they are detected infrequently (i.e., in less than 5 percent of samples) in soil.

- The maximum soil concentration is less than the protection of groundwater MCL-based SSL calculated using a DAF_{20}.

  ***Rationale*:** A DAF_1 is conservative; a DAF_{20} is assumed to be more accurate at most sites. Additionally, it is unlikely that groundwater would be remediated to concentrations more conservative than federal SDWA MCLs.

These were the primary considerations guiding the assessment of migration-to-groundwater COPCs.

Migration-to-Groundwater COPCs - Surface Soil - The following chemicals in surface soil were identified as COPCs for migration from surface soil to groundwater:

- PAHs - benzo(a)pyrene.
- PCBs - Aroclor-1260.
- Dioxins/Furans - 1,2,3,4,6,7,8,9-OCDD, 1,2,3,4,6,7,8-HPCDD, 1,2,3,4,6,7,8-HPCDF, 1,2,3,4,7,8,9-HPCDF, 1,2,3,4,7,8-HXCDF, 1,2,3,6,7,8-HXCDD, 1,2,3,6,7,8-HXCDF, 1,2,3,7,8,9-HXCDD, 1,2,3,7,8-PECDF, 2,3,4,6,7,8-HXCDF, 2,3,4,7,8-PECDF, 2,3,7,8-TCDD, 2,3,7,8-TCDF, and 2,3,7,8-TCDD equivalents.
- Inorganics - arsenic, barium, cadmium, lead, mercury, and zinc.

Of these COPCs, 1,2,3,4,6,7,8,9-OCDD, 1,2,3,4,6,7,8-HPCDD, 1,2,3,4,6,7,8-HPCDF, 1,2,3,4,7,8,9-HPCDF, 1,2,3,6,7,8-HXCDD, 1,2,3,6,7,8-HXCDF, 1,2,3,7,8,9-HXCDD, 1,2,3,7,8-PECDF, 2,3,4,6,7,8-HXCDF, 2,3,7,8-TCDD, barium, and zinc concentrations do not exceed SSLs at a DAF_{20}. However, maximum 2,3,7,8-TCDD and benzo(a)pyrene concentrations do not exceed MCL-based SSLs calculated using a DAF_{20}, and the detected mercury concentration marginally exceeds its MCL-based SSL calculated using a DAF_{20}:

- The MCL-based SSL for 2,3,7,8-TCDD for groundwater protection is 15 ng/kg and 300 ng/kg based on DAF_1 and DAF_{20}, respectively, The maximum detected 2,3,7,8-TCDD concentration (89.2 ng/kg) does not exceed the SSL based on a DAF_{20}.

- The MCL-based SSL for benzo(a)pyrene for groundwater protection is 240 µg/kg and 4,800 µg/kg based on DAF_1 and DAF_{20}, respectively, The maximum detected benzo(a)pyrene concentration (1,200 µg/kg) does not exceed the SSL based on a DAF_{20}.

- The MCL-based SSL for mercury (elemental) for groundwater protection is 0.1 mg/kg and 2 mg/kg based on DAF_1 and DAF_{20}, respectively. The detected mercury concentration (3.3 mg/kg) marginally exceeds the SSL based on a DAF_{20}.

Additionally, Aroclor 1260, cadmium, and lead were not detected in the subsurface soils at concentrations exceeding SSLs based on a DAF_{20}. This suggests limited evidence of migration from surface to subsurface soils. Based on this analysis, arsenic was selected as a COC for migration from surface soil to groundwater for UXO 32.

Migration to Groundwater COPCs - Subsurface Soil - The following chemicals in subsurface soil were identified as COPCs for migration from subsurface soil to groundwater:

- SVOCs - benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, diethyl phthalate, di-n-butyl phthalate, and naphthalene.
- Pesticides - 4,4’-DDE, 4,4’-DDT, and heptachlor epoxide.
- PCBs - Aroclor-1260.
- Metals - arsenic, cadmium, copper, lead, and nickel.

Of these COPCs, benzo(b)fluoranthene, benzo(k)fluoranthene, diethyl phthalate, di-n-butyl phthalate, 4,4’-DDE, 4,4’-DDT, Aroclor-1260, cadmium, copper, lead, and nickel concentrations do not exceed SSLs at a DAF_{20}. Benzo(a)anthracene, naphthalene, and heptachlor epoxide were detected infrequently (i.e., in less than 5 percent of samples). Additionally, the maximum benzo(a)pyrene concentration (190 µg/kg) does not exceed the MCL-based SSL calculated using a DAF_{20} (4,800 µg/kg) and the maximum heptachlor epoxide concentration (2.9 µg/kg) does not exceed the MCL-based SSL (4.1 µg/kg).

Based on this analysis, arsenic was selected as a COC for migration from subsurface soil to groundwater for UXO 32. However, the subsurface soil samples are mostly saturated soil samples and are likely more representative of groundwater contamination than soil contamination.

TABLE 5-1

SUMMARY OF CANCER RISKS AND HAZARD INDICES
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $> 10^{-4}$	Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$	Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Adult Construction Worker	Surface Soil (current)	Incidental Ingestion	8E-06	--	--	Arsenic	1	--
		Dermal Contact	8E-07	--	--	--	0.1	--
		Inhalation	1E-06	--	--	--	1	--
		Total	1E-05	--	--	Arsenic	3	Target Organs ≤ 1
	Surface Soil (under cap)	Incidental Ingestion	6E-06	--	--	Arsenic	1	--
		Dermal Contact	8E-07	--	--	--	0.10	--
		Inhalation	1E-06	--	--	--	1	--
		Total	8E-06	--	--	Arsenic	2	Target Organs ≤ 1
	Surface Soil (future)	Incidental Ingestion	1E-05	--	--	Arsenic	2	Arsenic
		Dermal Contact	1E-06	--	--	--	0.1	--
		Inhalation	1E-06	--	--	--	2	Arsenic
		Total	1E-05	--	--	Arsenic	3	Arsenic
	Subsurface Soil	Incidental Ingestion	8E-06	--	--	Arsenic	1	--
		Dermal Contact	7E-07	--	--	--	0.1	--
		Inhalation	1E-06	--	--	--	1	--
		Total	1E-05	--	--	Arsenic	2	Target Organs ≤ 1
	Groundwater (upgradient)	Incidental Ingestion	4E-09	--	--	--	0.01	--
		Dermal Contact	4E-08	--	--	--	0.09	--
		Inhalation	4E-09	--	--	--	0.0001	--
		Total	4E-08	--	--	--	0.1	--
	Groundwater (downgradient)	Incidental Ingestion	1E-08	--	--	--	0.006	--
		Dermal Contact	3E-08	--	--	--	0.05	--
		Inhalation	2E-09	--	--	--	0.0001	--
		Total	5E-08	--	--	--	0.05	--
Adult Industrial Worker	Surface Soil (current)	Incidental Ingestion	6E-05	--	Arsenic	--	0.4	--
		Dermal Contact	1E-05	--	--	Arsenic	0.07	--
		Inhalation	1E-08	--	--	--	0.0005	--
		Total	7E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.4	--
	Surface Soil (under cap)	Incidental Ingestion	5E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	0.4	--
		Dermal Contact	1E-05	--	--	Arsenic, Aroclor-1260	0.09	--
		Inhalation	1E-08	--	--	--	0.0006	--
		Total	6E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	0.5	--
	Surface Soil (future)	Incidental Ingestion	8E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	0.6	--
		Dermal Contact	2E-05	--	--	Arsenic, Aroclor-1260	0.1	--
		Inhalation	2E-08	--	--	--	0.0007	--
		Total	1E-04	--	Arsenic	2,3,7,8-TCDD Equivalents, Benzo(a)pyrene Equivalents, Aroclor-1260	0.7	--
	Subsurface Soil	Incidental Ingestion	6E-05	--	Arsenic	--	0.4	--
		Dermal Contact	1E-05	--	--	Arsenic	0.07	--
		Inhalation	1E-08	--	--	--	0.0005	--
		Total	7E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.4	--

TABLE 5-1

SUMMARY OF CANCER RISKS AND HAZARD INDICES
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $> 10^{-4}$	Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$	Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Child Recreational User	Surface Soil (current)	Incidental Ingestion	3E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.7	--
		Dermal Contact	3E-06	--	--	Arsenic	0.06	--
		Inhalation	3E-10	--	--	--	0.00006	--
		Total	3E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.8	--
	Surface Soil (under cap)	Incidental Ingestion	2E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	0.8	--
		Dermal Contact	3E-06	--	--	--	0.07	--
		Inhalation	3E-10	--	--	--	0.00006	--
		Total	2E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	0.8	--
	Surface Soil (future)	Incidental Ingestion	4E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Benzo(a)pyrene Equivalents	1	--
		Dermal Contact	4E-06	--	--	Arsenic	0.1	--
		Inhalation	4E-10	--	--	--	0.00008	--
		Total	5E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Benzo(a)pyrene Equivalents, Aroclor-1260	1	--
	Subsurface Soil	Incidental Ingestion	3E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.7	--
		Dermal Contact	3E-06	--	--	Arsenic	0.06	--
		Inhalation	3E-10	--	--	--	0.00005	--
		Total	3E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.8	--
Adult Recreational User	Surface Soil (current)	Incidental Ingestion	1E-05	--	--	Arsenic	0.08	--
		Dermal Contact	2E-06	--	--	--	0.009	--
		Inhalation	1E-09	--	--	--	0.00006	--
		Total	1E-05	--	--	Arsenic	0.09	--
	Surface Soil (under cap)	Incidental Ingestion	9E-06	--	--	Arsenic	0.08	--
		Dermal Contact	2E-06	--	--	--	0.01	--
		Inhalation	1E-09	--	--	--	0.00006	--
		Total	1E-05	--	--	Arsenic, Aroclor-1260	0.09	--
	Surface Soil (future)	Incidental Ingestion	2E-05	--	--	Arsenic	0.1	--
		Dermal Contact	2E-06	--	--	Arsenic	0.02	--
		Inhalation	2E-09	--	--	--	0.00008	--
		Total	2E-05	--	Arsenic	--	0.1	--
	Subsurface Soil	Incidental Ingestion	1E-05	--	--	Arsenic	0.07	--
		Dermal Contact	2E-06	--	--	--	0.009	--
		Inhalation	1E-09	--	--	--	0.00005	--
		Total	1E-05	--	--	Arsenic	0.08	--
Lifelong Recreational User	Surface Soil (current)	Incidental Ingestion	4E-05	--	Arsenic	Benzo(a)pyrene Equivalents	NA	NA
		Dermal Contact	5E-06	--	--	Arsenic	NA	NA
		Inhalation	2E-09	--	--	--	NA	NA
		Total	5E-05	--	Arsenic	Benzo(a)pyrene Equivalents	NA	NA
	Surface Soil (under cap)	Incidental Ingestion	3E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	NA	NA
		Dermal Contact	4E-06	--	--	Arsenic, Aroclor-1260	NA	NA
		Inhalation	1E-09	--	--	--	NA	NA
		Total	3E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	NA	NA
	Surface Soil (future)	Incidental Ingestion	6E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Benzo(a)pyrene Equivalents, Aroclor-1260	NA	NA
		Dermal Contact	7E-06	--	--	Arsenic	NA	NA
		Inhalation	2E-09	--	--	--	NA	NA
		Total	6E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Benzo(a)pyrene Equivalents, Aroclor-1260	NA	NA
	Subsurface Soil	Incidental Ingestion	4E-05	--	Arsenic	Benzo(a)pyrene Equivalents	NA	NA
		Dermal Contact	5E-06	--	--	Arsenic	NA	NA
		Inhalation	1E-09	--	--	--	NA	NA
		Total	5E-05	--	Arsenic	Benzo(a)pyrene Equivalents	NA	NA

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $> 10^{-4}$	Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$	Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Child Resident	Surface Soil (current)	Incidental Ingestion	2E-04	Arsenic	--	Benzo(a)pyrene Equivalents	5	Arsenic
		Dermal Contact	2E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.4	--
		Inhalation	4E-09	--	--	--	0.0007	--
		Total	2E-04	Arsenic	Benzo(a)pyrene Equivalents	--	5	Arsenic
	Surface Soil (under cap)	Incidental Ingestion	1E-04	--	Arsenic, Aroclor-1260	2,3,7,8-TCDD Equivalents	5	Arsenic
		Dermal Contact	2E-05	--	--	Arsenic, Aroclor-1260	0.5	--
		Inhalation	3E-09	--	--	--	0.0007	--
		Total	2E-04	--	Arsenic, Aroclor-1260	2,3,7,8-TCDD Equivalents	6	Arsenic
	Surface Soil (future)	Incidental Ingestion	3E-04	Arsenic	Benzo(a)pyrene Equivalents	2,3,7,8-TCDD Equivalents, Aroclor-1260	8	Arsenic
		Dermal Contact	3E-05	--	Arsenic	Benzo(a)pyrene Equivalents, Aroclor-1260	0.7	--
		Inhalation	5E-09	--	--	--	0.0009	--
		Total	3E-04	Arsenic	Benzo(a)pyrene Equivalents	2,3,7,8-TCDD Equivalents, Aroclor-1260	8	Arsenic
	Subsurface Soil	Incidental Ingestion	2E-04	Arsenic	Benzo(a)pyrene Equivalents	--	5	Arsenic
		Dermal Contact	2E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.4	--
		Inhalation	4E-09	--	--	--	0.0006	--
		Total	2E-04	Arsenic	Benzo(a)pyrene Equivalents	--	5	Arsenic
	Groundwater (upgradient)	Incidental Ingestion	6E-05	--	Arsenic	Tetrachloroethene, Trichloroethene	138	Arsenic, Trichloroethene, Cobalt
		Dermal Contact	6E-06	--	--	Trichloroethene	2	Target Organs HI < 1
		Inhalation	0E+00	--	--	--	--	--
		Total	7E-05	--	Arsenic, Trichloroethene	Tetrachloroethene	140	Arsenic, Trichloroethene, Cobalt
	Groundwater (downgradient)	Incidental Ingestion	1E-04	--	Arsenic	Trichloroethene	54	Arsenic, Trichloroethene, Cobalt
		Dermal Contact	3E-06	--	--	--	0.8	--
		Inhalation	0E+00	--	--	--	--	--
		Total	1E-04	--	Arsenic	Trichloroethene	55	Arsenic, Trichloroethene, Cobalt
Adult Resident	Surface Soil (current)	Incidental Ingestion	8E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.5	--
		Dermal Contact	1E-05	--	--	Arsenic	0.06	--
		Inhalation	1E-08	--	--	--	0.0007	--
		Total	9E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.6	--
	Surface Soil (under cap)	Incidental Ingestion	6E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	0.6	--
		Dermal Contact	1E-05	--	--	Arsenic, Aroclor-1260	0.08	--
		Inhalation	1E-08	--	--	--	0.0007	--
		Total	7E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	0.6	--
	Surface Soil (future)	Incidental Ingestion	1E-04	--	Arsenic	2,3,7,8-TCDD Equivalents, Benzo(a)pyrene Equivalents, Aroclor-1260	0.8	--
		Dermal Contact	2E-05	--	--	Arsenic, Aroclor-1260	0.1	--
		Inhalation	2E-08	--	--	--	0.0009	--
		Total	1E-04	--	Arsenic	2,3,7,8-TCDD Equivalents, Benzo(a)pyrene Equivalents, Aroclor-1260	0.9	--
	Subsurface Soil	Incidental Ingestion	8E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.5	--
		Dermal Contact	1E-05	--	--	Arsenic, Benzo(a)pyrene Equivalents	0.06	--
		Inhalation	1E-08	--	--	--	0.0006	--
		Total	9E-05	--	Arsenic	Benzo(a)pyrene Equivalents	0.6	--
	Groundwater (upgradient)	Incidental Ingestion	9E-05	--	Arsenic, Trichloroethene	Tetrachloroethene	59	Arsenic, Trichloroethene, Cobalt
		Dermal Contact	7E-06	--	--	Tetrachloroethene, Trichloroethene	0.7	--
		Inhalation	6E-06	--	--	Trichloroethene	2	Trichloroethene
		Total	9E-05	--	Arsenic, Trichloroethene	Tetrachloroethene	60	Arsenic, Trichloroethene, Cobalt
	Groundwater (downgradient)	Incidental Ingestion	2E-04	Arsenic	--	Trichloroethene	23	Arsenic, Trichloroethene, Cobalt
		Dermal Contact	4E-06	--	--	Trichloroethene	0.3	--
		Inhalation	3E-06	--	--	Trichloroethene	0.9	--
		Total	2E-04	Arsenic	Trichloroethene	Tetrachloroethene	23	Arsenic, Trichloroethene, Cobalt

TABLE 5-1

SUMMARY OF CANCER RISKS AND HAZARD INDICES
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10^{-4}	Chemicals with Cancer Risks > 10^{-5} and ≤ 10^{-4}	Chemicals with Cancer Risks > 10^{-6} and ≤ 10^{-5}	Hazard Index	Chemicals Contributing to an Target Organ HI > 1
Lifelong Resident	Surface Soil (current)	Incidental Ingestion	3E-04	Arsenic	Benzo(a)pyrene Equivalents	--	NA	NA
		Dermal Contact	3E-05	--	Arsenic	Benzo(a)pyrene Equivalents	NA	NA
		Inhalation	2E-08	--	--	--	NA	NA
		Total	3E-04	Arsenic	Benzo(a)pyrene Equivalents	--	NA	NA
	Surface Soil (under cap)	Incidental Ingestion	2E-04	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	--	NA	NA
		Dermal Contact	3E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	NA	NA
		Inhalation	2E-08	--	--	--	NA	NA
		Total	2E-04	Arsenic	2,3,7,8-TCDD Equivalents, Aroclor-1260	--	NA	NA
	Surface Soil (future)	Incidental Ingestion	4E-04	Arsenic	2,3,7,8-TCDD Equivalents, Benzo(a)pyrene Equivalents	--	NA	NA
		Dermal Contact	5E-05	--	Arsenic	2,3,7,8-TCDD Equivalents, Benzo(a)pyrene Equivalents, Aroclor-1260	NA	NA
		Inhalation	2E-08	--	--	--	NA	NA
		Total	4E-04	Arsenic	2,3,7,8-TCDD Equivalents, Benzo(a)pyrene Equivalents, Aroclor-1260	--	NA	NA
	Subsurface Soil	Incidental Ingestion	3E-04	Arsenic	Benzo(a)pyrene Equivalents	--	NA	NA
		Dermal Contact	3E-05	--	Arsenic	Benzo(a)pyrene Equivalents	NA	NA
		Inhalation	2E-08	--	--	--	NA	NA
		Total	3E-04	Arsenic	Benzo(a)pyrene Equivalents	--	NA	NA
	Groundwater (upgradient)	Incidental Ingestion	1E-04	--	Arsenic, Trichloroethene	Tetrachloroethene	NA	NA
		Dermal Contact	1E-05	--	--	Tetrachloroethene, Trichloroethene	NA	NA
		Inhalation	6E-06	--	--	Trichloroethene	NA	NA
		Total	2E-04	--	Arsenic, Trichloroethene	Tetrachloroethene	NA	NA
	Groundwater (downgradient)	Incidental Ingestion	4E-04	Arsenic	Trichloroethene	Tetrachloroethene	NA	NA
		Dermal Contact	8E-06			Arsenic, Trichloroethene	NA	NA
		Inhalation	3E-06			Trichloroethene	NA	NA
		Total	4E-04	Arsenic	Trichloroethene	Tetrachloroethene	NA	NA

TABLE 5-2

CHEMICALS RETAINED AS COCs FOR DIRECT CONTACT
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Parameter	Surface soil (current)	Surface soil (under cap)	Surface soil (future)	Subsurface soil	Groundwater (upgradient)	Groundwater (downgradient)
VOLATILE ORGANIC COMPOUNDS						
TETRACHLOROETHENE					X	X
TRICHLOROETHENE					X	X
POLYCYCLIC AROMATIC HYDROCARBONS						
BAP EQUIVALENT	X		X	X		
PCBS						
AROCLOR-1260		X	X			
DIOXINS/FURANS						
2,3,7,8-TCDD EQUIVALENTS		X	X			
METALS						
ARSENIC	X	X	X	X	X	X
CADMIUM		X	X			
COBALT					X	X

Notes
X - Chemical was retained as a COC for direct contact.

FIGURE 5-1
SUMMARY OF CUMULATIVE CANCER RISKS FROM ALL MEDIA
UXO 32
INDIAN HEAD, MARYLAND

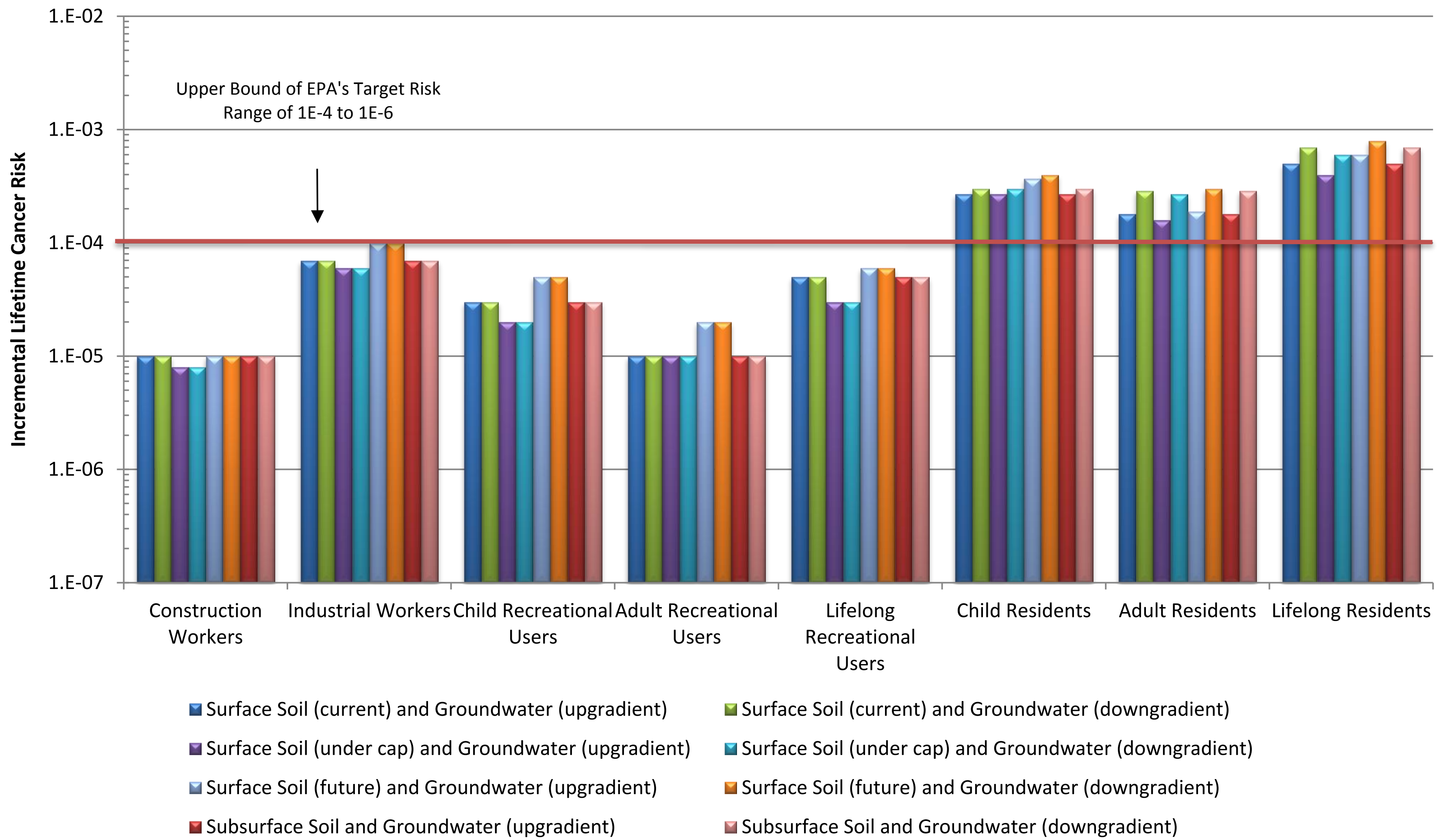


FIGURE 5-2
SUMMARY OF CUMULATIVE HAZARD INDICES FROM ALL MEDIA
UXO 32
INDIAN HEAD, MARYLAND

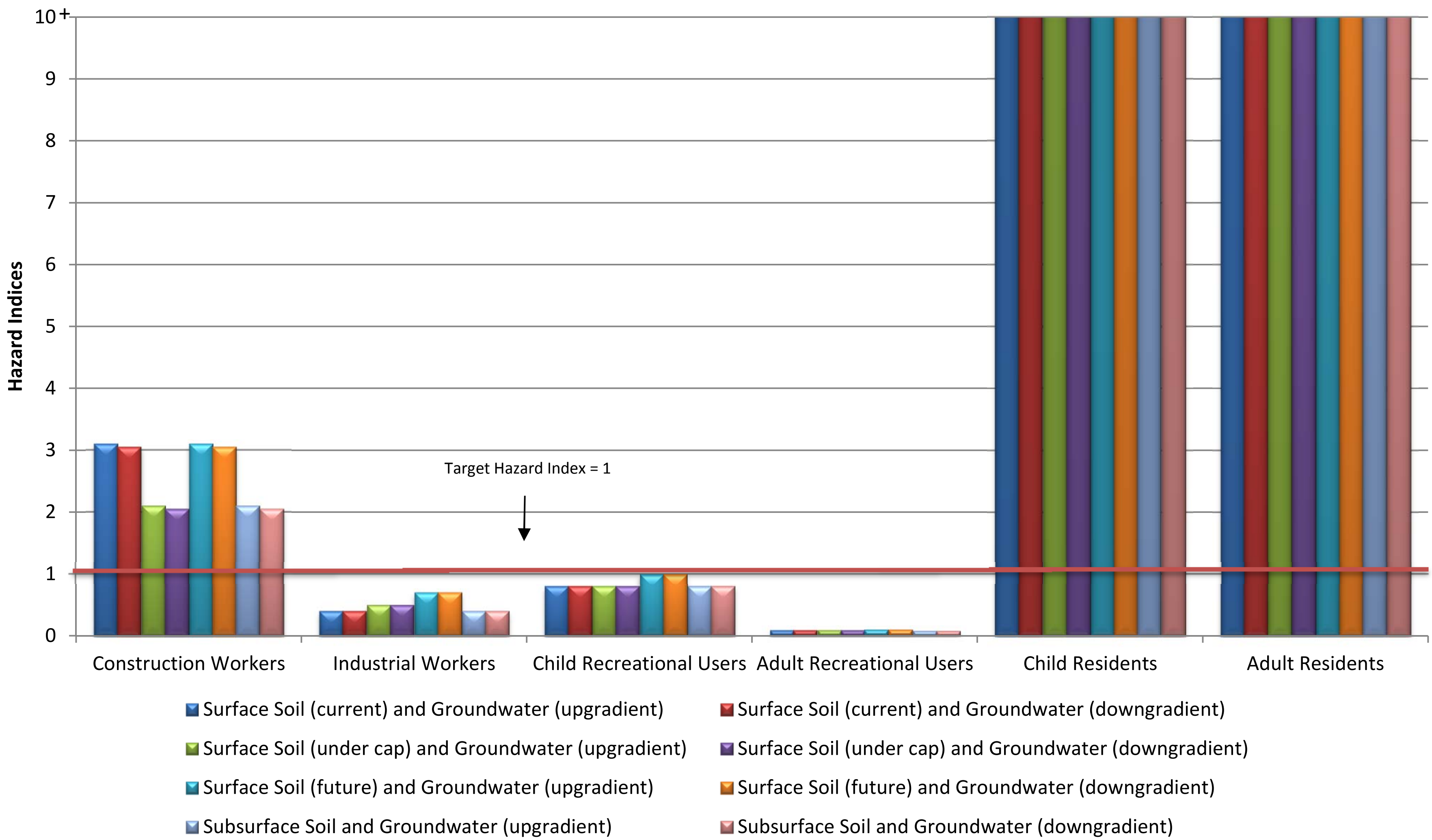


FIGURE 5-3
SUMMARY OF MEDIA-SPECIFIC CANCER RISKS
UXO 32
INDIAN HEAD, MARYLAND

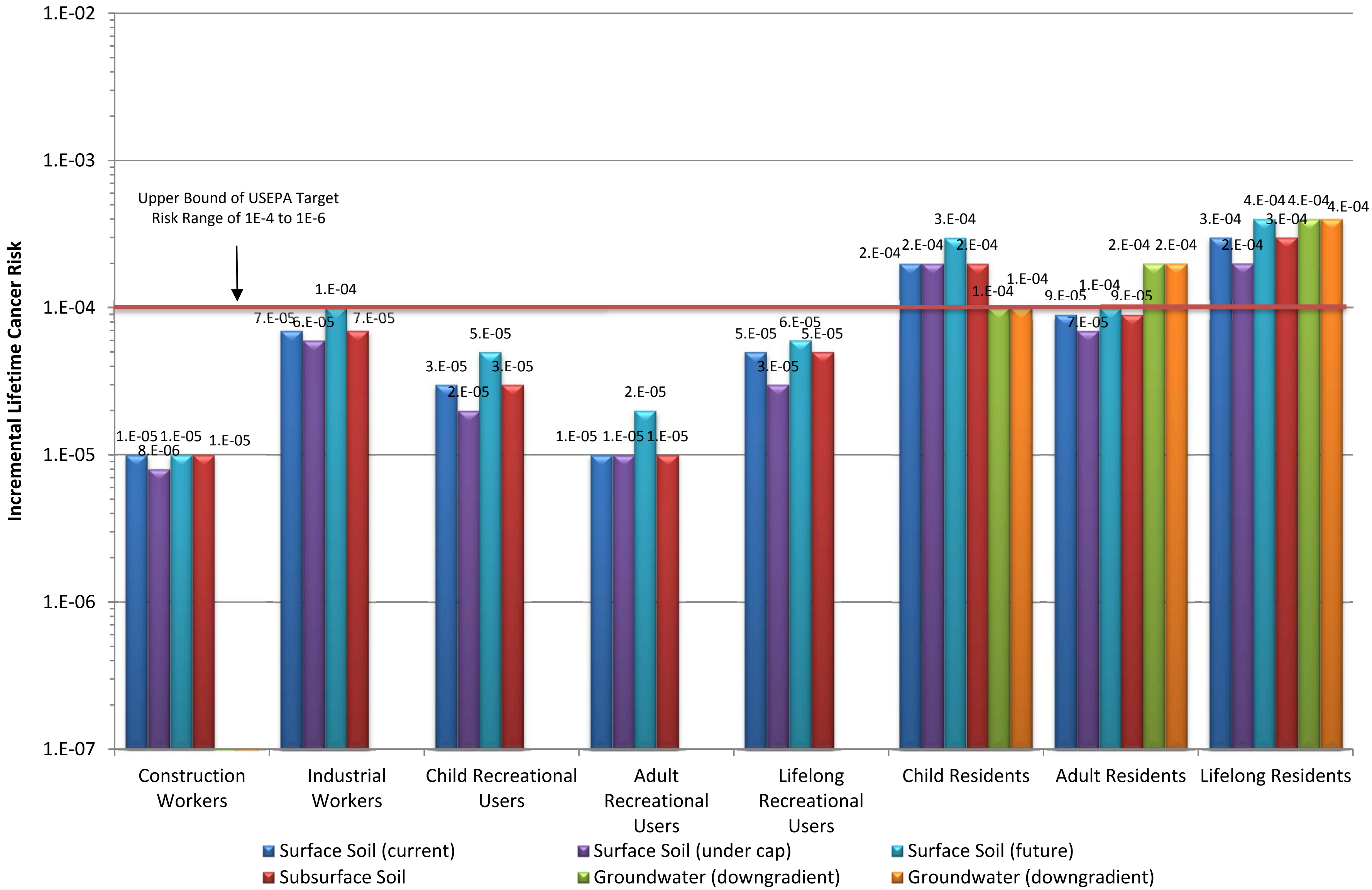
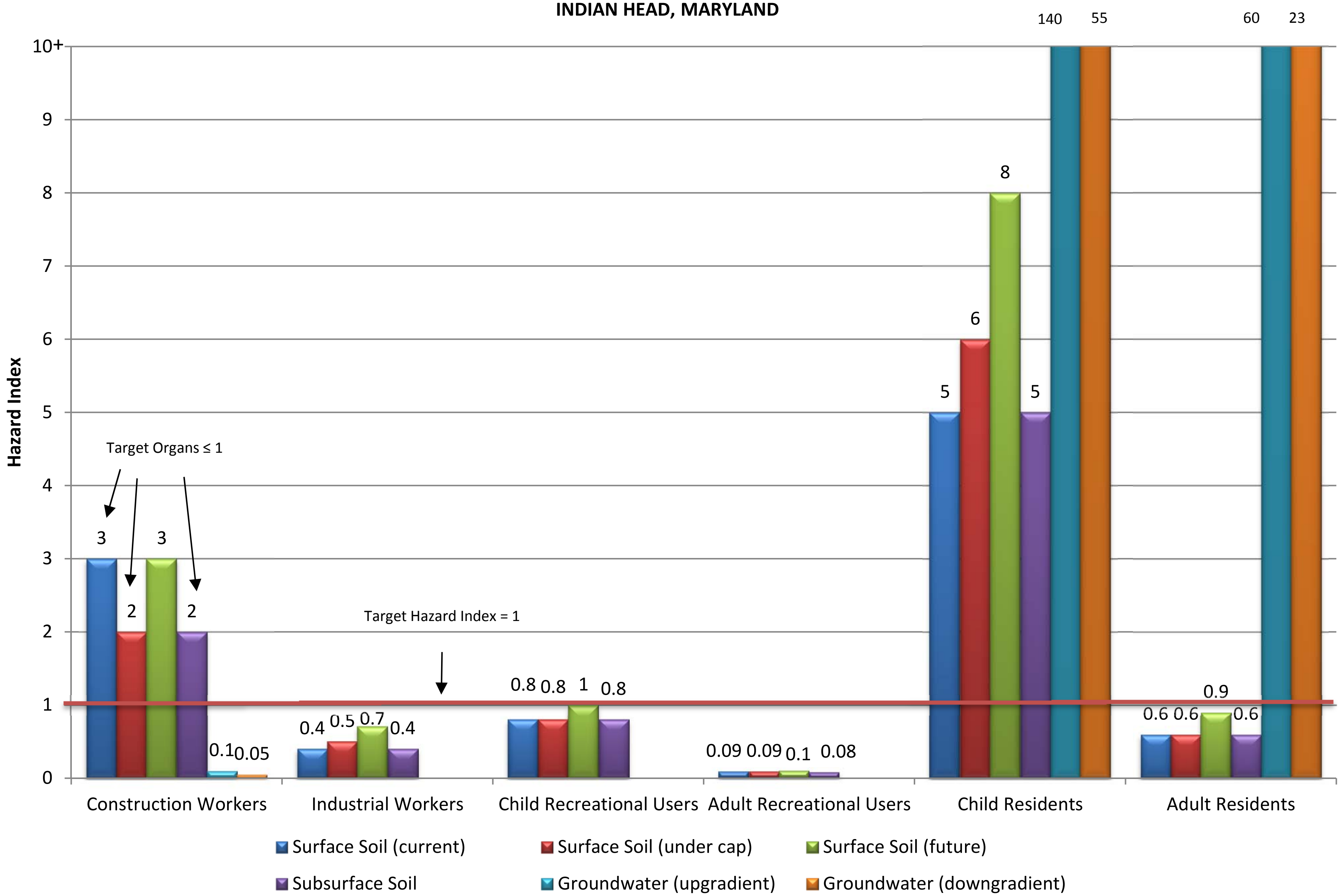


FIGURE 5-4
SUMMARY OF MEDIA-SPECIFIC HAZARD INDICES
UXO 32
INDIAN HEAD, MARYLAND



6.0 UNCERTAINTY ANALYSIS

This section presents a summary of uncertainties inherent in the risk assessment and includes a discussion of how they may affect the quantitative risk estimates and conclusions of the risk analysis. The HHRA for UXO 32 was performed in accordance with current USEPA guidance. However, varying degrees of uncertainty are associated with the HHRA. The following sections discuss general uncertainties in risk assessment and uncertainties specific to this risk assessment for UXO 32.

Uncertainty in COPC selection is related to the status of the predictive databases, the grouping of samples, the numbers, types, and distributions of samples, data quality, and the procedures used to include or exclude constituents as COPCs. Uncertainty associated with the exposure assessment includes the values used as input variables for a given intake route or scenario, the assumptions made to determine EPCs, and the predictions regarding future land uses and population characteristics. Uncertainty in the toxicity assessment includes the quality of the existing toxicity data needed to support dose response relationships and the weight of evidence used to determine the carcinogenicity of COPCs. Uncertainty in risk characterization is associated with exposure to multiple chemicals and the cumulative uncertainty from combining conservative assumptions made in earlier steps of the risk assessment.

Whereas various sources of random uncertainty and bias exist, the magnitude of bias and uncertainty and the direction of bias are influenced by the assumptions made throughout the risk assessment, including selection of COPCs and selection of values for dose response relationships. Throughout the risk assessment, assumptions that consider safety factors were made to overestimate the final calculated risks. Generally, risk assessments carry two types of uncertainty, measurement and informational uncertainty. Measurement uncertainty refers to the usual variance that accompanies scientific measurements. For example, this type of uncertainty is associated with the analytical data collected for each site. The risk assessment reflects the accumulated variances of the individual values used. Informational uncertainty stems from inadequate availability of information needed to complete the toxicity and exposure assessments. This gap is often significant, such as the absence of information on the effects of human exposure to low doses of a chemical, the biological mechanism of chemical action, or the behavior of a chemical in soil.

After the risk assessment is complete, the results must be reviewed and evaluated to identify the type and magnitude of uncertainty involved. Relying on risk assessment results without considering the uncertainties, limitations, and assumptions inherent in the process can be misleading. For example, to account for uncertainties in developing exposure assumptions, conservative estimates were made to ensure that the particular assumptions protected sensitive subpopulations or maximally exposed individuals. If a number of conservative assumptions are combined in an exposure model, the resulting calculations can propagate the uncertainties associated with those assumptions, thereby producing much larger uncertainty in the results. This uncertainty is biased toward over predicting both carcinogenic and non-carcinogenic risks. Thus, both the results of the risk assessment and the uncertainties associated with them must be considered when making risk management decisions.

This interpretation of uncertainty is especially relevant when the risks exceed the point of departure for defining "acceptable" risk. For example, when risks calculated using a high degree of uncertainty are less than an "acceptable" risk level (i.e., 10^{-6}), the interpretation of no significant risk is typically straightforward. However, when risks calculated with a high degree of uncertainty exceed a regulatory acceptable risk level (i.e., 10^{-4}), a conclusion can be difficult unless uncertainty is considered.

6.1 UNCERTAINTY IN COPC SELECTION

The most significant issues related to uncertainty in COPC selection at UXO 32 are the usability of existing databases (only validated data were used in the risk assessment), the COPC screening levels used, the absence of screening levels for a few chemicals detected in site media, and the selection of COPCs using USEPA generic $SSLs_{air}$. A brief discussion of each of these issues is provided in the remainder of this section.

Usability and Completeness of Existing Databases - As discussed in Section 2.0, data from samples collected during several field investigations were used to assess risks to potential human receptors. These data were validated according to USEPA data validation guidelines. Only fixed base analytical results (i.e., results from a fixed base laboratory, not field analytical results) from the field investigations for the target analyte lists were used in the quantitative risk evaluation. Data regarded as rejected (i.e., qualified as "R" during data validation) were not used in the quantitative risk assessment. Elimination of data qualified as "R" may increase uncertainty in the risk assessment.

COPC Screening Levels - Using risk-based screening values based on conservative land use scenarios (i.e., residential land use for soil) corresponding to ILCRs of 10^{-6} and HQs of 0.1 ensured that all significant contributors to risk at a site were evaluated. Eliminating chemicals present at concentrations that correspond to ILCRs less than 10^{-6} and HQs less than 0.1 should not have affected the final conclusions of the risk assessment because those chemicals are not expected to pose potential health concerns at the concentrations detected.

Chemicals without Established Direct Contact Screening Levels - Risk based screening levels are currently not available for some constituents detected at UXO 32. If available, appropriate surrogates were selected for some of these chemicals, based on similar chemical structures. In COPC screening, acenaphthene was used as a surrogate for acenaphthylene, and pyrene was selected as a surrogate for benzo(g,h,i)perylene and phenanthrene. Applying the toxicity values of one compound to another increases uncertainty in the risk assessment both with regard to COPC selection and the calculated risks. The direction of the uncertainty is unknown.

A large number of constituents do not have $SSLs_{air}$ for the migration from soil to air pathway. This uncertainty is expected to be small because for most chemicals potential risks associated with exposures via inhalation are typically orders of magnitude less than those associated with exposures via incidental ingestion and dermal contact with soil. A comparison of the screening criteria for direct contact exposures with the screening criteria for migration from soil to air shows that, in most cases, the direct contact screening criteria are at least an order of magnitude less than the soil-to-air migration screening criteria for the same compound. Based on the results of these comparisons, if unacceptable risks result from inhalation exposures, unacceptable risks are usually also posed by exposures via the incidental ingestion and dermal contact exposure pathways.

Use of Protection of Groundwater SSLs for Transfers from Soil to Groundwater for COPC Selection - A number of chemicals were selected as COPCs because their maximum concentrations exceeded protection of groundwater SSLs for migration from soil to groundwater assuming a DAF_1. However, USEPA's Soil Screening Guidance (1996) states, "the EPA has selected a default DAF of 20 to account for contaminant dilution and attenuation during transport through the saturated zone to a compliance point (i.e., receptor well). At most sites, this adjustment will more accurately reflect a contaminant's threat to groundwater resources than assuming a DAF of 1 (i.e., no dilution or attenuation)." The guidance further states, "a DAF of 20 is protective for sources up to 0.5 acres in size", and "can be protective of larger sources as well." Consequently, the use of SSLs based on a DAF_1 is very conservative. A more refined evaluation of the potential for chemical migration from soil to groundwater is provided in Section 5.3.4. COCs were recommended for the FS based on that analysis.

Chemicals Potentially Attributable to Background

As per Navy guidance, several chemicals were eliminated from the quantitative HHRA for UXO 32 because their maximum concentrations were less than facility background levels for soil. The following chemicals were eliminated as COPCs on the basis of background:

- Surface Soil - none
- Subsurface Soil – aluminum, cobalt, iron, manganese, and vanadium

The elimination of the aforementioned metals from the quantitative HHRA could result in an underestimation of risk. In order to evaluate the implications of omitting these metals from the quantitative HHRA, ILCRs and HIs were recalculated including the metals listed above. Relevant RAGS Part D tables for HHRA results including chemicals omitted from the quantitative HHRA on the basis of background are included in Attachment 3. The results of this analysis are presented in the following table.

ANALYSIS OF RISKS FOR CHEMICALS OMITTED FROM THE QUANTITATIVE HHRA ON THE BASIS OF BACKGROUND – RME SCENARIO – UXO 32				
Receptor	ILCR		HI	
	COPCs Only(1)	COPCs + BKG(2)	COPCs Only(1)	COPCs + BKG(2)
Subsurface Soil				
Construction Worker	1E-05	1E-05	2	3
Industrial Worker	7E-05	7E-05	0.4	0.5
Child Recreational User	3E-05	3E-05	0.8	0.9
Adult Recreational User	1E-05	1E-05	0.08	0.1
Lifelong Recreational User	5E-05	5E-05	NA	NA
Future Child Resident	2E-04	2E-04	5	6
Future Adult Resident	9E-05	9E-05	0.6	0.7
Lifelong Resident	3E-04	3E-04	NA	NA

1 - Total risks calculated in the HHRA for COPCs only.
2 - Risk values include constituents eliminated on the basis of background.
NA – Not applicable.

As indicated in the table, ILCRs and the receptors with HIs exceeding 1 do not change when chemicals eliminated on the basis of background are included in the HHRA calculations.

6.2 EXPOSURE ASSESSMENT UNCERTAINTY

Uncertainty in the exposure assessment arose because of the methods used to calculate EPCs, determination of land use conditions, selection of receptors and scenarios, and selection of exposure parameters. Each of these is discussed below.

Land Use - Current land use patterns at UXO 32 are well established, thereby limiting the uncertainty associated with land use assumptions. Land use is currently limited to industrial/commercial activities, and the area is expected to remain commercial/industrial in the future. Facility maintenance workers are the only current receptors potentially contacting environmental media at UXO 32. To be conservative, risks to current and future construction workers, industrial workers, recreational users, and on site residents were evaluated.

Exposure Routes and Receptor Identification - Determination of various receptor groups and exposure routes of potential concern was based on current land use at the site and anticipated future land use.

Therefore, uncertainty associated with selecting exposure routes and potential receptors is minimal because these are considered well defined.

Exposure Point Concentrations - Uncertainty is associated with the use of 95-percent UCL on the mean concentrations as EPCs. As a result of using the 95-percent UCL, estimations of potential risk for the RME scenario are most likely overstated because each UCL is a representation of the upper limit that potential receptors would be exposed to over the entire exposure period. In some cases (because data sets had less than five samples, because there were less than four detections, or because the UCL was greater than the maximum concentration), the maximum concentration was used as the EPC. Using the maximum concentration tends to overestimate potential risks because receptors are assumed to be continuously exposed to the maximum concentration for the entire exposure period.

Exposure Parameters - Each exposure factor selected for use in the risk assessment had some associated uncertainty. Exposure factors are generally based on surveys of physiological and lifestyle profiles across the U.S., and the attributes and activities studied in these surveys generally have a broad distribution. To avoid underestimating exposure, in most cases, USEPA guidelines on the RME receptor were used. These generally specify using the 95th percentile value for most parameters. Therefore, the selected values for the RME receptor represent an upper bound of the observed or expected habits of most of the population.

Uncertainty can generally be assessed quantitatively for many assumptions made in determining factors for calculating exposures and intakes. Many of these parameters were determined from statistical analyses of human population characteristics. Often, the database used to derive a particular exposure parameter (e.g., body weight) is relatively large. Consequently, the values chosen for such variables in the RME scenario have low uncertainty.

Many of the exposure parameters used to calculate exposures and risks in this report were selected from a distribution of possible values, including values provided in USEPA guidance (1989, 1991, 1993, 1997a, 2004a). For the RME scenario, the value representing the 95th percentile was generally selected for each parameter to ensure that the assessment bounds most actual risks from a postulated exposure. This risk number is used in risk management decisions, but it does not indicate what an average and more-representative exposure might be, or what risk range might be expected for individuals in the exposed population.

6.3 UNCERTAINTY IN THE TOXICOLOGICAL EVALUATION

Uncertainties associated with the toxicity assessment (determination of RfDs and CSFs and use of available criteria) are presented in this section.

Derivation of Toxicity Criteria - Uncertainty associated with the toxicity assessment is associated with hazard assessment and dose response evaluations for the COPCs. The hazard assessment characterizes the nature and strength of causal evidence or the likelihood that a chemical that induces adverse effects in animals will do likewise in humans. A hazard assessment of carcinogenicity was evaluated as a weight of evidence determination using USEPA methods. Positive animal cancer test data suggest that humans contain tissue(s) that may manifest a carcinogenic response; however, animal data cannot necessarily be used to predict the target tissue in humans. In the hazard assessment of non-carcinogenic effects, however, positive animal data often suggest the nature of the effects (i.e., the target tissues and type of effects) to be anticipated in humans.

Uncertainty in hazard assessment arises from the nature and quality of the animal and human data. Uncertainty is reduced when:

- Similar effects are observed across species, strain, sex, and exposure route.
- The magnitude of the response is clearly dose related.
- Pharmacokinetic data indicate a similar fate in humans and animals.
- Postulated mechanisms of toxicity are similar for humans and animals.
- The COC is structurally similar to other chemicals for which toxicity is more completely characterized.

Uncertainty in the dose response evaluation includes determining a CSF for the carcinogenic assessment and deriving of an RfD for the non-carcinogenic assessment. Uncertainty is introduced from interspecies (animal-to-human) extrapolation, which, in the absence of quantitative pharmacokinetic or mechanistic data, is usually based on consideration of interspecies differences in basal metabolic rate. Uncertainty also results from intraspecies variation. Most toxicity experiments are performed on animals that are very similar in age and genotype, so intragroup biological variation is minimal.

In contrast, the human population of concern may reflect a great deal of heterogeneity, including unusual sensitivity or tolerance to the COPC. Even toxicity data from human occupational exposures reflect a bias because only those individuals sufficiently healthy to regularly attend work (the “healthy worker effect”) and those not unusually sensitive to the chemical are likely to be occupationally exposed. Finally, uncertainty arises from the quality of the key study from which the quantitative estimate is derived and the database used. For cancer effects, the uncertainty associated with dose response factors was mitigated by assuming the 95-percent upper bound for the slope factor. Another source of uncertainty in carcinogenic assessment is the method by which data from high doses in animal studies are extrapolated to the dose range expected for environmentally exposed humans. The linearized multi stage model, which is used in nearly all quantitative estimations of human risk based on animal data, is based on a non-threshold assumption of carcinogenesis. Evidence suggests, however, that epigenetic carcinogens, as well as many genotoxic carcinogens, have a threshold below which they are non-carcinogenic. Therefore, using the linearized multi stage model was conservative for chemicals that exhibited a threshold for carcinogenicity.

For non-carcinogenic effects, additional uncertainty factors may have been applied to derive the RfD to mitigate poor quality of the key study or gaps in the database. Additional uncertainty for non-carcinogenic effects arose from using an effect level in the estimate of an RfD because this estimate was predicated on the assumption of a threshold less than which adverse effects were not expected. Therefore, an uncertainty factor is usually applied to estimate a no effect level.

Additional uncertainty arose in estimating an RfD for chronic exposure from subchronic data. Unless empirical data indicated that effects did not worsen with increasing duration of exposure, an additional uncertainty factor was applied to the no effect level in the subchronic study. Uncertainty in deriving RfDs was mitigated by using uncertainty and modifying factors that normally ranged between 3 and 10. The resulting combination of uncertainty and modifying factors may have reached 1,000 or more. Deriving dermal RfDs and CSFs from oral values may also have caused uncertainty. This was particularly the case when no gastrointestinal absorption rates were available in the literature or when only qualitative statements regarding absorption were available.

Use of Chronic Toxicity Values for Construction Workers – Under the guidelines established by the Superfund program, exposures to construction workers of one year or less are classified as subchronic exposures. Risks for noncarcinogenic effects associated with subchronic exposures should incorporate toxicity values for subchronic and not chronic effects. Subchronic toxicity values are not as widely available as chronic values. Subchronic toxicity values used in this HHRA were obtained from USEPA’s PPRTV internet site. Also ATSDR Minimal Risk Levels (MRLs) were used as subchronic toxicity values when PPRTV values were not available. Chronic toxicity values were used when subchronic toxicity values were not available. Using chronic toxicity criteria to evaluate subchronic exposures for construction workers tends to overestimate potential noncarcinogenic risks. Non-cancer risk estimates presented for the construction worker may be overestimated by as much as a factor of 10 because of the lack of subchronic reference doses/reference concentrations for the COPCs evaluated in this assessment.

6.4 UNCERTAINTY IN THE RISK CHARACTERIZATION

Uncertainty in risk characterization resulted from assumptions made regarding additivity of effects from exposure to multiple COPCs via various exposure routes. High uncertainty exists when summing non-carcinogenic risks for several substances across different exposure pathways. This assumes that each substance has a similar effect and/or mode of action. Even when chemicals affect the same target organs, they may have different mechanisms of action or differ in their fate in the body, so additivity may not be an appropriate assumption in all cases. However, the assumption of additivity was considered because in most cases it represents a conservative estimate of risk. Risks to any individual may also have been overestimated by summing multiple assumed exposure pathway risks for any single receptor. Although every effort was made to develop reasonable scenarios, not all individual receptors may be exposed via all pathways considered.

Finally, the risk characterization did not consider antagonistic or synergistic effects. Little or no information is available to determine the potential for antagonism or synergism for the COPCs. Because chemical specific interactions could not be predicted, the likelihood for risks being over- or under predicted could not be defined, but the methodology used is based on current USEPA guidance.

7.0 REMEDIAL GOAL OPTIONS

Cleanup goals were developed for those media with ILCRs greater than 1×10^{-4} and total HIs greater than 1.0. Cleanup goals were derived for those COCs that contribute significantly to the cancer risk and/or HI for each exposure pathway in a given land use scenario for a receptor group. Chemicals were not considered as significant contributors to risk, and were therefore not included as COCs, if their individual carcinogenic risk contribution was less than 1×10^{-6} and their non-carcinogenic HQ was less than 0.1. Cleanup goals were calculated using the following equation:

$$\text{Cleanup Goal [chemical i]} = \text{EPC[chemical i]}\times\text{Target Risk/Calculated Risk[chemical i]}$$

where:

Cleanup goal [chemical i]	=	chemical-specific cleanup goal
EPC [chemical i]	=	exposure point concentration used in risk assessment calculations
Target risk	=	target risk for carcinogens or the target HQs for non-carcinogens
Calculated risk [chemical i]	=	total risk calculated for a specific chemical in the risk assessment

The cleanup goals calculated for soil and groundwater are presented in Tables 7-1 and 7-2. These tables include USEPA RSL screening criteria.

TABLE 7-1

PRELIMINARY REMEDIAL GOALS FOR SOIL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CONSTRUCTION WORKER					
Chemical	**USEPA Industrial RSL[1] (mg/kg)**	**Target Cancer Risk Level**			**Hazard Index = 1 (mg/kg)**
		10^{-6} (mg/kg)	**10^{-5} (mg/kg)**	**10^{-4} (mg/kg)**	
2,3,7,8-TCDD Equivalents	1.8E-05	1.5E-04	2.0E-03	1.5E-02	5.6E-03
Arsenic	1.6E+00	1.2E+01	1.2E+02	1.2E+03	4.5E+01
Lead	8.0E+02	NA	NA	NA	NA
Benzo(a)pyrene Equivalents	2.1E-01	2.1E+00	2.1E+01	2.1E+02	NA
Aroclor-1260	7.4E-01	7.6E+00	7.6E+01	7.6E+02	NA

RESIDENT[2]					
Chemical	**USEPA Residential RSL[1] (mg/kg)**	**Target Cancer Risk Level**			**Hazard Index = 1 (mg/kg)**
		10^{-6} (mg/kg)	**10^{-5} (mg/kg)**	**10^{-4} (mg/kg)**	
2,3,7,8-TCDD Equivalents	4.5E-06	4.5E-06	4.5E-05	4.5E-04	7.2E-05
Arsenic	3.9E-01	3.9E-01	3.9E+00	3.9E+01	2.2E+01
Lead	4.0E+02	NA	NA	NA	NA
Benzo(a)pyrene Equivalents	1.5E-02	1.5E-02	1.5E-01	1.5E+00	NA
Aroclor-1260	2.2E-01	2.2E-01	2.2E+00	2.2E+01	NA

Notes:
1 - USEPA Regional Screening Level Table, November 2011.
[Cancer benchmark value = 1E-06, Hazard index (HI) = 1.0].
2 - Target cancer risk level based on lifelong resident and hazard index based on child resident.
NA - Not applicable/not available.

TABLE 7-2

PRELIMINARY REMEDIAL GOALS FOR GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CONSTRUCTION WORKER					
Chemical	**USEPA Tapwater RSL(1) (μg/L)**	**Target Cancer Risk Level**			**Hazard Index = 1 (μg/L)**
		10^{-6} (μg/L)	**10^{-5} (μg/L)**	**10^{-4} (μg/L)**	
Arsenic	0.045	4.5E-02	4.5E-01	4.5E+00	5
Cobalt	4.7	NA	NA	NA	5
Tetrachloroethene	0.072	7.7E-02	7.7E-01	7.7E+00	99
Trichloroethene	0.44	1.1E+00	1.1E+01	1.1E+02	7

RESIDENT(2)					
Chemical	**USEPA Tapwater RSL(1) (μg/L)**	**Target Cancer Risk Level**			**Hazard Index = 1 (μg/L)**
		10^{-6} (μg/L)	**10^{-5} (μg/L)**	**10^{-4} (μg/L)**	
Arsenic	0.045	4.5E-02	4.5E-01	4.5E+00	5
Cobalt	4.7	NA	NA	NA	5
Tetrachloroethene	0.072	7.7E-02	7.7E-01	7.7E+00	99
Trichloroethene (Mutagenic)	0.44	1.8E+00	1.8E+01	1.8E+02	NA
Trichloroethene (Nonmutagenic)	0.44	1.4E+00	1.4E+01	1.4E+02	7

1 - USEPA Regional Screening Level Table, November 2011.
[Cancer benchmark value = 1E-06, Hazard index (HI) = 1.0].
2 - Target cancer risk level based on lifelong resident and hazard index based on child resident.
NA - Not applicable/not available.

8.0 SUMMARY

The HHRA for UXO 32 was performed to characterize potential risks to likely human receptors that could potentially be exposed to soil and groundwater under current and future land use. Potential receptors evaluated under current and future land use are construction workers and industrial workers. Potential receptors evaluated in the HHRA for future land use are hypothetical recreational users and residents. Although future land use is unlikely to change from current land uses, potential future receptors were evaluated in the HHRA primarily for decision-making purposes.

COPCs were selected for direct contact routes of exposure to environmental media and for the potential migration of chemicals from soil to groundwater. The predominant COPCs (in terms of frequency of detection and magnitude of concentrations) for direct contact exposure are as follows:

- PAHs, PCBs, dioxins/furans, and inorganics were retained as direct contact COPCs in surface soil.
- PAHs and arsenic were retained as direct contact COPCs in subsurface soil.
- VOCs and inorganics were retained as direct contact COPCs in groundwater.
- Many of these same organic and inorganic chemicals were also selected as COPCs for the evaluation of chemical migration from soil to groundwater.
- VOCs were selected as COPCs for vapor intrusion.

Quantitative estimates of non-carcinogenic and carcinogenic risks (HIs and ILCRs, respectively) were developed for potential human receptors directly contacting site environmental media. Media with risk estimates exceeding the upper bound of USEPA's target risk range of 10^{-4} to 10^{-6}, or a HI of 1, are identified in the following table.

Summary of Direct Contact Risk Estimates
Ingestion, Dermal Contact, and Inhalation of COPCs

Environmental Medium	Receptors With Risk Estimates Exceeding Risk Management Benchmarks	Chemicals of Concern
Surface soil (current)	Child resident(1), lifelong resident(2)	Arsenic, cPAHs
Surface soil (under cap)	Child resident(1), lifelong resident(2)	Arsenic, Aroclor-1260, 2,3,7,8-TCDD equivalents
Surface soil (future)	Construction worker(1), child resident(1), lifelong resident(2)	Arsenic, cPAHs, Aroclor-1260, 2,3,7,8-TCDD equivalents
Subsurface Soil	Child resident(1), lifelong resident(2)	Arsenic, cPAHs

Environmental Medium	Receptors With Risk Estimates Exceeding Risk Management Benchmarks	Chemicals of Concern
Groundwater (upgradient): Direct Contact	Child resident(1), adult resident(1), lifelong resident(2)	Arsenic, Cobalt, Trichloroethene, Tetrachloroethene
Groundwater (upgradient): Vapor Intrusion	None	No COCs
Groundwater (downgradient): Direct Contact	Child resident(1), adult resident(1), lifelong resident(2)	Arsenic, Cobalt, Trichloroethene, Tetrachloroethene
Groundwater (downgradient): Vapor Intrusion	None	No COCs

1 - Receptor risks exceed non-cancer risk benchmark of target organ-specific HI greater than 1.
2 - Receptor risks exceed 1 x 10^{-4} cancer risk benchmark. Risk estimates presented for the lifelong resident (estimates not presented for the various age groups that define this receptor).

Based on lead modeling, the results for surface soil (under cap) and surface soil (future) exceed the USEPA goal of no more than 5 percent of children exceeding a 10 µg/dL blood-lead level. Except for construction workers exposed to surface soil (under cap), the results for construction workers, industrial workers, and adult recreational users are not at variance with the USEPA goal of no more than 5 percent of children (fetuses of exposed women) exceeding a 10 µg/dL blood-lead level.

The chemicals selected as COCs based on their potential to migrate from soil to groundwater are presented in the following table.

Chemicals of Concern for Migration from Soil to Groundwater

Environmental Medium	Chemicals selected as COC
Surface soil	Arsenic
Subsurface soil	Arsenic

At UXO 32, the COCs for migration from soil to groundwater were detected in surface soil and subsurface soil samples collected at either the soil-groundwater interface or in the saturated zone.

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ATTACHMENTS

1 POSITIVE DETECTIONS FOR SURFACE AND SUBSURFACE SOIL AND GROUNDWATER
2 CALCULATION OF TARGET GROUNDWATER CONCENTRATIONS CORRESPONDING TO TARGET INDOOR AIR CONCENTRATIONS
3 RAGS PART D TABLES
4 PROUCL PRINTOUTS
5 SAMPLE CALCULATIONS
6 LEAD MODELING RESULTS
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ATTACHMENT 1

POSITIVE DETECTIONS FOR SURFACE AND SUBSURFACE SOIL AND GROUNDWATER

Surface Soil

ATTACHMENT 1
POSITIVE DETECTIONS FOR SURFACE SOIL
COMPARISON TO DIRECT CONTACT AND PROTECTION OF GROUNDWATER CRITERIA
HUMAN HEALTH RISK ASSESSMENT - UXO 32

LOCATION	Adjusted USEPA Regional Screening Levels[1,2] Residential Soil		USEPA Regional Screening Levels[1,2] Protection of Groundwater SSLs		U32SA01SB01	U32SA01SB02	U32SA02SB01	U32SA02SB02	U32SA03SB01	U32SA03SB02	U32SA04SB01
SAMPLE ID					U32SA01SB0101	U32SA01SB0201	U32SA02SB0101	U32SA02SB0201	U32SA03SB0101	U32SA03SB0201	U32SA04SB0101
SAMPLE DATE					20101027	20101027	20101027	20101027	20101027	20101027	20101027
SAMPLE CODE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX					SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP
SUBMATRIX					SS	SS	SS	SS	SS	SS	SS
TOP DEPTH					1	1	1	1	1	1	1
BOTTOM DEPTH					2	2	2	2	2	2	2
DIOXINS/FURANS (NG/KG)											
1,2,3,4,6,7,8,9-OCDD	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8,9-OCDF	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDD	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-PECDF	150	C	8.7		NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-PECDF	15	C	0.87		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
TEQ	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TEQ - HALFND	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL PECDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
METALS (MG/KG)											
ARSENIC	0.39	C	0.0013		**45.7**	**23.9**	**14.6**	**14.7**	**25.8**	**15.4**	**16.7**
BARIUM	1500	N	120		NA	NA	NA	NA	NA	NA	NA
CADMIUM	7	N	0.52		NA	NA	NA	NA	NA	NA	NA
CHROMIUM	12000	N[3]	28000000	[3]	NA	NA	NA	NA	NA	NA	NA
LEAD	400	N	14	[4]	NA	NA	NA	NA	NA	NA	NA
MERCURY	2.3	N[5]	0.033		NA	NA	NA	NA	NA	NA	NA
SELENIUM	39	N	0.4		NA	NA	NA	NA	NA	NA	NA
ZINC	2300	N	290		NA	NA	NA	NA	NA	NA	NA
MISCELLANEOUS PARAMETERS (%)											
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL SOLIDS	NC		NC		NA	NA	NA	NA	NA	NA	NA
PCBS (UG/KG)											
AROCLOR-1260	220	C	24		NA	NA	NA	NA	NA	NA	NA
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
2-METHYLNAPHTHALENE	31000	N	140		NA	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	340000	N[6]	4100	[6]	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	1700000	N	42000		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT	15	C	NC		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT-HALFND	15	C	NC		NA	NA	NA	NA	NA	NA	NA
BENZO(A)ANTHRACENE	150	C	10		NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		NA	NA	NA	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	150	C	35		NA	NA	NA	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	170000	N[7]	9500	[7]	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	NA	NA	NA	NA	NA	NA
CHRYSENE	15000	C	1100		NA	NA	NA	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	15	C	11		NA	NA	NA	NA	NA	NA	NA
FLUORANTHENE	230000	N	70000		NA	NA	NA	NA	NA	NA	NA
FLUORENE	230000	N	4000		NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	3600	C	0.47		NA	NA	NA	NA	NA	NA	NA
PHENANTHRENE	170000	N[7]	9500	[7]	NA	NA	NA	NA	NA	NA	NA
PYRENE	170000	N	9500		NA	NA	NA	NA	NA	NA	NA

LOCATION	Adjusted USEPA Regional Screening Levels[1,2] Residential Soil		USEPA Regional Screening Levels[1,2] Protection of Groundwater SSLs		U32SA04SB02	U32SA05SB01			U32SA05SB02	U32SA06SB01	U32SA06SB02
SAMPLE ID					U32SA04SB0201	U32SA05SB0101	U32SA05SB0101-AVG	U32SA05SB0101-D	U32SA05SB0201	U32SA06SB0101	U32SA06SB0201
SAMPLE DATE					20101027	20101027	20101027	20101027	20101027	20101027	20101027
SAMPLE CODE					NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL
MATRIX					SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP
SUBMATRIX					SS	SS	SS	SS	SS	SS	SS
TOP DEPTH					1	1	1	1	1	1	1
BOTTOM DEPTH					2	2	2	2	2	2	2
DIOXINS/FURANS (NG/KG)											
1,2,3,4,6,7,8,9-OCDD	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8,9-OCDF	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDD	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-PECDF	150	C	8.7		NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-PECDF	15	C	0.87		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
TEQ	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TEQ - HALFND	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL PECDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
METALS (MG/KG)											
ARSENIC	0.39	C	0.0013		**12.7**	**315**	**284**	**253**	**34.7**	**35.2**	**16.1**
BARIUM	1500	N	120		NA	NA	NA	NA	NA	NA	NA
CADMIUM	7	N	0.52		NA	NA	NA	NA	NA	NA	NA
CHROMIUM	12000	N(3)	28000000	(3)	NA	NA	NA	NA	NA	NA	NA
LEAD	400	N	14	(4)	NA	NA	NA	NA	NA	NA	NA
MERCURY	2.3	N(5)	0.033		NA	NA	NA	NA	NA	NA	NA
SELENIUM	39	N	0.4		NA	NA	NA	NA	NA	NA	NA
ZINC	2300	N	290		NA	NA	NA	NA	NA	NA	NA
MISCELLANEOUS PARAMETERS (%)											
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL SOLIDS	NC		NC		NA	NA	NA	NA	NA	NA	NA
PCBS (UG/KG)											
AROCLOR-1260	220	C	24		NA	NA	NA	NA	NA	NA	NA
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
2-METHYLNAPHTHALENE	31000	N	140		NA	15.2	17.95	20.7	3.55 J	NA	NA
ACENAPHTHYLENE	340000	N(6)	4100	(6)	NA	7.78 U	7.795 U	7.81 U	5.91 J	NA	NA
ANTHRACENE	1700000	N	42000		NA	9.72	6.8125	7.81 U	10.6	NA	NA
BAP EQUIVALENT	15	C	NC		NA	**30.5**	**27.1**	**23.7**	**24.3**	NA	NA
BAP EQUIVALENT-HALFND	15	C	NC		NA	**30.5**	**27.1**	**23.7**	**28.2**	NA	NA
BENZO(A)ANTHRACENE	150	C	10		NA	*20.2*	*19.1*	*18*	*18.1*	NA	NA
BENZO(A)PYRENE	15	C	3.5		NA	**17.5**	15	*12.5*	**17.3**	NA	NA
BENZO(B)FLUORANTHENE	150	C	35		NA	*49*	*39.55*	30.1	33.1	NA	NA
BENZO(G,H,I)PERYLENE	170000	N(7)	9500	(7)	NA	14 J	13.05	12.1 J	15 J	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	62.2 J	35.59	8.98 J	38.6	NA	NA
CHRYSENE	15000	C	1100		NA	61.8	63.3	64.8	28	NA	NA
DIBENZO(A,H)ANTHRACENE	15	C	11		NA	4.28 J	4.87	5.46 J	7.88 U	NA	NA
FLUORANTHENE	230000	N	70000		NA	39.3	34.1	28.9	30.3	NA	NA
FLUORENE	230000	N	4000		NA	3.89 J	3.89 J	7.81 U	7.88 U	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	10.9	9.355	7.81 J	14.2	NA	NA
NAPHTHALENE	3600	C	0.47		NA	*5.83 J*	*6.23*	*6.63 J*	*5.12 J*	NA	NA
PHENANTHRENE	170000	N(7)	9500	(7)	NA	73.5	77.9	82.3	14.6	NA	NA
PYRENE	170000	N	9500		NA	28.4	24.75	21.1	25.2	NA	NA

ATTACHMENT 1
POSITIVE DETECTIONS FOR SURFACE SOIL
COMPARISON TO DIRECT CONTACT AND PROTECTION OF GROUNDWATER CRITERIA
HUMAN HEALTH RISK ASSESSMENT - UXO 32

LOCATION	Adjusted USEPA Regional Screening Levels[1,2] Residential Soil		USEPA Regional Screening Levels[1,2] Protection of Groundwater SSLs		U32SA07SB01	U32SA07SB02			U32SA08SB01	U32SA08SB02	U32SA09SB01
SAMPLE ID					U32SA07SB0101	U32SA07SB0201	U32SA07SB0201-AVG	U32SA07SB0201-D	U32SA08SB0101	U32SA08SB0201	U32SA09SB0101
SAMPLE DATE					20101028	20101027	20101027	20101027	20101028	20101027	20101028
SAMPLE CODE					NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL
MATRIX					SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP
SUBMATRIX					SS	SS	SS	SS	SS	SS	SS
TOP DEPTH					1	1	1	1	1	1	1
BOTTOM DEPTH					2	2	2	2	2	2	2
DIOXINS/FURANS (NG/KG)											
1,2,3,4,6,7,8,9-OCDD	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8,9-OCDF	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDD	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-PECDF	150	C	8.7		NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-PECDF	15	C	0.87		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
TEQ	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TEQ - HALFND	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL PECDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
METALS (MG/KG)											
ARSENIC	0.39	C	0.0013		3.91	109	115	121	12.6	129	3.65
BARIUM	1500	N	120		NA	NA	NA	NA	NA	NA	NA
CADMIUM	7	N	0.52		NA	NA	NA	NA	NA	NA	NA
CHROMIUM	12000	N(3)	28000000	(3)	NA	NA	NA	NA	NA	NA	NA
LEAD	400	N	14	(4)	NA	NA	NA	NA	NA	NA	NA
MERCURY	2.3	N(5)	0.033		NA	NA	NA	NA	NA	NA	NA
SELENIUM	39	N	0.4		NA	NA	NA	NA	NA	NA	NA
ZINC	2300	N	290		NA	NA	NA	NA	NA	NA	NA
MISCELLANEOUS PARAMETERS (%)											
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL SOLIDS	NC		NC		NA	NA	NA	NA	NA	NA	NA
PCBS (UG/KG)											
AROCLOR-1260	220	C	24		NA	NA	NA	NA	NA	NA	NA
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
2-METHYLNAPHTHALENE	31000	N	140		NA	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	340000	N(6)	4100	(6)	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	1700000	N	42000		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT	15	C	NC		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT-HALFND	15	C	NC		NA	NA	NA	NA	NA	NA	NA
BENZO(A)ANTHRACENE	150	C	10		NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		NA	NA	NA	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	150	C	35		NA	NA	NA	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	170000	N(7)	9500	(7)	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	NA	NA	NA	NA	NA	NA
CHRYSENE	15000	C	1100		NA	NA	NA	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	15	C	11		NA	NA	NA	NA	NA	NA	NA
FLUORANTHENE	230000	N	70000		NA	NA	NA	NA	NA	NA	NA
FLUORENE	230000	N	4000		NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	3600	C	0.47		NA	NA	NA	NA	NA	NA	NA
PHENANTHRENE	170000	N(7)	9500	(7)	NA	NA	NA	NA	NA	NA	NA
PYRENE	170000	N	9500		NA	NA	NA	NA	NA	NA	NA

LOCATION	Adjusted USEPA Regional Screening Levels[1,2] Residential Soil		USEPA Regional Screening Levels[1,2] Protection of Groundwater SSLs		U32SA09SB02	U32SA10SB01	U32SA10SB02	U32SA11SB01	U32SA11SB02	U32SA12SB01	
SAMPLE ID					U32SA09SB0201	U32SA10SB0101	U32SA10SB0201	U32SA11SB0101	U32SA11SB0201	U32SA12SB0101	U32SA12SB0101-AVG
SAMPLE DATE					20101027	20101028	20101027	20101028	20101028	20101028	20101028
SAMPLE CODE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	AVG
MATRIX					SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP
SUBMATRIX					SS	SS	SS	SS	SS	SS	SS
TOP DEPTH					1	1	1	1	1	1	1
BOTTOM DEPTH					2	2	2	2	2	2	2
DIOXINS/FURANS (NG/KG)											
1,2,3,4,6,7,8,9-OCDD	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8,9-OCDF	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDD	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-PECDF	150	C	8.7		NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-PECDF	15	C	0.87		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
TEQ	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TEQ - HALFND	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL PECDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
METALS (MG/KG)											
ARSENIC	0.39	C	0.0013		174	77.7	6.52	25.5	28.4	14.8	14.8
BARIUM	1500	N	120		NA	NA	NA	NA	NA	NA	NA
CADMIUM	7	N	0.52		NA	NA	NA	NA	NA	NA	NA
CHROMIUM	12000	N(3)	28000000	(3)	NA	NA	NA	NA	NA	NA	NA
LEAD	400	N	14	(4)	NA	NA	NA	NA	NA	NA	NA
MERCURY	2.3	N(5)	0.033		NA	NA	NA	NA	NA	NA	NA
SELENIUM	39	N	0.4		NA	NA	NA	NA	NA	NA	NA
ZINC	2300	N	290		NA	NA	NA	NA	NA	NA	NA
MISCELLANEOUS PARAMETERS (%)											
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL SOLIDS	NC		NC		NA	NA	NA	NA	NA	NA	NA
PCBS (UG/KG)											
AROCLOR-1260	220	C	24		NA	*189 J*	39.7 U	*134*	*55.1*	*32.2 J*	*25.1*
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
2-METHYLNAPHTHALENE	31000	N	140		NA	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	340000	N(6)	4100	(6)	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	1700000	N	42000		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT	15	C	NC		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT-HALFND	15	C	NC		NA	NA	NA	NA	NA	NA	NA
BENZO(A)ANTHRACENE	150	C	10		NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		NA	NA	NA	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	150	C	35		NA	NA	NA	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	170000	N(7)	9500	(7)	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	NA	NA	NA	NA	NA	NA
CHRYSENE	15000	C	1100		NA	NA	NA	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	15	C	11		NA	NA	NA	NA	NA	NA	NA
FLUORANTHENE	230000	N	70000		NA	NA	NA	NA	NA	NA	NA
FLUORENE	230000	N	4000		NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	3600	C	0.47		NA	NA	NA	NA	NA	NA	NA
PHENANTHRENE	170000	N(7)	9500	(7)	NA	NA	NA	NA	NA	NA	NA
PYRENE	170000	N	9500		NA	NA	NA	NA	NA	NA	NA

LOCATION	Adjusted USEPA Regional Screening Levels[1,2] Residential Soil		USEPA Regional Screening Levels[1,2] Protection of Groundwater SSLs		U32SA12SB01	U32SA12SB02			U32SA13SB01	U32SA13SB02	U32SA14SB01
SAMPLE ID					U32SA12SB0101-D	U32SA12SB0201	U32SA12SB0201-AVG	U32SA12SB0201-D	U32SA13SB0101	U32SA13SB0201	U32SA14SB0101
SAMPLE DATE					20101028	20101027	20101027	20101027	20101027	20101027	20101028
SAMPLE CODE					DUP	ORIG	AVG	DUP	NORMAL	NORMAL	ORIG
MATRIX					SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP
SUBMATRIX					SS	SS	SS	SS	SS	SS	SS
TOP DEPTH					1	1	1	1	1	1	1
BOTTOM DEPTH					2	2	2	2	2	2	2
DIOXINS/FURANS (NG/KG)											
1,2,3,4,6,7,8,9-OCDD	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8,9-OCDF	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDD	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-PECDF	150	C	8.7		NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-PECDF	15	C	0.87		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
TEQ	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TEQ - HALFND	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL PECDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
METALS (MG/KG)											
ARSENIC	0.39	C	0.0013		NA	74.3	74.3	NA	8.79	51.9	137
BARIUM	1500	N	120		NA	NA	NA	NA	NA	NA	NA
CADMIUM	7	N	0.52		NA	NA	NA	NA	NA	NA	NA
CHROMIUM	12000	N[3]	28000000	[3]	NA	NA	NA	NA	NA	NA	NA
LEAD	400	N	14	[4]	NA	NA	NA	NA	NA	NA	NA
MERCURY	2.3	N[5]	0.033		NA	NA	NA	NA	NA	NA	NA
SELENIUM	39	N	0.4		NA	NA	NA	NA	NA	NA	NA
ZINC	2300	N	290		NA	NA	NA	NA	NA	NA	NA
MISCELLANEOUS PARAMETERS (%)											
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL SOLIDS	NC		NC		NA	NA	NA	NA	NA	NA	NA
PCBS (UG/KG)											
AROCLOR-1260	220	C	24		18 J	39.9 U	40 U	40.1 U	39.9 U	41.7 U	44.3 U
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
2-METHYLNAPHTHALENE	31000	N	140		NA	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	340000	N[6]	4100	[6]	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	1700000	N	42000		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT	15	C	NC		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT-HALFND	15	C	NC		NA	NA	NA	NA	NA	NA	NA
BENZO(A)ANTHRACENE	150	C	10		NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		NA	NA	NA	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	150	C	35		NA	NA	NA	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	170000	N[7]	9500	[7]	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	NA	NA	NA	NA	NA	NA
CHRYSENE	15000	C	1100		NA	NA	NA	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	15	C	11		NA	NA	NA	NA	NA	NA	NA
FLUORANTHENE	230000	N	70000		NA	NA	NA	NA	NA	NA	NA
FLUORENE	230000	N	4000		NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	3600	C	0.47		NA	NA	NA	NA	NA	NA	NA
PHENANTHRENE	170000	N[7]	9500	[7]	NA	NA	NA	NA	NA	NA	NA
PYRENE	170000	N	9500		NA	NA	NA	NA	NA	NA	NA

LOCATION	Adjusted USEPA Regional Screening Levels[1,2] Residential Soil		USEPA Regional Screening Levels[1,2] Protection of Groundwater SSLs		U32SA14SB01		U32SA14SB02	U32SBS0301	U32SBS0401	U32SBS0701	U32SBS0901
SAMPLE ID					U32SA14SB0101-AVG	U32SA14SB0101-D	U32SA14SB0201	U32SBS030101	U32SBS040101	U32SBS070101	U32SBS090101
SAMPLE DATE					20101028	20101028	20101028	20101201	20101201	20101201	20101201
SAMPLE CODE					AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX					SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	UNDER CAP	UNDER CAP	UNDER CAP	UNDER CAP
SUBMATRIX					SS	SS	SS	SS	SS	SS	SS
TOP DEPTH					1	1	1	0	0	0	0
BOTTOM DEPTH					2	2	2	1	1	1	1
DIOXINS/FURANS (NG/KG)											
1,2,3,4,6,7,8,9-OCDD	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8,9-OCDF	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDD	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-PECDF	150	C	8.7		NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-PECDF	15	C	0.87		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
TEQ	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TEQ - HALFND	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL PECDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
METALS (MG/KG)											
ARSENIC	0.39	C	0.0013		**155**	**173**	**350**	**5.5 J**	**5.2 J**	**37 J**	**110 J**
BARIUM	1500	N	120		NA	NA	NA	NA	NA	NA	NA
CADMIUM	7	N	0.52		NA	NA	NA	NA	NA	NA	NA
CHROMIUM	12000	N[3]	28000000	(3)	NA	NA	NA	NA	NA	NA	NA
LEAD	400	N	14	(4)	NA	NA	NA	*16*	5.3	5.7	*140*
MERCURY	2.3	N[5]	0.033		NA	NA	NA	NA	NA	NA	NA
SELENIUM	39	N	0.4		NA	NA	NA	NA	NA	NA	NA
ZINC	2300	N	290		NA	NA	NA	NA	NA	NA	NA
MISCELLANEOUS PARAMETERS (%)											
PERCENT MOISTURE	NC		NC		NA	NA	NA	18	9.3	13	12
TOTAL SOLIDS	NC		NC		NA	NA	NA	NA	NA	NA	NA
PCBS (UG/KG)											
AROCLOR-1260	220	C	24		44.3 U	NA	11.9 J	5.8 J	10 J	38 U	**11000**
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
2-METHYLNAPHTHALENE	31000	N	140		NA	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	340000	N[6]	4100	(6)	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	1700000	N	42000		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT	15	C	NC		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT-HALFND	15	C	NC		NA	NA	NA	NA	NA	NA	NA
BENZO(A)ANTHRACENE	150	C	10		NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		NA	NA	NA	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	150	C	35		NA	NA	NA	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	170000	N[7]	9500	(7)	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	NA	NA	NA	NA	NA	NA
CHRYSENE	15000	C	1100		NA	NA	NA	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	15	C	11		NA	NA	NA	NA	NA	NA	NA
FLUORANTHENE	230000	N	70000		NA	NA	NA	NA	NA	NA	NA
FLUORENE	230000	N	4000		NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	3600	C	0.47		NA	NA	NA	NA	NA	NA	NA
PHENANTHRENE	170000	N[7]	9500	(7)	NA	NA	NA	NA	NA	NA	NA
PYRENE	170000	N	9500		NA	NA	NA	NA	NA	NA	NA

ATTACHMENT 1
POSITIVE DETECTIONS FOR SURFACE SOIL
COMPARISON TO DIRECT CONTACT AND PROTECTION OF GROUNDWATER CRITERIA
HUMAN HEALTH RISK ASSESSMENT - UXO 32

LOCATION	Adjusted USEPA Regional Screening Levels[1,2] Residential Soil		USEPA Regional Screening Levels[1,2] Protection of Groundwater SSLs		U32SBS1301			U32SBS1512	U32SO01	U32SO02	U32SO03
SAMPLE ID					U32SBS130101	U32SBS130101-AVG	U32SBS130101-D	U32SBS151201	U32SO010101	U32SO020101	U32SO030101
SAMPLE DATE					20101201	20101201	20101201	20101201	20100916	20100916	20100916
SAMPLE CODE					ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX					SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					UNDER CAP	UNDER CAP	UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP
SUBMATRIX					SS	SS	SS	SS	SS	SS	SS
TOP DEPTH					0	0	0	1	0	0	0
BOTTOM DEPTH					1	1	1	2	0.5	0.5	0.5
DIOXINS/FURANS (NG/KG)											
1,2,3,4,6,7,8,9-OCDD	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8,9-OCDF	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDD	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-PECDF	150	C	8.7		NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-PECDF	15	C	0.87		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
TEQ	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TEQ - HALFND	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL PECDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
METALS (MG/KG)											
ARSENIC	0.39	C	0.0013		**32 J**	**22.5**	**13 J**	**8 J**	**30.8 J**	**423 J**	**338 J**
BARIUM	1500	N	120		NA	NA	NA	NA	NA	NA	NA
CADMIUM	7	N	0.52		NA	NA	NA	NA	0.499 U	0.503 U	0.0313 B
CHROMIUM	12000	N[3]	28000000	(3)	NA	NA	NA	NA	NA	NA	NA
LEAD	400	N	14	(4)	*52*	*63.5*	*75*	9.4	11.4 J	*50.7 J*	*141 J*
MERCURY	2.3	N[5]	0.033		NA	NA	NA	NA	NA	NA	NA
SELENIUM	39	N	0.4		NA	NA	NA	NA	NA	NA	NA
ZINC	2300	N	290		NA	NA	NA	NA	NA	NA	NA
MISCELLANEOUS PARAMETERS (%)											
PERCENT MOISTURE	NC		NC		13	12	11	18	NA	NA	NA
TOTAL SOLIDS	NC		NC		NA	NA	NA	NA	92	90	88
PCBS (UG/KG)											
AROCLOR-1260	220	C	24		**7700 J**	**4950**	**2200 J**	11 J	*24.7 J*	*39*	22.2 J
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
2-METHYLNAPHTHALENE	31000	N	140		NA	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	340000	N[6]	4100	(6)	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	1700000	N	42000		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT	15	C	NC		NA	NA	NA	NA	360 U	**240**	**180**
BAP EQUIVALENT-HALFND	15	C	NC		NA	NA	NA	NA	360 U	**240**	**180**
BENZO(A)ANTHRACENE	150	C	10		NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		NA	NA	NA	NA	360 U	**240 J**	**180 J**
BENZO(B)FLUORANTHENE	150	C	35		NA	NA	NA	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	170000	N[7]	9500	(7)	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	NA	NA	NA	NA	NA	NA
CHRYSENE	15000	C	1100		NA	NA	NA	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	15	C	11		NA	NA	NA	NA	360 U	370 U	380 U
FLUORANTHENE	230000	N	70000		NA	NA	NA	NA	NA	NA	NA
FLUORENE	230000	N	4000		NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	3600	C	0.47		NA	NA	NA	NA	NA	NA	NA
PHENANTHRENE	170000	N[7]	9500	(7)	NA	NA	NA	NA	NA	NA	NA
PYRENE	170000	N	9500		NA	NA	NA	NA	NA	NA	NA

ATTACHMENT 1
POSITIVE DETECTIONS FOR SURFACE SOIL
COMPARISON TO DIRECT CONTACT AND PROTECTION OF GROUNDWATER CRITERIA
HUMAN HEALTH RISK ASSESSMENT - UXO 32

LOCATION SAMPLE ID SAMPLE DATE SAMPLE CODE MATRIX SAMPLE TYPE POSITION SUBMATRIX TOP DEPTH BOTTOM DEPTH	Adjusted USEPA Regional Screening Levels[1,2] Residential Soil		USEPA Regional Screening Levels[1,2] Protection of Groundwater SSLs		U32SO04 U32SO040101 20100916 NORMAL SO NORMAL NOT UNDER CAP SS 0 0.5	U32SO05 U32SO050101 20100916 NORMAL SO NORMAL NOT UNDER CAP SS 0 0.5	U32SO06 U32SO060101 20100916 NORMAL SO NORMAL NOT UNDER CAP SS 0 0.5	U32SO07 U32SO070101 20100917 NORMAL SO NORMAL NOT UNDER CAP SS 0 0.5	U32SO08 U32SO080101 20100917 NORMAL SO NORMAL NOT UNDER CAP SS 0 0.5	U32SO09 U32SO090101 20100917 NORMAL SO NORMAL NOT UNDER CAP SS 0 0.5	U32SO16 U32SO160101 20100917 NORMAL SO NORMAL NOT UNDER CAP SS 0 0.5
DIOXINS/FURANS (NG/KG)											
1,2,3,4,6,7,8,9-OCDD	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8,9-OCDF	15000	C	870		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDD	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,6,7,8-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8,9-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA
1,2,3,4,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8,9-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
1,2,3,7,8-PECDF	150	C	8.7		NA	NA	NA	NA	NA	NA	NA
2,3,4,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
2,3,4,7,8-PECDF	15	C	0.87		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDD	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
2,3,7,8-TCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA
TEQ	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TEQ - HALFND	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HPCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL HXCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL PECDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL TCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA
METALS (MG/KG)											
ARSENIC	0.39	C	0.0013		**308 J**	**143 J**	**98.9 J**	**61.5 J**	**91.4 J**	**161 J**	**36.3 J**
BARIUM	1500	N	120		NA	NA	NA	NA	NA	NA	NA
CADMIUM	7	N	0.52		0.476 U	0.5 U	0.0213 J	0.536 U	0.101 J	*5.29*	0.528 U
CHROMIUM	12000	N(3)	28000000	(3)	NA	NA	NA	NA	NA	NA	NA
LEAD	400	N	14	(4)	*196 J*	*120 J*	*27.1 J*	12.9 J	*17.1 J*	*88 J*	12.6 J
MERCURY	2.3	N(5)	0.033		NA	NA	NA	NA	NA	NA	NA
SELENIUM	39	N	0.4		NA	NA	NA	NA	NA	NA	NA
ZINC	2300	N	290		NA	NA	NA	NA	NA	NA	NA
MISCELLANEOUS PARAMETERS (%)											
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA
TOTAL SOLIDS	NC		NC		92	88	86	85	87	87	87
PCBS (UG/KG)											
AROCLOR-1260	220	C	24		*33.8 J*	**312**	**238 J**	**384**	*72.7*	**259**	*150 J*
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
2-METHYLNAPHTHALENE	31000	N	140		NA	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	340000	N(6)	4100	(6)	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	1700000	N	42000		NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT	15	C	NC		**360**	**1200**	**190**	390 U	380 U	**63**	380 U
BAP EQUIVALENT-HALFND	15	C	NC		**360**	**1200**	**190**	390 U	380 U	**63**	380 U
BENZO(A)ANTHRACENE	150	C	10		NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		**360**	**1200**	**190 J**	390 U	380 U	**63 J**	380 U
BENZO(B)FLUORANTHENE	150	C	35		NA	NA	NA	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	170000	N(7)	9500	(7)	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	NA	NA	NA	NA	NA	NA
CHRYSENE	15000	C	1100		NA	NA	NA	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	15	C	11		360 U	380 U	380 U	390 U	380 U	380 U	380 U
FLUORANTHENE	230000	N	70000		NA	NA	NA	NA	NA	NA	NA
FLUORENE	230000	N	4000		NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	3600	C	0.47		NA	NA	NA	NA	NA	NA	NA
PHENANTHRENE	170000	N(7)	9500	(7)	NA	NA	NA	NA	NA	NA	NA
PYRENE	170000	N	9500		NA	NA	NA	NA	NA	NA	NA

LOCATION	Adjusted USEPA Regional Screening Levels(1,2) Residential Soil		USEPA Regional Screening Levels(1,2) Protection of Groundwater SSLs		U32SO17	U32SO19	U32SO20			U32SO21	U32SO22	U32SOS18
SAMPLE ID					U32SO170101	U32SO190101	U32SO200101	U32SO200101-AVG	U32SO200101-D	U32SO210101	U32SO220101	U32SOS180601
SAMPLE DATE					20100917	20100917	20100917	20100917	20100917	20100917	20100917	20101129
SAMPLE CODE					NORMAL	NORMAL	ORIG	AVG	DUP	NORMAL	NORMAL	NORMAL
MATRIX					SO	SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	UNDER CAP
SUBMATRIX					SS	SS	SS	SS	SS	SS	SS	SS
TOP DEPTH					0	0	0	0	0	0	0	0
BOTTOM DEPTH					0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
DIOXINS/FURANS (NG/KG)												
1,2,3,4,6,7,8,9-OCDD	15000	C	870		NA	NA	NA	NA	NA	NA	NA	6400
1,2,3,4,6,7,8,9-OCDF	15000	C	870		NA	NA	NA	NA	NA	NA	NA	530
1,2,3,4,6,7,8-HPCDD	450	C	26		NA	NA	NA	NA	NA	NA	NA	450 J
1,2,3,4,6,7,8-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA	190 J
1,2,3,4,7,8,9-HPCDF	450	C	26		NA	NA	NA	NA	NA	NA	NA	62
1,2,3,4,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA	220
1,2,3,6,7,8-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA	9.1
1,2,3,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA	44
1,2,3,7,8,9-HXCDD	45	C	2.6		NA	NA	NA	NA	NA	NA	NA	5.9
1,2,3,7,8-PECDF	150	C	8.7		NA	NA	NA	NA	NA	NA	NA	48
2,3,4,6,7,8-HXCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA	25
2,3,4,7,8-PECDF	15	C	0.87		NA	NA	NA	NA	NA	NA	NA	110
2,3,7,8-TCDD	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA	0.74 J
2,3,7,8-TCDF	45	C	2.6		NA	NA	NA	NA	NA	NA	NA	130
TEQ	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA	87.7
TEQ - HALFND	4.5	C	0.26		NA	NA	NA	NA	NA	NA	NA	89.2
TOTAL HPCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA	2800
TOTAL HPCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA	560
TOTAL HXCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA	94
TOTAL HXCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA	650
TOTAL PECDF	NC		NC		NA	NA	NA	NA	NA	NA	NA	750
TOTAL TCDD	NC		NC		NA	NA	NA	NA	NA	NA	NA	13
TOTAL TCDF	NC		NC		NA	NA	NA	NA	NA	NA	NA	550
METALS (MG/KG)												
ARSENIC	0.39	C	0.0013		59 J	86.7 J	3.98 J	4.055	4.13 J	9.47 J	3.24 J	37 J
BARIUM	1500	N	120		NA	NA	NA	NA	NA	NA	NA	150
CADMIUM	7	N	0.52		0.552 U	0.538 U	0.516 UJ	0.5125 U	0.509 U	5.83	0.273 J	69
CHROMIUM	12000	N(3)	28000000	(3)	NA	NA	NA	NA	NA	NA	NA	75
LEAD	400	N	14	(4)	11.5 J	54.2 J	13.6 J	17.5	21.4 J	263 J	8.77 J	9800
MERCURY	2.3	N(5)	0.033		NA	NA	NA	NA	NA	NA	NA	3.3 J
SELENIUM	39	N	0.4		NA	NA	NA	NA	NA	NA	NA	0.91
ZINC	2300	N	290		NA	NA	NA	NA	NA	NA	NA	3500
MISCELLANEOUS PARAMETERS (%)												
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA	20
TOTAL SOLIDS	NC		NC		83	84	87	88	89	86	87	NA
PCBS (UG/KG)												
AROCLOR-1260	220	C	24		57.8	131	37.2 J	34.25	31.3 J	608	253	NA
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)												
2-METHYLNAPHTHALENE	31000	N	140		NA	NA	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	340000	N(6)	4100	(6)	NA	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	1700000	N	42000		NA	NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT	15	C	NC		400 U	390 U	380 U	380 U	380 U	170	380 U	NA
BAP EQUIVALENT-HALFND	15	C	NC		400 U	390 U	380 U	380 U	380 U	170	380 U	NA
BENZO(A)ANTHRACENE	150	C	10		NA	NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		400 U	390 U	380 U	380 U	380 U	170 J	380 U	NA
BENZO(B)FLUORANTHENE	150	C	35		NA	NA	NA	NA	NA	NA	NA	NA
BENZO(G,H,I)PERYLENE	170000	N(7)	9500	(7)	NA	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	NA	NA	NA	NA	NA	NA	NA
CHRYSENE	15000	C	1100		NA	NA	NA	NA	NA	NA	NA	NA
DIBENZO(A,H)ANTHRACENE	15	C	11		400 U	390 U	380 U	380 U	380 U	380 U	380 U	NA
FLUORANTHENE	230000	N	70000		NA	NA	NA	NA	NA	NA	NA	NA
FLUORENE	230000	N	4000		NA	NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	3600	C	0.47		NA	NA	NA	NA	NA	NA	NA	NA
PHENANTHRENE	170000	N(7)	9500	(7)	NA	NA	NA	NA	NA	NA	NA	NA
PYRENE	170000	N	9500		NA	NA	NA	NA	NA	NA	NA	NA

Footnotes:
(1) Screening criteria based on EPA Regional Screening Levels (RSLs) Summary Table (November 2011). The adjusted RSLs for residential soils represent the one-in-one million (1E-06) cancer risk level or a non-cancer hazard quotient of 0.1 for carcinogenic (C) and non-carcinogenic (N)
(2) Concentrations exceeding the referenced groundwater protection values are "italicized" (and highlighted yellow). Concentrations exceeding the referenced RSLs for residential soils are "bolded" (and highlighted orange). Concentrations exceeding both referenced criteria are presented in "reverse bold" (and highlighted red).
(3) The value is for trivalent chromium.
(4) MCL-based SSL.
(5) The value is for mercuric chloride (and other mercury salts).
(6) The value for acenaphthene is used as a surrogate.
(7) The value for pyrene is used as a surrogate for phenanthrene.
Definitions: C = carcinogenic endpoint; N = non-carcinogenic endpoint; NC = no criterion available; NA = Not analyzed
Qualifiers: B = present in blank; J = estimated; L = biased low; U = non-detected

Subsurface Soil

LOCATION	Adjusted USEPA Regional Screening Levels(1,2) Residential Soil		USEPA Regional Screening Levels(1,2) Protection of Groundwater SSLs		41MW01-41SB03		41MW02-41SB04			41MW03-41SB07			
SAMPLE ID					41SB0303	41SB0304	41SB0402	41SB0403	41SB0404	41SB0702	41SB0702-AVG	41SB0702-D	41SB0703
SAMPLE DATE					19920801	19920801	19920801	19920801	19920801	19920801	19920801	19920801	19920801
SAMPLE CODE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	ORIG	AVG	DUP	ORIG
MATRIX					SO	SO	SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP
SUBMATRIX					SB	SB	SB	SB	SB	SB	SB	SB	SB
TOP DEPTH					10	15	5	10	15	5	5	5	10
BOTTOM DEPTH					12	17	7	12	17	9	9	9	14
METALS (MG/KG)													
ALUMINUM	7700	N	23000		469	3200	2030	1020	2520	415	450	485	1390
ARSENIC	0.39	C	0.0013		2.4 J	0.76 UJ	6.6 J	0.69 UJ	0.73 UJ	3.4 J	3.8	4.2 J	0.76 UJ
BARIUM	1500	N	120		9 B	70.7	14.7 B	17.9 B	23.3 B	10 B	10.55 U	11.1 B	27.1 B
BERYLLIUM	16	N	13		0.37 B	2.9	0.24 U	0.23 U	0.37 B	0.25 U	0.25 U	0.25 U	0.25 U
CADMIUM	7	N	0.52		1.2 U	1.3 U	1.2 U	1.2 U	1.2 U	1.2 U	1.25 U	1.3 U	1.3 U
CALCIUM	NC		NC		333 U	2720	209 B	76.5 B	405 B	153 B	166.5 U	180 B	1040 B
CHROMIUM	12000	N(3)	28000000	(3)	2.5 U	3.7	4.3	2.6	3.5	2.5 U	2.5 U	2.5 U	2.5 U
COBALT	2.3	N	0.21		8.3 B	66.2	3.6 U	3.5 U	10.4 B	3.7 U	3.75 U	3.8 U	22.7
COPPER	310	N	22		5.9 B	*62.9*	4 B	8.4	6.7	5.4 B	4 U	2.6 B	14.2
IRON	5500	N	270		*2480*	9470	6410	*1430*	*3040*	*2410*	*2615*	*2820*	*4020*
LEAD	400	N	14	(4)	3.2 J	10.1 J	4.1 J	3.1 J	3.6 J	2.5 UJ	2.325	3.4 J	4.3 J
MAGNESIUM	NC		NC		208 B	2080	117 B	46.6 B	351 B	53.2 B	59.95 U	66.7 B	876 B
MANGANESE	180	N	21		*22.7*	*84.2*	10.6	3.3 B	*57.5*	3.1 B	3.15 U	3.2 B	*35.4*
MERCURY	2.3	N(5)	0.033		0.25 U	0.25 U	0.24 U	0.23 U	0.24 U	0.25 U	0.25 U	0.25 U	0.25 U
NICKEL	150	N	20		3.7 U	*27.3*	3.6 U	3.5 U	3.6 U	3.7 U	3.75 U	3.8 U	7.2 B
POTASSIUM	NC		NC		225 U	1290	305 B	213 U	354 B	237 B	247 U	257 B	808 B
SELENIUM	39	N	0.4		0.49 U	0.51 U	0.47 U	0.46 U	0.49 U	0.49 U	0.495 U	0.5 U	0.5 U
SILVER	39	N	0.6		1.2 U	1.3 U	1.2 B	1.2 U	*10.1*	1.2 U	1.25 U	1.3 U	1.3 U
VANADIUM	39	N	78		5.1 B	22.2	7.8 B	3.4 B	12.6	5.8 B	5.55 U	5.3 B	7.9 B
ZINC	2300	N	290		21	84.2	5.3	4.7	10.5	5.3	3.3	2.6 B	18.5
MISCELLANEOUS PARAMETERS (%)													
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBS (UG/KG)													
AROCLOR-1260	220	C	24		40 U	42 U	37 U	38 U	39 U	41 U	41 U	41 U	42 U
PESTICIDES/PCBS (UG/KG)													
4,4'-DDD	2000	C	66		4 U	4.2 U	3.7 U	3.8 U	3.9 U	4.1 U	4.1 U	4.1 U	4.2 U
4,4'-DDE	1400	C	46		4 U	4.2 U	3.7 U	3.8 U	3.9 U	4.1 U	4.1 U	4.1 U	4.2 U
4,4'-DDT	1700	C	67		4 U	4.2 U	7.5	3.8 U	3.9 U	4.1 U	4.1 U	4.1 U	4.2 U
ENDOSULFAN II	37000	N	1100		4 U	4.2 U	3.7 U	3.8 U	3.9 U	4.1 U	4.1 U	4.1 U	4.2 U
ENDRIN	1800	N	68		4 U	4.2 U	20	3.8 U	3.9 U	4.1 U	4.1 U	4.1 U	4.2 U
GAMMA-CHLORDANE	1600	C(6)	13	(6)	2.1 U	2.2 U	1.9 U	2 U	2 U	2.1 U	2.1 U	2.1 U	2.2 U
HEPTACHLOR EPOXIDE	53	C	0.068		2.1 U	2.2 U	1.9 U	2 U	2 U	2.1 U	2.1 U	2.1 U	2.2 U
PETROLEUM HYDROCARBONS (MG/KG)													
TOTAL PETROLEUM HYDROCARBONS	NC		NC		12.2 U	12.6 U	16.3	11.5 U	12 U	12.2 U	12.35 U	12.5 U	12.6 U
SEMIVOLATILES (UG/KG)													
2-METHYLNAPHTHALENE	31000	N	140		400 U	420 U	370 U	390 U	400 U	410 U	410 U	410 U	420 U
ACENAPHTHYLENE	340000	N(7)	4100	(7)	400 U	420 U	82 J	390 U	400 U	410 U	410 U	410 U	420 U
ANTHRACENE	1700000	N	42000		400 U	420 U	90 J	390 U	400 U	410 U	410 U	410 U	420 U
BAP EQUIVALENT	15	C	NC		400 U	420 U	294.72	390 U	400 U	410 U	410 U	410 U	420 U
BAP EQUIVALENT-HALFND	15	C	NC		400 U	420 U	479.72	390 U	400 U	410 U	410 U	410 U	420 U
BENZO(A)ANTHRACENE	150	C	10		400 U	420 U	320 J	390 U	400 U	410 U	410 U	410 U	420 U
BENZO(A)PYRENE	15	C	3.5		400 U	420 U	190 J	390 U	400 U	410 U	410 U	410 U	420 U
BENZO(B)FLUORANTHENE	150	C	35		400 U	420 U	560	390 U	400 U	410 U	410 U	410 U	420 U
BENZO(K)FLUORANTHENE	1500	C	350		400 U	420 U	*420*	390 U	400 U	410 U	410 U	410 U	420 U
CARBAZOLE	NC		NC		400 U	420 U	48 J	390 U	400 U	410 U	410 U	410 U	420 U
CHRYSENE	15000	C	1100		400 U	420 U	520	390 U	400 U	410 U	410 U	410 U	420 U
DIBENZOFURAN	7800	N	110		400 U	420 U	42 J	390 U	400 U	410 U	410 U	410 U	420 U
DIETHYL PHTHALATE	4900000	N	4700		400 U	420 U	370 U	390 U	400 U	410 U	410 U	410 U	420 U
DI-N-BUTYL PHTHALATE	610000	N	1700		400 U	420 U	370 U	390 U	400 U	410 U	410 U	410 U	420 U
FLUORANTHENE	230000	N	70000		400 U	420 U	640	390 U	400 U	410 U	410 U	410 U	420 U
INDENO(1,2,3-CD)PYRENE	150	C	120		400 U	420 U	120 J	390 U	400 U	410 U	410 U	410 U	420 U
NAPHTHALENE	3600	C	0.47		400 U	420 U	*56 J*	390 U	400 U	410 U	410 U	410 U	420 U
PHENANTHRENE	170000	N(8)	9500	(8)	400 U	420 U	350 J	390 U	400 U	410 U	410 U	410 U	420 U
PYRENE	170000	N	9500		400 U	420 U	520	390 U	400 U	410 U	410 U	410 U	420 U
VOLATILES (UG/KG)													
ACETONE	6100000	N	4500		17 U	23 U	9 U	27 U	15 U	11 U	13.5 U	16 U	18 U
CARBON DISULFIDE	82000	N	310		12 U	12 U	4 J	6 J	3 J	3 J	3 J	12 U	12 U

ATTACHMENT 1
POSITIVE DETECTIONS FOR SUBSURFACE SOIL
COMPARISON TO DIRECT CONTACT AND PROTECTION OF GROUNDWATER CRITERIA
HUMAN HEALTH RISK ASSESSMENT - UXO 32

LOCATION	Adjusted USEPA Regional Screening Levels[1,2] Residential Soil		USEPA Regional Screening Levels[1,2] Protection of Groundwater SSLs		41MW03-41SB07			41SB01			41SB02		
SAMPLE ID					41SB0703-AVG	41SB0703-D	41SB0704	41SB0102	41SB0103	41SB0105	41SB0201	41SB0203	41SB0204
SAMPLE DATE					19920801	19920801	19920801	19920801	19920801	19920801	19920801	19920801	19920801
SAMPLE CODE					AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX					SO	SO	SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP
SUBMATRIX					SB	SB	SB	SB	SB	SB	SB	SB	SB
TOP DEPTH					10	10	15	5	10	20	5	10	15
BOTTOM DEPTH					14	14	17	7	12	22	7	12	17
METALS (MG/KG)													
ALUMINUM	7700	N	23000		1815	2240	2450	7070	492	5130	2800	2390	3190
ARSENIC	0.39	C	0.0013		0.755 U	0.75 UJ	0.78 UJ	0.72 UJ	0.75 UJ	0.77 UJ	**328 J**	**2 J**	**1.3 J**
BARIUM	1500	N	120		33.975	54.4	60.2	24.6 B	9.8 B	93.9	92.6	24.5 B	39.5 B
BERYLLIUM	16	N	13		0.25 U	0.25 U	1.5	0.52 B	0.25 U	4.6	0.39 B	0.31 B	0.31 B
CADMIUM	7	N	0.52		1.3 U	1.3 U	1.3 U	1.2 U	1.3 U	1.3 U	*2*	1.2 U	1.2 U
CALCIUM	NC		NC		1095 U	1150 B	1870	547 B	74.9 U	3080	780 B	287 U	706 B
CHROMIUM	12000	N(3)	28000000	(3)	2.5 U	2.5 U	5	15.7	2.9	12.8	7.2	6.6	6.6
COBALT	2.3	N	0.21		**19.3**	**15.9**	**71.7**	4.2 B	3.8 B	**70.4**	6.2 B	3.7 B	5.7 B
COPPER	310	N	22		16.6	19	16.6	10.5	13	20.5	*23.9*	6.6	8.6
IRON	5500	N	270		*4610*	*5200*	**6510**	**7670**	*481*	**35200**	**13800**	**5670**	**6120**
LEAD	400	N	14	(4)	5.35	6.4 J	*15.8 J*	4.4 J	2.6 J	6.2 J	*46 J*	5 J	6.2 J
MAGNESIUM	NC		NC		1013 U	1150 B	1650	416 B	29.2 B	2350	186 B	265 B	651 B
MANGANESE	180	N	21		*40.15*	*44.9*	*59.5*	17.9 J	1.3 UJ	*116 J*	*27.8 J*	14.8 J	*30.7 J*
MERCURY	2.3	N(5)	0.033		0.25 U	0.25 U	0.26 U	0.12 U	0.13 U	0.13 U	*0.18*	0.12 U	0.12 U
NICKEL	150	N	20		7 U	6.8 B	*53.1*	4.1 B	3.8 U	*30.9*	5.2 B	3.5 U	3.6 U
POTASSIUM	NC		NC		989 U	1170 B	1410	903 B	231 B	2100	330 B	303 B	493 B
SELENIUM	39	N	0.4		0.5 U	0.5 U	0.52 U	0.48 UJ	0.5 UJ	0.51 UJ	*0.7 J*	0.46 UJ	0.48 UJ
SILVER	39	N	0.6		1.3 U	1.3 U	1.3 U	1.2 U	1.3 U	2 B	1.8 B	1.3 B	1.2 U
VANADIUM	39	N	78		8.35 U	8.8 B	14.6	27.4	4.1 B	**58.3**	11.8	11.1 B	20.4
ZINC	2300	N	290		21.35	24.2	33.6	23.8	7.7	76.4	33.9	11.2	29.1
MISCELLANEOUS PARAMETERS (%)													
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBS (UG/KG)													
AROCLOR-1260	220	C	24		41.5 U	41 U	43 U	40 U	41 U	41 U	38 U	38 U	40 U
PESTICIDES/PCBS (UG/KG)													
4,4'-DDD	2000	C	66		4.15 U	4.1 U	4.3 U	4 U	4.1 U	4.1 U	53	3.8 U	4 U
4,4'-DDE	1400	C	46		4.15 U	4.1 U	4.3 U	4 U	4.1 U	4.1 U	*160*	3.8 U	4 U
4,4'-DDT	1700	C	67		4.15 U	4.1 U	4.3 U	4 U	4.1 U	4.1 U	*980*	5.9	4 U
ENDOSULFAN II	37000	N	1100		4.15 U	4.1 U	4.3 U	4 U	4.1 U	4.1 U	3.8 U	3.8 U	4 U
ENDRIN	1800	N	68		4.15 U	4.1 U	4.3 U	4 U	4.1 U	4.1 U	15	3.8 U	4 U
GAMMA-CHLORDANE	1600	C(6)	13	(6)	2.15 U	2.1 U	2.2 U	2.1 U	2.1 U	2.1 U	1.4 J	2 U	2.1 U
HEPTACHLOR EPOXIDE	53	C	0.068		2.15 U	2.1 U	2.2 U	2.1 U	2.1 U	2.1 U	2 U	2 U	2.1 U
PETROLEUM HYDROCARBONS (MG/KG)													
TOTAL PETROLEUM HYDROCARBONS	NC		NC		12.5 U	12.4 U	12.9 U	17.2	12.5 U	12.6 U	143	12.5	17.7
SEMIVOLATILES (UG/KG)													
2-METHYLNAPHTHALENE	31000	N	140		420 U	420 U	430 U	400 U	410 U	410 U	38 J	390 UJ	410 U
ACENAPHTHYLENE	340000	N(7)	4100	(7)	420 U	420 U	430 U	400 U	410 U	410 U	380 UJ	390 UJ	410 U
ANTHRACENE	1700000	N	42000		420 U	420 U	430 U	400 U	410 U	410 U	380 UJ	390 UJ	410 U
BAP EQUIVALENT	15	C	NC		420 U	420 U	430 U	400 U	410 U	410 U	**116**	390 U	410 U
BAP EQUIVALENT-HALFND	15	C	NC		420 U	420 U	430 U	400 U	410 U	410 U	**346.09**	390 U	410 U
BENZO(A)ANTHRACENE	150	C	10		420 U	420 U	430 U	400 U	410 U	410 U	380 UJ	390 UJ	410 U
BENZO(A)PYRENE	15	C	3.5		420 U	420 U	430 U	400 U	410 U	410 U	**100 J**	390 UJ	410 U
BENZO(B)FLUORANTHENE	150	C	35		420 U	420 U	430 U	400 U	410 U	410 U	**160 J**	390 UJ	410 U
BENZO(K)FLUORANTHENE	1500	C	350		420 U	420 U	430 U	400 U	410 U	410 U	380 UJ	390 UJ	410 U
CARBAZOLE	NC		NC		420 U	420 U	430 U	400 U	410 U	410 U	250 J	390 UJ	410 U
CHRYSENE	15000	C	1100		420 U	420 U	430 U	400 U	410 U	410 U	380 UJ	390 UJ	410 U
DIBENZOFURAN	7800	N	110		420 U	420 U	430 U	400 U	410 U	410 U	380 UJ	390 UJ	410 U
DIETHYL PHTHALATE	4900000	N	4700		420 U	420 U	430 U	400 U	410 U	410 U	*12000*	390 UJ	410 U
DI-N-BUTYL PHTHALATE	610000	N	1700		420 U	420 U	430 U	400 U	410 U	410 U	*3300*	390 UJ	410 U
FLUORANTHENE	230000	N	70000		420 U	420 U	430 U	400 U	410 U	410 U	380 UJ	390 UJ	410 U
INDENO(1,2,3-CD)PYRENE	150	C	120		420 U	420 U	430 U	400 U	410 U	410 U	380 UJ	390 UJ	410 U
NAPHTHALENE	3600	C	0.47		420 U	420 U	430 U	400 U	410 U	410 U	380 U	390 UJ	410 U
PHENANTHRENE	170000	N(8)	9500	(8)	420 U	420 U	430 U	400 U	410 U	410 U	140 J	390 UJ	410 U
PYRENE	170000	N	9500		420 U	420 U	430 U	400 U	410 U	410 U	380 UJ	390 UJ	410 U
VOLATILES (UG/KG)													
ACETONE	6100000	N	4500		17.5 U	17 U	27 U	38 U	490	220 B	38 U	1200	85 U
CARBON DISULFIDE	82000	N	310		12 U	12 U	13 U	12 U	6 J	13 U	2 J	11 U	12 U

LOCATION	Adjusted USEPA Regional Screening Levels[1,2] Residential Soil		USEPA Regional Screening Levels[1,2] Protection of Groundwater SSLs		41SB05			41SB06					
SAMPLE ID					41SB0502	41SB0503	41SB0504	41SB0602	41SB0602-AVG	41SB0602-D	41SB0603	41SB0603-AVG	41SB0603-D
SAMPLE DATE					19920801	19920801	19920801	19920801	19920801	19920801	19920801	19920801	19920801
SAMPLE CODE					NORMAL	NORMAL	NORMAL	ORIG	AVG	DUP	ORIG	AVG	DUP
MATRIX					SO	SO	SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP
SUBMATRIX					SB	SB	SB	SB	SB	SB	SB	SB	SB
TOP DEPTH					5	10	15	5	5	5	10	10	10
BOTTOM DEPTH					7	12	17	9	9	9	14	14	14
METALS (MG/KG)													
ALUMINUM	7700	N	23000		884	1960	11900	1210	1180	1150	2740	2210	1680
ARSENIC	0.39	C	0.0013		17 J	3.2 J	0.5 UJ	11.2 J	5.725	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ
BARIUM	1500	N	120		43.3 B	36.8 B	84.1	15.4 B	14.3 U	13.2 B	18.5 B	23.65 U	28.8 B
BERYLLIUM	16	N	13		0.3 U	0.6 B	3.8	0.3 U	0.3 U	0.3 U	0.3	0.225	0.3 U
CADMIUM	7	N	0.52		1.2 U	1.2	1.3 U	1.3 U	1.3 U	1.3 U	1.2 U	1.25 U	1.3 U
CALCIUM	NC		NC		304 U	1430	3480	121 U	127 U	133 U	1200 B	862.5 U	525 B
CHROMIUM	12000	N(3)	28000000	(3)	2.5 U	8.7	27.7	2.5 U	2.5 U	2.5 U	8.6	5.85	3.1
COBALT	2.3	N	0.21		3.7 U	32.1	70.9	3.8 U	3.8 U	3.8 U	8.9 B	7.45 U	6 B
COPPER	310	N	22		3.8 B	8.4	25.8	2.5 U	3.3 U	4.1 B	12.7	9.65	6.6
IRON	5500	N	270		10300	55600	79600	1840	1710	1580	63300	41050	18800
LEAD	400	N	14	(4)	3.2 J	29.7 J	6.7 J	3.2 J	5.05	6.9 J	6.3 J	5.25	4.2 J
MAGNESIUM	NC		NC		79.8 B	417 B	3180	98.2 B	91.1 U	84 B	158 B	186 U	214 B
MANGANESE	180	N	21		4.1	369	219	5.4	5.5	5.6	98.6	64.9	31.2
MERCURY	2.3	N(5)	0.033		0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
NICKEL	150	N	20		3.7 U	3.6 U	49	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U
POTASSIUM	NC		NC		654 B	527 B	3320	460 B	380 U	300 B	404 B	397.5 U	391 B
SELENIUM	39	N	0.4		0.3 UJ	0.3 UJ	0.3 UJ	0.7 UJ	0.5 U	0.3 UJ	0.3 UJ	0.3 U	0.3 UJ
SILVER	39	N	0.6		1.2 U	4.1	4.1	1.3 U	1.3 U	1.3 U	4.8	2.725	1.3 U
VANADIUM	39	N	78		6.4 B	12.8	125	4.1 B	4.4 U	4.7 B	42.2	28.35	14.5
ZINC	2300	N	290		5.1	18	97.2	5.3	5.9	6.5	11.4	13.35	15.3
MISCELLANEOUS PARAMETERS (%)													
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBS (UG/KG)													
AROCLOR-1260	220	C	24		41 U	40 U	41 U	41 U	41 U	41 U	41 U	41.5 U	42 U
PESTICIDES/PCBS (UG/KG)													
4,4'-DDD	2000	C	66		4.1 U	0.86 J	4.1 U	4.1 U	4.1 U	4.1 U	4.1 U	4.15 U	4.2 U
4,4'-DDE	1400	C	46		4.1 U	4 U	4.1 U	4.1 U	4.1 U	4.1 U	4.1 U	4.15 U	4.2 U
4,4'-DDT	1700	C	67		4.1 U	4 U	4.1 U	4.1 U	4.1 U	4.1 U	4.1 U	4.15 U	4.2 U
ENDOSULFAN II	37000	N	1100		4.1 U	1.5 J	4.1 U	4.1 U	4.1 U	4.1 U	4.1 U	4.15 U	4.2 U
ENDRIN	1800	N	68		4.1 U	4 U	4.1 U	4.1 U	4.1 U	4.1 U	4.1 U	4.15 U	4.2 U
GAMMA-CHLORDANE	1600	C(6)	13	(6)	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.15 U	2.2 U
HEPTACHLOR EPOXIDE	53	C	0.068		2.1 U	2.9	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.15 U	2.2 U
PETROLEUM HYDROCARBONS (MG/KG)													
TOTAL PETROLEUM HYDROCARBONS	NC		NC		12.2 U	10 U	12.7 U	12.5 U	12.5 U	12.5 U	12.4 U	12.55 U	12.7 U
SEMIVOLATILES (UG/KG)													
2-METHYLNAPHTHALENE	31000	N	140		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
ACENAPHTHYLENE	340000	N(7)	4100	(7)	410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
ANTHRACENE	1700000	N	42000		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
BAP EQUIVALENT	15	C	NC		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
BAP EQUIVALENT-HALFND	15	C	NC		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
BENZO(A)ANTHRACENE	150	C	10		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
BENZO(A)PYRENE	15	C	3.5		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
BENZO(B)FLUORANTHENE	150	C	35		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
BENZO(K)FLUORANTHENE	1500	C	350		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
CARBAZOLE	NC		NC		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
CHRYSENE	15000	C	1100		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
DIBENZOFURAN	7800	N	110		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
DIETHYL PHTHALATE	4900000	N	4700		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
DI-N-BUTYL PHTHALATE	610000	N	1700		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
FLUORANTHENE	230000	N	70000		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
INDENO(1,2,3-CD)PYRENE	150	C	120		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
NAPHTHALENE	3600	C	0.47		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
PHENANTHRENE	170000	N(8)	9500	(8)	410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
PYRENE	170000	N	9500		410 U	400 U	420 U	410 U	410 U	410 U	420 U	420 U	420 U
VOLATILES (UG/KG)													
ACETONE	6100000	N	4500		9 U	10 U	64 U	9 U	9.5 U	10 U	12 U	10.5 U	9 UJ
CARBON DISULFIDE	82000	N	310		12 U	12 U	13 U	12 U	12 U	12 U	12 U	12 U	12 U

ATTACHMENT 1
POSITIVE DETECTIONS FOR SUBSURFACE SOIL
COMPARISON TO DIRECT CONTACT AND PROTECTION OF GROUNDWATER CRITERIA
HUMAN HEALTH RISK ASSESSMENT - UXO 32

LOCATION	Adjusted USEPA Regional Screening Levels[1,2] Residential Soil		USEPA Regional Screening Levels[1,2] Protection of Groundwater SSLs		41SB08			U32SA01SB01	U32SA01SB02		U32SA03SB01		U32SA03SB02
SAMPLE ID					41SB0802	41SB0803	41SB0804	U32SA01SB0102	U32SA01SB0202	U32SA01SB0203	U32SA03SB0102	U32SA03SB0103	U32SA03SB0202
SAMPLE DATE					19920801	19920801	19920801	20101027	20101027	20101027	20101027	20101027	20101027
SAMPLE CODE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX					SO	SO	SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP
SUBMATRIX					SB	SB	SB	SB	SB	SB	SB	SB	SB
TOP DEPTH					5	10	15	2	2	3	2	3	2
BOTTOM DEPTH					7	12	17	3	3	4	3	4	3
METALS (MG/KG)													
ALUMINUM	7700	N	23000		1490 J	769 J	7150 J	NA	NA	NA	NA	NA	NA
ARSENIC	0.39	C	0.0013		0.74 U	0.77 U	0.78 U	**1.17 J**	**18.5 J**	**0.965 J**	**172 J**	**16.3 J**	**241 J**
BARIUM	1500	N	120		17.2 B	7.2 B	74.8	NA	NA	NA	NA	NA	NA
BERYLLIUM	16	N	13		0.25 U	0.26 U	1 B	NA	NA	NA	NA	NA	NA
CADMIUM	7	N	0.52		1.2 U	1.3 U	1.3 U	NA	NA	NA	NA	NA	NA
CALCIUM	NC		NC		340 B	309 B	2130	NA	NA	NA	NA	NA	NA
CHROMIUM	12000	N(3)	28000000	(3)	3.2	2.6 U	8.5	NA	NA	NA	NA	NA	NA
COBALT	2.3	N	0.21		**18.9**	5.9 B	**26.5**	NA	NA	NA	NA	NA	NA
COPPER	310	N	22		4 B	2.6 U	6.9	NA	NA	NA	NA	NA	NA
IRON	5500	N	270		*2060 J*	*1900 J*	**11100 J**	NA	NA	NA	NA	NA	NA
LEAD	400	N	14	(4)	2.3	1.7	4.6	NA	NA	NA	NA	NA	NA
MAGNESIUM	NC		NC		270 B	170 B	1890	NA	NA	NA	NA	NA	NA
MANGANESE	180	N	21		*152 J*	7.4 J	*85.8 J*	NA	NA	NA	NA	NA	NA
MERCURY	2.3	N(5)	0.033		0.12 U	0.13 U	0.13 U	NA	NA	NA	NA	NA	NA
NICKEL	150	N	20		4.7 B	3.9 U	13.7	NA	NA	NA	NA	NA	NA
POTASSIUM	NC		NC		263 B	237 U	1680	NA	NA	NA	NA	NA	NA
SELENIUM	39	N	0.4		0.49 UJ	0.51 UJ	0.52 UJ	NA	NA	NA	NA	NA	NA
SILVER	39	N	0.6		1.2 U	1.3 U	1.3 U	NA	NA	NA	NA	NA	NA
VANADIUM	39	N	78		6.8 B	4.3 B	22.2	NA	NA	NA	NA	NA	NA
ZINC	2300	N	290		18.6	17.6	53.1	NA	NA	NA	NA	NA	NA
MISCELLANEOUS PARAMETERS (%)													
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBS (UG/KG)													
AROCLOR-1260	220	C	24		45 U	47 U	42 U	NA	NA	NA	NA	NA	NA
PESTICIDES/PCBS (UG/KG)													
4,4'-DDD	2000	C	66		4.5 U	4.7 U	4.2 U	NA	NA	NA	NA	NA	NA
4,4'-DDE	1400	C	46		4.5 U	4.7 U	4.2 U	NA	NA	NA	NA	NA	NA
4,4'-DDT	1700	C	67		4.5 U	4.7 U	4.2 U	NA	NA	NA	NA	NA	NA
ENDOSULFAN II	37000	N	1100		4.5 U	4.7 U	4.2 U	NA	NA	NA	NA	NA	NA
ENDRIN	1800	N	68		4.5 U	4.7 U	4.2 U	NA	NA	NA	NA	NA	NA
GAMMA-CHLORDANE	1600	C(6)	13	(6)	2.3 U	2.4 U	2.2 U	NA	NA	NA	NA	NA	NA
HEPTACHLOR EPOXIDE	53	C	0.068		2.3 U	2.4 U	2.2 U	NA	NA	NA	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/KG)													
TOTAL PETROLEUM HYDROCARBONS	NC		NC		12.2 U	12.7 U	12.9 U	NA	NA	NA	NA	NA	NA
SEMIVOLATILES (UG/KG)													
2-METHYLNAPHTHALENE	31000	N	140		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	340000	N(7)	4100	(7)	450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
ANTHRACENE	1700000	N	42000		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT	15	C	NC		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT-HALFND	15	C	NC		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
BENZO(A)ANTHRACENE	150	C	10		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	150	C	35		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
CARBAZOLE	NC		NC		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
CHRYSENE	15000	C	1100		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
DIBENZOFURAN	7800	N	110		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
DIETHYL PHTHALATE	4900000	N	4700		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
DI-N-BUTYL PHTHALATE	610000	N	1700		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
FLUORANTHENE	230000	N	70000		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
NAPHTHALENE	3600	C	0.47		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
PHENANTHRENE	170000	N(8)	9500	(8)	450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
PYRENE	170000	N	9500		450 U	470 U	420 U	NA	NA	NA	NA	NA	NA
VOLATILES (UG/KG)													
ACETONE	6100000	N	4500		41 U	30 U	41 U	NA	NA	NA	NA	NA	NA
CARBON DISULFIDE	82000	N	310		12 U	13 U	13 U	NA	NA	NA	NA	NA	NA

LOCATION	Adjusted USEPA Regional Screening Levels(1,2) Residential Soil		USEPA Regional Screening Levels(1,2) Protection of Groundwater SSLs		U32SA03SB02	U32SA05SB01	U32SA06SB01	U32SA06SB02	U32SA07SB02	U32SA08SB02		U32SA09SB02	
SAMPLE ID					U32SA03SB0203	U32SA05SB0102	U32SA06SB0102	U32SA06SB0202	U32SA07SB0202	U32SA08SB0202	U32SA08SB0203	U32SA09SB0202	U32SA09SB0203
SAMPLE DATE					20101027	20101027	20101027	20101027	20101027	20101027	20101027	20101027	20101027
SAMPLE CODE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX					SO	SO	SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP
SUBMATRIX					SB	SB	SB	SB	SB	SB	SB	SB	SB
TOP DEPTH					3	2	2	2	2	2	3	2	3
BOTTOM DEPTH					4	3	3	3	3	3	4	3	4
METALS (MG/KG)													
ALUMINUM	7700	N	23000		NA	NA	NA	NA	NA	NA	NA	NA	NA
ARSENIC	0.39	C	0.0013		8.77 J	2.69 J	11 J	5.29 J	9.1 J	18.4 J	12.6 J	21.6 J	15.6 J
BARIUM	1500	N	120		NA	NA	NA	NA	NA	NA	NA	NA	NA
BERYLLIUM	16	N	13		NA	NA	NA	NA	NA	NA	NA	NA	NA
CADMIUM	7	N	0.52		NA	NA	NA	NA	NA	NA	NA	NA	NA
CALCIUM	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
CHROMIUM	12000	N(3)	28000000	(3)	NA	NA	NA	NA	NA	NA	NA	NA	NA
COBALT	2.3	N	0.21		NA	NA	NA	NA	NA	NA	NA	NA	NA
COPPER	310	N	22		NA	NA	NA	NA	NA	NA	NA	NA	NA
IRON	5500	N	270		NA	NA	NA	NA	NA	NA	NA	NA	NA
LEAD	400	N	14	(4)	NA	NA	NA	NA	NA	NA	NA	NA	NA
MAGNESIUM	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
MANGANESE	180	N	21		NA	NA	NA	NA	NA	NA	NA	NA	NA
MERCURY	2.3	N(5)	0.033		NA	NA	NA	NA	NA	NA	NA	NA	NA
NICKEL	150	N	20		NA	NA	NA	NA	NA	NA	NA	NA	NA
POTASSIUM	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
SELENIUM	39	N	0.4		NA	NA	NA	NA	NA	NA	NA	NA	NA
SILVER	39	N	0.6		NA	NA	NA	NA	NA	NA	NA	NA	NA
VANADIUM	39	N	78		NA	NA	NA	NA	NA	NA	NA	NA	NA
ZINC	2300	N	290		NA	NA	NA	NA	NA	NA	NA	NA	NA
MISCELLANEOUS PARAMETERS (%)													
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBS (UG/KG)													
AROCLOR-1260	220	C	24		NA	NA	NA	NA	NA	NA	NA	NA	NA
PESTICIDES/PCBS (UG/KG)													
4,4'-DDD	2000	C	66		NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	1400	C	46		NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	1700	C	67		NA	NA	NA	NA	NA	NA	NA	NA	NA
ENDOSULFAN II	37000	N	1100		NA	NA	NA	NA	NA	NA	NA	NA	NA
ENDRIN	1800	N	68		NA	NA	NA	NA	NA	NA	NA	NA	NA
GAMMA-CHLORDANE	1600	C(6)	13	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA
HEPTACHLOR EPOXIDE	53	C	0.068		NA	NA	NA	NA	NA	NA	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/KG)													
TOTAL PETROLEUM HYDROCARBONS	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
SEMIVOLATILES (UG/KG)													
2-METHYLNAPHTHALENE	31000	N	140		NA	NA	NA	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	340000	N(7)	4100	(7)	NA	NA	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	1700000	N	42000		NA	NA	NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT	15	C	NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT-HALFND	15	C	NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZO(A)ANTHRACENE	150	C	10		NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	150	C	35		NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	NA	NA	NA	NA	NA	NA	NA	NA
CARBAZOLE	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
CHRYSENE	15000	C	1100		NA	NA	NA	NA	NA	NA	NA	NA	NA
DIBENZOFURAN	7800	N	110		NA	NA	NA	NA	NA	NA	NA	NA	NA
DIETHYL PHTHALATE	4900000	N	4700		NA	NA	NA	NA	NA	NA	NA	NA	NA
DI-N-BUTYL PHTHALATE	610000	N	1700		NA	NA	NA	NA	NA	NA	NA	NA	NA
FLUORANTHENE	230000	N	70000		NA	NA	NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	NA	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	3600	C	0.47		NA	NA	NA	NA	NA	NA	NA	NA	NA
PHENANTHRENE	170000	N(8)	9500	(8)	NA	NA	NA	NA	NA	NA	NA	NA	NA
PYRENE	170000	N	9500		NA	NA	NA	NA	NA	NA	NA	NA	NA
VOLATILES (UG/KG)													
ACETONE	6100000	N	4500		NA	NA	NA	NA	NA	NA	NA	NA	NA
CARBON DISULFIDE	82000	N	310		NA	NA	NA	NA	NA	NA	NA	NA	NA

LOCATION	Adjusted USEPA Regional Screening Levels(1,2) Residential Soil		USEPA Regional Screening Levels(1,2) Protection of Groundwater SSLs		U32SA10SB01	U32SA11SB01	U32SA11SB02	U32SA12SB02	U32SA13SB02	U32SA14SB01		U32SA14SB02	U32SBS0434
SAMPLE ID					U32SA10SB0102	U32SA11SB0102	U32SA11SB0202	U32SA12SB0202	U32SA13SB0202	U32SA14SB0102	U32SA14SB0103	U32SA14SB0202	U32SBS043401
SAMPLE DATE					20101028	20101028	20101028	20101027	20101027	20101028	20101028	20101028	20101201
SAMPLE CODE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
MATRIX					SO	SO	SO	SO	SO	SO	SO	SO	SO
SAMPLE TYPE					NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
POSITION					NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	NOT UNDER CAP	UNDER CAP
SUBMATRIX					SB	SB	SB	SB	SB	SB	SB	SB	SB
TOP DEPTH					2	2	2	2	2	2	3	2	3
BOTTOM DEPTH					3	3	3	3	3	3	4	3	4
METALS (MG/KG)													
ALUMINUM	7700	N	23000		NA	NA	NA	NA	NA	NA	NA	NA	NA
ARSENIC	0.39	C	0.0013		7.1 J	11.1 J	1.88 J	5.93 J	8.45 J	54.4 J	1.12 J	5.58 J	2.9 J
BARIUM	1500	N	120		NA	NA	NA	NA	NA	NA	NA	NA	NA
BERYLLIUM	16	N	13		NA	NA	NA	NA	NA	NA	NA	NA	NA
CADMIUM	7	N	0.52		NA	NA	NA	NA	NA	NA	NA	NA	NA
CALCIUM	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
CHROMIUM	12000	N(3)	28000000	(3)	NA	NA	NA	NA	NA	NA	NA	NA	NA
COBALT	2.3	N	0.21		NA	NA	NA	NA	NA	NA	NA	NA	NA
COPPER	310	N	22		NA	NA	NA	NA	NA	NA	NA	NA	NA
IRON	5500	N	270		NA	NA	NA	NA	NA	NA	NA	NA	NA
LEAD	400	N	14	(4)	NA	NA	NA	NA	NA	NA	NA	NA	5.4
MAGNESIUM	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
MANGANESE	180	N	21		NA	NA	NA	NA	NA	NA	NA	NA	NA
MERCURY	2.3	N(5)	0.033		NA	NA	NA	NA	NA	NA	NA	NA	NA
NICKEL	150	N	20		NA	NA	NA	NA	NA	NA	NA	NA	NA
POTASSIUM	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
SELENIUM	39	N	0.4		NA	NA	NA	NA	NA	NA	NA	NA	NA
SILVER	39	N	0.6		NA	NA	NA	NA	NA	NA	NA	NA	NA
VANADIUM	39	N	78		NA	NA	NA	NA	NA	NA	NA	NA	NA
ZINC	2300	N	290		NA	NA	NA	NA	NA	NA	NA	NA	NA
MISCELLANEOUS PARAMETERS (%)													
PERCENT MOISTURE	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	22
PCBS (UG/KG)													
AROCLOR-1260	220	C	24		NA	NA	NA	NA	NA	NA	NA	NA	42 U
PESTICIDES/PCBS (UG/KG)													
4,4'-DDD	2000	C	66		NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	1400	C	46		NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	1700	C	67		NA	NA	NA	NA	NA	NA	NA	NA	NA
ENDOSULFAN II	37000	N	1100		NA	NA	NA	NA	NA	NA	NA	NA	NA
ENDRIN	1800	N	68		NA	NA	NA	NA	NA	NA	NA	NA	NA
GAMMA-CHLORDANE	1600	C(6)	13	(6)	NA	NA	NA	NA	NA	NA	NA	NA	NA
HEPTACHLOR EPOXIDE	53	C	0.068		NA	NA	NA	NA	NA	NA	NA	NA	NA
PETROLEUM HYDROCARBONS (MG/KG)													
TOTAL PETROLEUM HYDROCARBONS	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
SEMIVOLATILES (UG/KG)													
2-METHYLNAPHTHALENE	31000	N	140		NA	NA	NA	NA	NA	NA	NA	NA	NA
ACENAPHTHYLENE	340000	N(7)	4100	(7)	NA	NA	NA	NA	NA	NA	NA	NA	NA
ANTHRACENE	1700000	N	42000		NA	NA	NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT	15	C	NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
BAP EQUIVALENT-HALFND	15	C	NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZO(A)ANTHRACENE	150	C	10		NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZO(B)FLUORANTHENE	150	C	35		NA	NA	NA	NA	NA	NA	NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	NA	NA	NA	NA	NA	NA	NA	NA
CARBAZOLE	NC		NC		NA	NA	NA	NA	NA	NA	NA	NA	NA
CHRYSENE	15000	C	1100		NA	NA	NA	NA	NA	NA	NA	NA	NA
DIBENZOFURAN	7800	N	110		NA	NA	NA	NA	NA	NA	NA	NA	NA
DIETHYL PHTHALATE	4900000	N	4700		NA	NA	NA	NA	NA	NA	NA	NA	NA
DI-N-BUTYL PHTHALATE	610000	N	1700		NA	NA	NA	NA	NA	NA	NA	NA	NA
FLUORANTHENE	230000	N	70000		NA	NA	NA	NA	NA	NA	NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	NA	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	3600	C	0.47		NA	NA	NA	NA	NA	NA	NA	NA	NA
PHENANTHRENE	170000	N(8)	9500	(8)	NA	NA	NA	NA	NA	NA	NA	NA	NA
PYRENE	170000	N	9500		NA	NA	NA	NA	NA	NA	NA	NA	NA
VOLATILES (UG/KG)													
ACETONE	6100000	N	4500		NA	NA	NA	NA	NA	NA	NA	NA	NA
CARBON DISULFIDE	82000	N	310		NA	NA	NA	NA	NA	NA	NA	NA	NA

LOCATION SAMPLE ID SAMPLE DATE SAMPLE CODE MATRIX SAMPLE TYPE POSITION SUBMATRIX TOP DEPTH BOTTOM DEPTH	Adjusted USEPA Regional Screening Levels(1,2) Residential Soil		USEPA Regional Screening Levels(1,2) Protection of Groundwater SSLs		U32SBS0934 U32SBS093401 20101201 NORMAL SO NORMAL UNDER CAP SB 3 4	U32SBS1334 U32SBS133401 20101201 NORMAL SO NORMAL UNDER CAP SB 3 4	U32SBS1823 U32SBS182301 20101201 NORMAL SO NORMAL UNDER CAP SB 2 3
METALS (MG/KG)							
ALUMINUM	7700	N	23000		NA	NA	NA
ARSENIC	0.39	C	0.0013		5.3 J	2.5 J	88 J
BARIUM	1500	N	120		NA	NA	NA
BERYLLIUM	16	N	13		NA	NA	NA
CADMIUM	7	N	0.52		NA	NA	NA
CALCIUM	NC		NC		NA	NA	NA
CHROMIUM	12000	N(3)	28000000	(3)	NA	NA	NA
COBALT	2.3	N	0.21		NA	NA	NA
COPPER	310	N	22		NA	NA	NA
IRON	5500	N	270		NA	NA	NA
LEAD	400	N	14	(4)	5	14	*23*
MAGNESIUM	NC		NC		NA	NA	NA
MANGANESE	180	N	21		NA	NA	NA
MERCURY	2.3	N(5)	0.033		NA	NA	NA
NICKEL	150	N	20		NA	NA	NA
POTASSIUM	NC		NC		NA	NA	NA
SELENIUM	39	N	0.4		NA	NA	NA
SILVER	39	N	0.6		NA	NA	NA
VANADIUM	39	N	78		NA	NA	NA
ZINC	2300	N	290		NA	NA	NA
MISCELLANEOUS PARAMETERS (%)							
PERCENT MOISTURE	NC		NC		23	15	27
PCBS (UG/KG)							
AROCLOR-1260	220	C	24		43 U	*67*	11 J
PESTICIDES/PCBS (UG/KG)							
4,4'-DDD	2000	C	66		NA	NA	NA
4,4'-DDE	1400	C	46		NA	NA	NA
4,4'-DDT	1700	C	67		NA	NA	NA
ENDOSULFAN II	37000	N	1100		NA	NA	NA
ENDRIN	1800	N	68		NA	NA	NA
GAMMA-CHLORDANE	1600	C(6)	13	(6)	NA	NA	NA
HEPTACHLOR EPOXIDE	53	C	0.068		NA	NA	NA
PETROLEUM HYDROCARBONS (MG/KG)							
TOTAL PETROLEUM HYDROCARBONS	NC		NC		NA	NA	NA
SEMIVOLATILES (UG/KG)							
2-METHYLNAPHTHALENE	31000	N	140		NA	NA	NA
ACENAPHTHYLENE	340000	N(7)	4100	(7)	NA	NA	NA
ANTHRACENE	1700000	N	42000		NA	NA	NA
BAP EQUIVALENT	15	C	NC		NA	NA	NA
BAP EQUIVALENT-HALFND	15	C	NC		NA	NA	NA
BENZO(A)ANTHRACENE	150	C	10		NA	NA	NA
BENZO(A)PYRENE	15	C	3.5		NA	NA	NA
BENZO(B)FLUORANTHENE	150	C	35		NA	NA	NA
BENZO(K)FLUORANTHENE	1500	C	350		NA	NA	NA
CARBAZOLE	NC		NC		NA	NA	NA
CHRYSENE	15000	C	1100		NA	NA	NA
DIBENZOFURAN	7800	N	110		NA	NA	NA
DIETHYL PHTHALATE	4900000	N	4700		NA	NA	NA
DI-N-BUTYL PHTHALATE	610000	N	1700		NA	NA	NA
FLUORANTHENE	230000	N	70000		NA	NA	NA
INDENO(1,2,3-CD)PYRENE	150	C	120		NA	NA	NA
NAPHTHALENE	3600	C	0.47		NA	NA	NA
PHENANTHRENE	170000	N(8)	9500	(8)	NA	NA	NA
PYRENE	170000	N	9500		NA	NA	NA
VOLATILES (UG/KG)							
ACETONE	6100000	N	4500		NA	NA	NA
CARBON DISULFIDE	82000	N	310		NA	NA	NA

Footnotes:

(1) Screening criteria based on EPA Regional Screening Levels (RSLs) Summary Table (November 2011). The adjusted RSLs for residential soils represent the one-in-one million (1E-06) cancer risk level or a non-cancer hazard quotient of 0.1 for carcinogenic (C) and non-carcinogenic (N)

(2) Concentrations exceeding the referenced groundwater protection values are "italicized" (and highlighted yellow). Concentrations exceeding the referenced RSLs for residential soils are "bolded" (and highlighted orange). Concentrations exceeding both referenced criteria are presented in "reverse bold" (and highlighted red).

(3) The value is for trivalent chromium.

(4) MCL-based SSL.

(5) The value is for mercuric chloride (and other mercury salts).

(6) The value for chlordane is used as a surrogate.

(7) The value for acenaphthene is used as a surrogate.

(8) The value for pyrene is used as a surrogate for phenanthrene.

Definitions: C = carcinogenic endpoint; N = non-carcinogenic endpoint; NC = no criterion available; NA = Not analyzed

Qualifiers: B = present in blank; J = estimated; L = biased low; U = non-detected

Groundwater

ATTACHMENT 1
POSITIVE DETECTIONS FOR GROUNDWATER
COMPARISON TO DIRECT CONTACT CRITERIA
HUMAN HEALTH RISK ASSESSMENT - UXO 32

LOCATION SAMPLE ID SAMPLE DATE SAMPLE CODE MATRIX SAMPLE TYPE SUBMATRIX	Adjusted USEPA Regional Screening Level - Tap Water(1,2)	USEPA Maximum Contaminant Level(1,2)	41MW01-41SB03 S32GW01-0611 20110628 NORMAL GW NORMAL NA	41MW02-41SB04 S32GW02-0611 20110628 NORMAL GW NORMAL NA	41MW05 S32GW05-0611 20110628 NORMAL GW NORMAL NA	41MW06 S32GW06-0611 20110628 NORMAL GW NORMAL NA	41MW07 S32GW07-0611 20110627 ORIG GW NORMAL NA
METALS (UG/L)							
ARSENIC	0.045 C	10	1.5 U	**10.6**	**15.5**	**2.71 K**	1.5 U
BERYLLIUM	1.6 N	4	**3.94**	1.36	0.563 J	**1.61**	**2.81**
COBALT	0.47 N	NA	**219**	**39.9**	**147**	**115**	**40.6**
VOLATILES (UG/L)							
CIS-1,2-DICHLOROETHENE	2.8 N	70	2.5 U	0.5 U	2.5 U	0.47 J	0.5 U
TETRACHLOROETHENE	0.072 C	5	2.5 U	0.5 U	2.5 U	**0.285 J**	0.5 U
TRICHLOROETHENE	0.26 N(3)	5	**21.8**	**1.31**	**13**	**28.2**	**4.57**

41MW07		41MW08	41MW09	41MW10	S57MW023	S57MW035
S32GW07-0611-AVG	S32GW07-0611-D	S32GW08-0611	S32GW09-0611	S32GW10-0611	S57GW23-0611	S57GW35-0611
20110627	20110627	20110627	20110627	20110627	20110627	20110627
AVG	DUP	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
GW	GW	GW	GW	GW	GW	GW
NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
NA	NA	NA	NA	NA	NA	NA
1.5 U	1.5 U	5.11 K	3.87 K	1.16 J	2.51 K	1.59 J
2.965	3.12	10.5	7.08	5.16	5.16	5.96
43.65	46.7	268	779	357	120	657
0.5 U	0.5 U	2.5 U	0.877 J	2.5 U	2.5 U	0.5 U
0.5 U	0.5 U	2.5 U	0.73 J	2.5 U	2.5 U	0.5 U
4.26	3.95	20.8	75	38.2	46.7	18.2

Footnotes:

(1) Screening criteria based on USEPA Regional Screening Levels (RSLs) Summary Table (November 2011). The RSLs for tap water represent the one-in-one million (1E-06) cancer risk level or a non-cancer hazard quotient of 0.1 for carcinogenic (C) and non-carcinogenic (N) chemicals, respectively. The EPA Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) are also presented.

(2) Concentrations exceeding the referenced RSLs for tap water are "bolded" (and highlighted orange). Concentrations exceeding available SDWA MCLs are "italicized" (and highlighted yellow). Concentrations exceeding both referenced criteria are presented in "reverse bold" (and highlighted red).

(3) Ten percent of non-cancer RSL is less than cancer RSL; therefore, presented non-cancer RSL.

Definitions: C = carcinogenic endpoint; N = non-carcinogenic endpoint; NC = no criterion available; NA = Not analyzed

Qualifiers: B = present in blank; J = estimated; K = biased high; U = non-detected

ATTACHMENT 2

CALCULATION OF TARGET GROUNDWATER CONCENTRATIONS CORRESPONDING TO TARGET INDOOR AIR CONCENTRATIONS

CALCULATION OF A TARGET GROUNDWATER CONCENTRATION CORRESPONDING TO A TARGET INDOOR AIR CONCENTRATION

The target groundwater concentrations were calculated according to the methodology present in Appendix D of USEPA's *Draft Guidance for Evaluating the Vapor Intrusion into Indoor Air from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* and Appendix A of DoD's *Vapor Intrusion Handbook*. Specifically the target groundwater concentration corresponding to a chemical's target indoor air concentration is calculated by dividing the target indoor air concentration by an appropriate attenuation factor and then converting the vapor concentration to an equivalent groundwater concentration assuming equilibrium between the aqueous and vapor phases at the water table. Diffusion resistances across the capillary fringe are assumed to be accounted for in the value of α. The equilibrium partitioning is assumed to obey Henry's Law so that:

$$C_{gw} = C_{target,ia} \times 10^{-3}\ m^3/L \times 1/H \times 1/\alpha$$

Where:

C_{gw}	=	target groundwater concentration, ug/L
$C_{target,ia}$	=	target indoor air concentration, ug/m^3
α	=	attenuation factor (ratio of indoor air concentration to source vapor concentration).
H	=	dimensionless Henry's Law Constant at 25º C.

The residential air concentrations from the current USEPA Regional Screening Level table were used as for target indoor air concentrations. A value of 0.001 was used for the attenuation factor. Table 1 presents the target groundwater concentrations.

References:

DoD (Department of Defense), January 2009. DoD Vapor Intrusion Handbook. Prepared by the Tri-Service Environmental Risk Assessment Workgroup.

USEPA (U.S. Environmental Protection Agency), November 2002. OSWER Draft Guidance for Evaluating the Vapor Intrusion into Indoor Air from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). Office of Solid Waste and Emergency Response. EPA 530-D-02-004.

TABLE 1
TARGET GROUNDWATER CONCENTRATION CORRESPONDING
TO TARGET INDOOR AIR CONCENTRATION
RESIDENTIAL

CAS No.	Chemical	Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1	Henry's Law Constants	Carcinogenic Screening Level	Noncarcinogenic Screening Level	Screenig Level
		Inhalation	Inhalation	H' (unitless)	Attenuation Factor = 0.001		
		ug/m^3	ug/m^3		ug/L	ug/L	ug/L
630-20-6	1,1,1,2-Tetrachloroethane	3.3E-01		1.0E-01	3.2E+00	NA	3.2E+00 C
811-97-2	1,1,1,2-Tetrafluoroethane		8.3E+04	2.0E+00	NA	4.1E+04	4.1E+04 N
71-55-6	1,1,1-Trichloroethane		5.2E+03	7.0E-01	NA	7.4E+03	7.4E+03 N
79-34-5	1,1,2,2-Tetrachloroethane	4.2E-02		1.5E-02	2.8E+00	NA	2.8E+00 C
79-00-5	1,1,2-Trichloroethane	1.5E-01	2.1E-01	3.4E-02	4.5E+00	6.2E+00	6.2E+00 N*
598-77-6	1,1,2-Trichloropropane			1.3E-02	NA	NA	NA
76-13-1	1,1,2-Trichlorotrifluoroethane		3.1E+04	2.2E+01	NA	1.4E+03	1.4E+03 N
92-52-4	1,1-Biphenyl		4.2E-01	1.3E-02	NA	3.3E+01	3.3E+01 N
75-34-3	1,1-Dichloroethane	1.5E+00		2.3E-01	6.5E+00	NA	6.5E+00 C
75-35-4	1,1-Dichloroethene		2.1E+02	1.1E+00	NA	2.0E+02	2.0E+02 N
75-37-6	1,1-Difluoroethane		4.2E+04	8.3E-01	NA	5.1E+04	5.1E+04 N
87-61-6	1,2,3-Trichlorobenzene			5.1E-02	NA	NA	NA
96-18-4	1,2,3-Trichloropropane		3.1E-01	1.4E-02	NA	2.2E+01	2.2E+01 N
96-19-5	1,2,3-Trichloropropene		3.1E-01	7.2E-01	NA	4.3E-01	4.3E-01 N
120-82-1	1,2,4-Trichlorobenzene		2.1E+00	5.8E-02	NA	3.6E+01	3.6E+01 N
95-63-6	1,2,4-Trimethylbenzene		7.3E+00	2.5E-01	NA	2.9E+01	2.9E+01 N
96-12-8	1,2-Dibromo-3-Chloropropane	1.6E-04	2.1E-01	6.0E-03	2.7E-02	3.5E+01	2.7E-02 C
106-93-4	1,2-Dibromoethane	4.1E-03	9.4E+00	2.7E-02	1.5E-01	3.5E+02	1.5E-01 C
95-50-1	1,2-Dichlorobenzene		2.1E+02	7.8E-02	NA	2.7E+03	2.7E+03 N
107-06-2	1,2-Dichloroethane	9.4E-02	7.3E+00	4.8E-02	1.9E+00	1.5E+02	1.9E+00 C
78-87-5	1,2-Dichloropropane	2.4E-01	4.2E+00	1.2E-01	2.1E+00	3.6E+01	2.1E+00 C
106-88-7	1,2-Epoxybutane		2.1E+01	7.4E-03	NA	2.9E+03	2.9E+03 N
6423-43-4	1,2-Propylene Glycol Dinitrate		2.8E-01	3.9E-05	NA	7.3E+03	7.3E+03 N
108-67-8	1,3,5-Trimethylbenzene			3.6E-01	NA	NA	NA
106-99-0	1,3-Butadiene	8.1E-02	2.1E+00	3.0E+00	2.7E-02	7.0E-01	2.7E-02 C
142-28-9	1,3-Dichloropropane			4.0E-02	NA	NA	NA
542-75-6	1,3-Dichloropropene	6.1E-01	2.1E+01	1.5E-01	4.2E+00	1.4E+02	4.2E+00 C
764-41-0	1,4-Dichloro-2-Butene	5.8E-04		2.7E-02	2.1E-02	NA	2.1E-02 C
106-46-7	1,4-Dichlorobenzene	2.2E-01	8.3E+02	9.9E-02	2.2E+00	8.4E+03	2.2E+00 C
822-06-0	1,6-Hexamethylene Diisocyanate		1.0E-02	2.0E-03	NA	5.1E+00	5.1E+00 N
107-04-0	1-Bromo-2-chloroethane	4.1E-03		3.7E-02	1.1E-01	NA	1.1E-01 C
71-36-3	1-Butanol			3.6E-04	NA	NA	NA
75-68-3	1-Chloro-1,1-Difluoroethane		5.2E+04	2.4E+00	NA	2.2E+04	2.2E+04 N
109-69-3	1-Chlorobutane			6.8E-01	NA	NA	NA
90-12-0	1-Methylnaphthalene			2.1E-02	NA	NA	NA
108-60-1	2,2'-Oxybis(1-Chloropropane)	2.4E-01		3.0E-03	7.9E+01	NA	7.9E+01 C
95-95-4	2,4,5-Trichlorophenol			6.6E-05	NA	NA	NA
88-06-2	2,4,6-Trichlorophenol	7.8E-01		1.1E-04	7.3E+03	NA	7.3E+03 C
118-96-7	2,4,6-Trinitrotoluene			8.5E-07	NA	NA	NA
120-83-2	2,4-Dichlorophenol			1.8E-04	NA	NA	NA
105-67-9	2,4-Dimethylphenol			3.9E-05	NA	NA	NA
606-20-2	2,6-Dinitrotoluene			3.1E-05	NA	NA	NA
78-93-3	2-Butanone		5.2E+03	2.3E-03	NA	2.2E+06	2.2E+06 N
91-58-7	2-Chloronaphthalene			1.3E-02	NA	NA	NA
95-57-8	2-Chlorophenol			4.6E-04	NA	NA	NA
95-49-8	2-Chlorotoluene			1.5E-01	NA	NA	NA
591-78-6	2-Hexanone		3.1E+01	3.8E-03	NA	8.1E+03	8.1E+03 N
91-57-6	2-Methylnaphthalene			2.1E-02	NA	NA	NA
95-48-7	2-Methylphenol		6.3E+02	4.9E-05	NA	1.3E+07	1.3E+07 N
79-46-9	2-Nitropropane	9.0E-04	2.1E+01	4.9E-03	1.8E-01	4.3E+03	1.8E-01 C
88-72-2	2-Nitrotoluene			5.1E-04	NA	NA	NA
107-05-1	3-Chloropropene	4.1E-01	1.0E+00	4.5E-01	9.1E-01	2.2E+00	2.2E+00 N*
108-39-4	3-Methylphenol		6.3E+02	3.5E-05	NA	1.8E+07	1.8E+07 N
99-08-1	3-Nitrotoluene			3.8E-04	NA	NA	NA
72-54-8	4,4'-DDD	3.5E-02		2.7E-04	1.3E+02	NA	1.3E+02 C
72-55-9	4,4'-DDE	2.5E-02		1.7E-03	1.5E+01	NA	1.5E+01 C
50-29-3	4,4'-DDT	2.5E-02		3.4E-04	7.4E+01	NA	7.4E+01 C
534-52-1	4,6-Dinitro-2-Methylphenol			5.7E-05	NA	NA	NA
106-47-8	4-Chloroaniline			4.7E-05	NA	NA	NA
98-56-6	4-Chlorobenzotrifluoride		3.1E+02	1.4E+00	NA	2.2E+02	2.2E+02 N
106-43-4	4-Chlorotoluene			1.8E-01	NA	NA	NA
108-10-1	4-Methyl-2-Pentanone		3.1E+03	5.6E-03	NA	5.5E+05	5.5E+05 N
106-44-5	4-Methylphenol		6.3E+02	4.1E-05	NA	1.5E+07	1.5E+07 N
99-99-0	4-Nitrotoluene			2.3E-04	NA	NA	NA
83-32-9	Acenaphthene			7.5E-03	NA	NA	NA
75-07-0	Acetaldehyde	1.1E+00	9.4E+00	2.7E-03	4.0E+02	3.4E+03	3.4E+03 N*
67-64-1	Acetone		3.2E+04	1.4E-03	NA	2.2E+07	2.2E+07 N
75-86-5	Acetone Cyanohydrin		6.3E+01	5.3E-04	NA	1.2E+05	1.2E+05 N
75-05-8	Acetonitrile		6.3E+01	1.4E-03	NA	4.5E+04	4.5E+04 N
98-86-2	Acetophenone			4.3E-04	NA	NA	NA
107-02-8	Acrolein		2.1E-02	5.0E-03	NA	4.2E+00	4.2E+00 N
107-13-1	Acrylonitrile	3.6E-02	2.1E+00	5.6E-03	6.4E+00	3.7E+02	6.4E+00 C
309-00-2	Aldrin	5.0E-04		1.8E-03	2.8E-01	NA	2.8E-01 C
319-84-6	alpha-BHC	1.4E-03		2.1E-04	6.7E+00	NA	6.7E+00 C
98-83-9	alphal Styrene (Alpha)			1.0E-01	NA	NA	NA
62-53-3	Aniline	1.5E+00	1.0E+00	8.3E-05	1.8E+04	1.2E+04	1.2E+04 N*
120-12-7	Anthracene			2.3E-03	NA	NA	NA
103-33-3	Azobenzene	7.8E-02		5.5E-04	1.4E+02	NA	1.4E+02 C
100-52-7	Benzaldehyde			1.1E-03	NA	NA	NA
71-43-2	Benzene	3.1E-01	3.1E+01	2.3E-01	1.4E+00	1.4E+02	1.4E+00 C
108-98-5	Benzenethiol			1.4E-02	NA	NA	NA
56-55-3	Benzo(a)anthracene	8.7E-03		4.9E-04	1.8E+01	NA	1.8E+01 C
50-32-8	Benzo(a)pyrene	8.7E-04		1.9E-05	4.7E+01	NA	4.7E+01 C
205-99-2	Benzo(b)fluoranthene	8.7E-03		2.7E-05	3.2E+02	NA	3.2E+02 C
207-08-9	Benzo(k)fluoranthene	8.7E-03		2.4E-05	3.6E+02	NA	3.6E+02 C
98-07-7	Benzotrichloride			1.1E-02	NA	NA	NA
100-51-6	Benzyl Alcohol			1.4E-05	NA	NA	NA
100-44-7	Benzyl Chloride	5.0E-02	1.0E+00	1.7E-02	3.0E+00	5.9E+01	3.0E+00 C
319-85-7	beta-BHC	4.6E-03		2.1E-04	2.2E+01	NA	2.2E+01 C
111-44-4	Bis(2-Chloroethyl)Ether	7.4E-03		7.0E-04	1.1E+01	NA	1.1E+01 C
542-88-1	Bis(2-Chloromethyl)Ether	3.9E-05		1.8E-01	2.2E-04	NA	2.2E-04 C

TABLE 1
TARGET GROUNDWATER CONCENTRATION CORRESPONDING
TO TARGET INDOOR AIR CONCENTRATION
RESIDENTIAL

CAS No.	Chemical	Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1	Henry's Law Constants	Carcinogenic Screening Level	Noncarcinogenic Screening Level	Screenig Level
		Inhalation	Inhalation	H' (unitless)	Attenuation Factor = 0.001		
		ug/m^3	ug/m^3		ug/L	ug/L	ug/L
117-81-7	Bis(2-ethylhexyl)phthalate	1.0E+00		1.1E-05	9.1E+04	NA	9.1E+04 C
108-86-1	Bromobenzene		6.3E+01	1.0E-01	NA	6.2E+02	6.2E+02 N
75-27-4	Bromodichloromethane	6.6E-02		8.7E-02	7.6E-01	NA	7.6E-01 C
593-60-2	Bromoethene	7.6E-02	3.1E+00	5.0E-01	1.5E-01	6.2E+00	1.5E-01 C
75-25-2	Bromoform	2.2E+00		2.2E-02	1.0E+02	NA	1.0E+02 C
74-83-9	Bromomethane		5.2E+00	3.0E-01	NA	1.7E+01	1.7E+01 N
85-68-7	Butyl Benzyl Phthalate			5.2E-05	NA	NA	NA
75-15-0	Carbon Disulfide		7.3E+02	5.9E-01	NA	1.2E+03	1.2E+03 N
56-23-5	Carbon Tetrachloride	4.1E-01	1.0E+02	1.1E+00	3.6E-01	8.9E+01	3.6E-01 C
12789-03-6	Chlordane	2.4E-02	7.3E-01	2.0E-03	1.2E+01	3.7E+02	1.2E+01 C
506-77-4	Chlorine Cyanide			7.9E-02	NA	NA	NA
108-90-7	Chlorobenzene		5.2E+01	1.3E-01	NA	4.1E+02	4.1E+02 N
124-48-1	Chlorodibromomethane	9.0E-02		3.2E-02	2.8E+00	NA	2.8E+00 C
75-45-6	Chlorodifluoromethane		5.2E+04	1.7E+00	NA	3.1E+04	3.1E+04 N
75-00-3	Chloroethane		1.0E+04	4.5E-01	NA	2.2E+04	2.2E+04 N
67-66-3	Chloroform	1.1E-01	1.0E+02	1.5E-01	7.3E-01	6.7E+02	7.3E-01 C
74-87-3	Chloromethane		9.4E+01	3.6E-01	NA	2.6E+02	2.6E+02 N
107-30-2	Chloromethyl Methyl Ether	3.5E-03		1.2E-02	2.8E-01	NA	2.8E-01 C
126-99-8	Chloroprene	8.1E-03	2.1E+01	2.3E+00	3.5E-03	9.2E+00	3.5E-03 C
218-01-9	Chrysene	8.7E-02		2.1E-04	4.1E+02	NA	4.1E+02 C
156-59-2	cis-1,2-Dichloroethene			1.7E-01	NA	NA	NA
1476-11-5	cis-1,4-Dichloro-2-Butene	5.8E-04		2.7E-02	2.1E-02	NA	2.1E-02 C
57-12-5	Cyanide			5.4E-03	NA	NA	NA
460-19-5	Cyanogen			2.2E-01	NA	NA	NA
506-68-3	Cyanogen Bromide			1.0E+00	NA	NA	NA
110-82-7	Cyclohexane		6.3E+03	6.1E+00	NA	1.0E+03	1.0E+03 N
132-64-9	Dibenzofuran			8.7E-03	NA	NA	NA
74-95-3	Dibromomethane		4.2E+00	3.4E-02	NA	1.2E+02	1.2E+02 N
75-71-8	Dichlorodifluoromethane		1.0E+02	1.4E+01	NA	7.1E+00	7.1E+00 N
77-73-6	Dicyclopentadiene		7.3E+00	2.6E+00	NA	2.9E+00	2.9E+00 N
60-57-1	Dieldrin	5.3E-04		4.1E-04	1.3E+00	NA	1.3E+00 C
60-29-7	Diethyl Ether			5.0E-02	NA	NA	NA
84-66-2	Diethyl Phthalate			2.5E-05	NA	NA	NA
108-20-3	Diisopropyl Ether		7.3E+02	1.0E-01	NA	7.0E+03	7.0E+03 N
1445-75-6	Diisopropyl Methylphosphonate (DIMP)			1.8E-03	NA	NA	NA
120-61-6	Dimethyl Terephthalate			5.5E-03	NA	NA	NA
84-74-2	di-n-Butyl Phthalate			7.4E-05	NA	NA	NA
25321-14-6	Dinitrotoluene Mixture			1.6E-05	NA	NA	NA
115-29-7	Endosulfan			2.7E-03	NA	NA	NA
72-20-8	Endrin			4.1E-04	NA	NA	NA
106-89-8	Epichlorohydrin	2.0E+00	1.0E+00	1.2E-03	1.6E+03	8.0E+02	8.0E+02 N*
759-94-4	Eptc (S-Ethyl Dipropylthiocarbamate)			6.5E-04	NA	NA	NA
141-78-6	Ethyl Acetate			5.5E-03	NA	NA	NA
140-88-5	Ethyl Acrylate			1.4E-02	NA	NA	NA
97-63-2	Ethyl Methacrylate		3.1E+02	2.3E-02	NA	1.3E+04	1.3E+04 N
100-41-4	Ethylbenzene	9.7E-01	1.0E+03	3.2E-01	3.0E+00	3.1E+03	3.0E+00 C
75-21-8	Ethylene Oxide	2.8E-02	3.1E+01	6.1E-03	4.6E+00	5.1E+03	4.6E+00 C
206-44-0	Fluoranthene			3.6E-04	NA	NA	NA
86-73-7	Fluorene			3.9E-03	NA	NA	NA
50-00-0	Formaldehyde	1.9E-01	1.0E+01	1.4E-05	1.4E+04	7.2E+05	1.4E+04 C
110-00-9	Furan			2.2E-01	NA	NA	NA
58-89-9	gamma-BHC (Lindane)	7.8E-03		2.1E-04	3.7E+01	NA	3.7E+01 C
76-44-8	Heptachlor	1.9E-03		1.2E-02	1.6E-01	NA	1.6E-01 C
1024-57-3	Heptachlor Epoxide	9.4E-04		8.6E-04	1.1E+00	NA	1.1E+00 C
118-74-1	Hexachlorobenzene	5.3E-03		7.0E-02	7.6E-02	NA	7.6E-02 C
87-68-3	Hexachlorobutadiene	1.1E-01		4.2E-01	2.6E-01	NA	2.6E-01 C
77-47-4	Hexachlorocyclopentadiene		2.1E-01	1.1E+00	NA	1.9E-01	1.9E-01 N
67-72-1	Hexachloroethane	2.2E-01	3.1E+01	1.6E-01	1.4E+00	1.9E+02	1.4E+00 C
110-54-3	Hexane		7.3E+02	7.4E+01	NA	9.9E+00	9.9E+00 N
74-90-8	Hydrogen Cyanide		8.3E-01	5.4E-03	NA	1.5E+02	1.5E+02 N
193-39-5	Indeno(1,2,3-cd)pyrene	8.7E-03		1.4E-05	6.1E+02	NA	6.1E+02 C
78-83-1	Isobutanol			4.0E-04	NA	NA	NA
78-59-1	Isophorone		2.1E+03	2.7E-04	NA	7.7E+06	7.7E+06 N
98-82-8	Isopropylbenzene		4.2E+02	4.7E-01	NA	8.9E+02	8.9E+02 N
7439-97-6	Mercury		3.1E-01	4.7E-01	NA	6.6E-01	6.6E-01 N
126-98-7	Methacrylonitrile		7.3E-01	1.0E-02	NA	7.2E+01	7.2E+01 N
72-43-5	Methoxychlor			8.3E-06	NA	NA	NA
79-20-9	Methyl Acetate			4.7E-03	NA	NA	NA
96-33-3	Methyl Acrylate			8.1E-03	NA	NA	NA
80-62-6	Methyl Methacrylate		7.3E+02	1.3E-02	NA	5.6E+04	5.6E+04 N
25013-15-4	Methyl Styrene (Mixture)		4.2E+01	1.0E-01	NA	4.0E+02	4.0E+02 N
1634-04-4	Methyl Tert-Butyl Ether	9.4E+00	3.1E+03	2.4E-02	3.9E+02	1.3E+05	3.9E+02 C
75-09-2	Methylene Chloride	5.2E+00	1.1E+03	1.3E-01	3.9E+01	8.3E+03	3.9E+01 C
108-38-3	m-xylene		1.0E+02	2.9E-01	NA	3.4E+02	3.4E+02 N
91-20-3	Naphthalene	7.2E-02	3.1E+00	1.8E-02	4.0E+00	1.7E+02	4.0E+00 C
98-95-3	Nitrobenzene	6.1E-02	9.4E+00	9.8E-04	6.2E+01	9.6E+03	6.2E+01 C
121-69-7	N-N-Dimethylaniline			2.3E-03	NA	NA	NA
924-16-3	N-Nitroso-di-n-Butylamine	1.5E-03		5.4E-04	2.8E+00	NA	2.8E+00 C
621-64-7	N-Nitroso-di-n-Propylamine	1.2E-03		2.2E-04	5.5E+00	NA	5.5E+00 C
86-30-6	N-Nitrosodiphenylamine	9.4E-01		2.1E-04	4.6E+03	NA	4.6E+03 C
111-84-2	Nonane		2.1E+02	1.4E+02	NA	1.5E+00	1.5E+00 N
103-65-1	N-Propylbenzene		1.0E+03	4.3E-01	NA	2.3E+03	2.3E+03 N
95-47-6	o-Xylene		1.0E+02	2.1E-01	NA	4.7E+02	4.7E+02 N
109-66-0	Pentane		1.0E+03	5.1E+01	NA	2.0E+01	2.0E+01 N
108-95-2	Phenol		2.1E+02	1.4E-05	NA	1.5E+07	1.5E+07 N
75-44-5	Phosgene		3.1E-01	6.8E-01	NA	4.5E-01	4.5E-01 N
123-38-6	Propionaldehyde		8.3E+00	3.0E-03	NA	2.8E+03	2.8E+03 N
75-56-9	Propylene Oxide	6.6E-01	3.1E+01	2.8E-03	2.3E+02	1.1E+04	2.3E+02 C
106-42-3	p-xylene		1.0E+02	2.8E-01	NA	3.5E+02	3.5E+02 N
129-00-0	Pyrene			4.9E-04	NA	NA	NA
110-86-1	Pyridine			4.5E-04	NA	NA	NA

TABLE 1
TARGET GROUNDWATER CONCENTRATION CORRESPONDING
TO TARGET INDOOR AIR CONCENTRATION
RESIDENTIAL

CAS No.	Chemical	Carcinogenic Target Risk (TR) = 1E-06	Noncancer Hazard Index (HI) = 1	Henry's Law Constants	Carcinogenic Screening Level	Noncarcinogenic Screening Level	Screenig Level
		Inhalation	Inhalation	H' (unitless)	Attenuation Factor = 0.001		
		ug/m^3	ug/m^3		ug/L	ug/L	ug/L
100-42-5	Styrene		1.0E+03	1.1E-01	NA	8.9E+03	8.9E+03 N
608-73-1	Technical-HCH	4.8E-03		2.1E-04	2.3E+01	NA	2.3E+01 C
127-18-4	Tetrachloroethene	4.1E-01	2.8E+02	7.2E-01	5.7E-01	3.9E+02	5.7E-01 C
78-00-2	Tetraethyl Lead			2.3E+01	NA	NA	NA
463-56-9	Thiocyanate			6.0E-03	NA	NA	NA
108-88-3	Toluene		5.2E+03	2.7E-01	NA	1.9E+04	1.9E+04 N
540-59-0	Total 1,2-Dichloroethene			1.7E-01	NA	NA	NA
1319-77-3	Total Methylphenol		6.3E+02	4.9E-05	NA	1.3E+07	1.3E+07 N
1330-20-7	Total Xylenes		1.0E+02	2.1E-01	NA	4.7E+02	4.7E+02 N
8001-35-2	Toxaphene	7.6E-03		2.5E-04	3.1E+01	NA	3.1E+01 C
156-60-5	trans-1,2-Dichloroethene		6.3E+01	1.7E-01	NA	3.8E+02	3.8E+02 N
110-57-6	trans-1,4-Dichloro-2-Butene	5.8E-04		2.7E-02	2.1E-02	NA	2.1E-02 C
123-73-9	trans-Crotonaldehyde			7.9E-04	NA	NA	NA
79-01-6	Trichloroethene	4.3E-01	2.1E+00	4.0E-01	1.1E+00	5.2E+00	5.2E+00 N*
75-69-4	Trichlorofluoromethane		7.3E+02	4.0E+00	NA	1.8E+02	1.8E+02 N
121-44-8	Triethylamine		7.3E+00	6.1E-03	NA	1.2E+03	1.2E+03 N
108-05-4	Vinyl Acetate		2.1E+02	2.1E-02	NA	1.0E+04	1.0E+04 N
75-01-4	Vinyl Chloride	1.6E-01	1.0E+02	1.1E+00	1.4E-01	8.8E+01	1.4E-01 C

* - Ten percent of noncarcinogenic value is less than carcinogenic value.
Toxicity values and target air concentrations were obtained from the USEPA Regional Screening Level Table, November 2011.

ATTACHMENT 3

RAGS-PART D TABLES

RAGS Part D Table 1

Selection of Exposure Pathways

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Surface Soil	Surface Soil	UXO 32	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with surface soil during excavation activities.
				Industrial Workers	Adult	Ingestion Dermal	Quant Quant	Industrial workers may contact surface soil during normal work activities.
		Air		Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Workers	Adult	Inhalation	Quant	Industrial workers may be exposed to fugitive dust and volatile emissions during normal work activities.
	Subsurface Soil	Subsurface Soil		Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with subsurface soil during excavation activities.
				Industrial Workers	Adult	Ingestion Dermal	Quant Quant	Although exposures to subsurface soil by industrial workers are considered unlikely at the site, this scenario was included to aid in future risk management decisions.
		Air		Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to fugitive dust and volatile emissions during construction activities.
				Industrial Workers	Adult	Inhalation	Quant	Although exposures to subsurface soil by industrial workers are considered unlikely at the site, this scenario was included to aid in future risk management decisions.
	Groundwater	Groundwater		Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with groundwater during excavation activities.
				Industrial Workers	Adult	Ingestion Dermal	None None	Industrial workers are not expected to have contact with groundwater under current site conditions.
		Air		Construction Workers	Adult	Inhalation	Quant	Construction workers may be exposed to COPCs that have volatilized from groundwater during excavation activities.
				Industrial Workers	Adult	Inhalation	None	Industrial workers are not expected to be exposed to COPCs that have volatilized from groundwater.
			Vapor Intrusion	Industrial Workers	Adult	Inhalation	Qual	Industrial workers may be exposed to COPCs that have volatilized from groundwater and migrated through building foundations into indoor air.
Future	Surface Soil	Surface Soil	UXO 32	Recreational Users	Child	Ingestion Dermal	Quant Quant	Recreational users may contact surface soil while at the site.
					Adult	Ingestion Dermal	Quant Quant	
				Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	
		Air		Recreational Users	Child	Inhalation	Quant	Recreational users may be exposed to fugitive dust and volatile emissions while at the site.
					Adult	Inhalation	Quant	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Inhalation	Quant	

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Subsurface Soil	Subsurface Soil	UXO 32	Recreational Users	Child	Ingestion	Quant	Although exposures to subsurface soil by recreational users are considered unlikely at the site, this scenario was included to aid in future risk management decisions.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
				Residents	Child	Ingestion	Quant	Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
		Air		Recreational Users	Child	Inhalation	Quant	Although exposures to subsurface soil by recreational users are considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
				Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
	Groundwater	Groundwater		Recreational Users	Child	Ingestion	None	Child recreational users are not expected to be exposed to groundwater.
						Dermal	None	
					Adult	Ingestion	None	Adult recreational users are not expected to be exposed to groundwater.
						Dermal	None	
				Residents	Child	Ingestion	Quant	Although a future residential scenario is considered unlikely at the site, these scenarios were included to aid in future risk management decisions.
						Dermal	Quant	
					Adult	Ingestion	Quant	
						Dermal	Quant	
		Air		Recreational Users	Child	Ingestion	None	Child recreational users are not expected to be exposed to COPCs that have volatilized from groundwater.
						Dermal	None	
					Adult	Ingestion	None	Adult recreational users are not expected to be exposed to COPCs that have volatilized from groundwater.
						Dermal	None	
				Residents	Child	Inhalation	None	Exposure to bathroom air was evaluated for adult residents only. Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Inhalation	Quant	
			Vapor Intrusion	Residents	Child	Inhalation	Quant	Although a future residential scenario is considered unlikely at the site, this scenario was included to aid in future risk management decisions.
					Adult	Inhalation	Quant	

Notes:
Quant - Quantitative.
Qual - Qualitative.

RAGS Part D Table 2

Occurrence, Distribution and Selection Of Chemicals of Potential Concern

LIST OF TABLES
RAGS PART D TABLE 2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

TABLE 2-1

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	Adjusted USEPA RSL Residential(5)	COPC Flag	Rationale for Contaminant Deletion or Selection(6)
DIOXINS/FURANS (NG/KG)											
3268-87-9	1,2,3,4,6,7,8,9-OCDD	1/1	6400	6400	U32SOS180601	-	6400	NA	15000 C	NO	BSL
39001-02-0	1,2,3,4,6,7,8,9-OCDF	1/1	530	530	U32SOS180601	-	530	NA	15000 C	NO	BSL
35822-46-9	1,2,3,4,6,7,8-HPCDD	1/1	450 J	450 J	U32SOS180601	-	450	NA	450 C	NO	BSL
67562-39-4	1,2,3,4,6,7,8-HPCDF	1/1	190 J	190 J	U32SOS180601	-	190	NA	450 C	NO	BSL
55673-89-7	1,2,3,4,7,8,9-HPCDF	1/1	62	62	U32SOS180601	-	62	NA	450 C	NO	BSL
70648-26-9	1,2,3,4,7,8-HXCDF	1/1	220	220	U32SOS180601	-	220	NA	45 C	YES	ASL
57653-85-7	1,2,3,6,7,8-HXCDD	1/1	9.1	9.1	U32SOS180601	-	9.1	NA	45 C	NO	BSL
57117-44-9	1,2,3,6,7,8-HXCDF	1/1	44	44	U32SOS180601	-	44	NA	45 C	NO	BSL
19408-74-3	1,2,3,7,8,9-HXCDD	1/1	5.9	5.9	U32SOS180601	-	5.9	NA	45 C	NO	BSL
57117-41-6	1,2,3,7,8-PECDF	1/1	48	48	U32SOS180601	-	48	NA	150 C	NO	BSL
60851-34-5	2,3,4,6,7,8-HXCDF	1/1	25	25	U32SOS180601	-	25	NA	45 C	NO	BSL
57117-31-4	2,3,4,7,8-PECDF	1/1	110	110	U32SOS180601	-	110	NA	15 C	YES	ASL
1746-01-6	2,3,7,8-TCDD	1/1	0.74 J	0.74 J	U32SOS180601	-	0.74	NA	4.5 C	NO	BSL
51207-31-9	2,3,7,8-TCDF	1/1	130	130	U32SOS180601	-	130	NA	45 C	YES	ASL
NA	2,3,7,8-TCDD EQUIVALENTS(7)	1/1	89.2	89.2	U32SOS180601	-	89.2	NA	4.5 C	YES	ASL
METALS (MG/KG)											
7440-38-2	ARSENIC	50/50	3.24 J	423 J	U32SO020101	-	423	14.9	0.39 C	YES	ASL
7440-39-3	BARIUM	1/1	150	150	U32SOS180601	-	150	80.4	1500 N	NO	BSL
7440-43-9	CADMIUM	6/16	0.0213 J	69	U32SOS180601	0.0313-0.552	69	2.5	7 N	YES	ASL
7440-47-3	CHROMIUM	1/1	75	75	U32SOS180601	-	75	33.4	12000 N(8)	NO	BSL
7439-92-1	LEAD	22/22	5.3	9800	U32SOS180601	-	9800	62.5	400	YES	ASL
7439-97-6	MERCURY	1/1	3.3 J	3.3 J	U32SOS180601	-	3.3	0.16	2.3 N(9)	YES	ASL
7782-49-2	SELENIUM	1/1	0.91	0.91	U32SOS180601	-	0.91	1.2	39 N	NO	BSL, BKG
7440-66-6	ZINC	1/1	3500	3500	U32SOS180601	-	3500	37.5	2300 N	YES	ASL
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
91-57-6	2-METHYLNAPHTHALENE	2/2	3.55 J	20.7	U32SA05SB0101-D	-	20.7	73	31000 N	NO	BSL, BKG
208-96-8	ACENAPHTHYLENE	1/2	5.91 J	5.91 J	U32SA05SB0201	7.78-7.81	5.91	NA	340000 N(10)	NO	BSL
120-12-7	ANTHRACENE	2/2	9.72	10.6	U32SA05SB0201	7.81	10.6	260	1700000 N	NO	BSL, BKG
NA	BAP EQUIVALENTS(7)	9/17	23.71	1200	U32SO050101	360-400	1200	NA	15 C	YES	ASL
56-55-3	BENZO(A)ANTHRACENE	2/2	18	20.2	U32SA05SB0101	-	20.2	480	150 C	NO	BSL, BKG
50-32-8	BENZO(A)PYRENE	9/17	12.5	1200	U32SO050101	360-400	1200	390	15 C	YES	ASL
205-99-2	BENZO(B)FLUORANTHENE	2/2	30.1	49	U32SA05SB0101	-	49	420	150 C	NO	BSL, BKG
191-24-2	BENZO(G,H,I)PERYLENE	2/2	12.1 J	15 J	U32SA05SB0201	-	15	130	170000 N(11)	NO	BSL, BKG
207-08-9	BENZO(K)FLUORANTHENE	2/2	8.98 J	62.2 J	U32SA05SB0101	-	62.2	360	1500 C	NO	BSL, BKG
218-01-9	CHRYSENE	2/2	28	64.8	U32SA05SB0101-D	-	64.8	440	15000 C	NO	BSL, BKG
53-70-3	DIBENZO(A,H)ANTHRACENE	1/17	4.28 J	5.46 J	U32SA05SB0101-D	7.88-400	5.46	NA	15 C	NO	BSL
206-44-0	FLUORANTHENE	2/2	28.9	39.3	U32SA05SB0101	-	39.3	1100	230000 N	NO	BSL, BKG
86-73-7	FLUORENE	1/2	3.89 J	3.89 J	U32SA05SB0101	7.81-7.88	3.89	150	230000 N	NO	BSL, BKG
193-39-5	INDENO(1,2,3-CD)PYRENE	2/2	7.81 J	14.2	U32SA05SB0201	-	14.2	100	150 C	NO	BSL, BKG
91-20-3	NAPHTHALENE	2/2	5.12 J	6.63 J	U32SA05SB0101-D	-	6.63	110	3600 C	NO	BSL, BKG

TABLE 2-1

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	Adjusted USEPA RSL Residential(5)	COPC Flag	Rationale for Contaminant Deletion or Selection(6)
85-01-8	PHENANTHRENE	2/2	14.6	82.3	U32SA05SB0101-D	-	82.3	1100	170000 N(11)	NO	BSL, BKG
129-00-0	PYRENE	2/2	21.1	28.4	U32SA05SB0101	-	28.4	880	170000 N	NO	BSL, BKG
PCBS (UG/KG)											
11096-82-5	AROCLOR-1260	25/31	5.8 J	11000	U32SBS090101	38-44.3	11000	NA	220 C	YES	ASL

Footnotes:

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - 95% UTL for surface soil from Background Soil Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland (Tetra Tech, 2002).
5 - USEPA RSLs for Chemicals at Superfund Sites, November 2011. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and background.
8 - The value is for trivalent chromium.
9 - The value is for mercuric chloride (and other mercury salts).
10 - The value for acenaphthene is used as a surrogate.
11 - The value for pyrene is used as a surrogate.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Rationale Codes:

For selection as a COPC:
ASL = Above screening level and background

For elimination as a COPC:
BSL = Below screening level
BKG = Below background concentration

Definitions:

BAP = Benzo(a)pyrene
CAS = Chemical Abstracts Service
COPC = Chemical of potential concern
J = Estimated value
NA = Not Available
NC = No Criteria
RSL = Regional Screening Level
USEPA = United States Environmental Protection Agency
UTL - Upper Tolerance Limit

TABLE 2-2

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND
PAGE 1 OF 2

CAS Number	Chemical	Frequency of Detection	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Background Concentration[4]	USEPA Protection of Groundwater SSL [5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
DIOXINS/FURANS (NG/KG)											
3268-87-9	1,2,3,4,6,7,8,9-OCDD	1/1	6400	6400	U32SOS180601	-	6400	NA	870	YES	ASL
39001-02-0	1,2,3,4,6,7,8,9-OCDF	1/1	530	530	U32SOS180601	-	530	NA	870	NO	BSL
35822-46-9	1,2,3,4,6,7,8-HPCDD	1/1	450 J	450 J	U32SOS180601	-	450	NA	26	YES	ASL
67562-39-4	1,2,3,4,6,7,8-HPCDF	1/1	190 J	190 J	U32SOS180601	-	190	NA	26	YES	ASL
55673-89-7	1,2,3,4,7,8,9-HPCDF	1/1	62	62	U32SOS180601	-	62	NA	26	YES	ASL
70648-26-9	1,2,3,4,7,8-HXCDF	1/1	220	220	U32SOS180601	-	220	NA	2.6	YES	ASL
57653-85-7	1,2,3,6,7,8-HXCDD	1/1	9.1	9.1	U32SOS180601	-	9.1	NA	2.6	YES	ASL
57117-44-9	1,2,3,6,7,8-HXCDF	1/1	44	44	U32SOS180601	-	44	NA	2.6	YES	ASL
19408-74-3	1,2,3,7,8,9-HXCDD	1/1	5.9	5.9	U32SOS180601	-	5.9	NA	2.6	YES	ASL
57117-41-6	1,2,3,7,8-PECDF	1/1	48	48	U32SOS180601	-	48	NA	8.7	YES	ASL
60851-34-5	2,3,4,6,7,8-HXCDF	1/1	25	25	U32SOS180601	-	25	NA	2.6	YES	ASL
57117-31-4	2,3,4,7,8-PECDF	1/1	110	110	U32SOS180601	-	110	NA	0.87	YES	ASL
1746-01-6	2,3,7,8-TCDD	1/1	0.74 J	0.74 J	U32SOS180601	-	0.74	NA	0.26	YES	ASL
51207-31-9	2,3,7,8-TCDF	1/1	130	130	U32SOS180601	-	130	NA	2.6	YES	ASL
NA	2,3,7,8-TCDD EQUIVALENTS[7]	1/1	89.2	89.2	U32SOS180601	-	89.2	NA	0.26	YES	ASL
METALS (MG/KG)											
7440-38-2	ARSENIC	50/50	3.24 J	423 J	U32SO020101	-	423	14.9	0.0013	YES	ASL
7440-39-3	BARIUM	1/1	150	150	U32SOS180601	-	150	80.4	120	YES	ASL
7440-43-9	CADMIUM	6/16	0.0213 J	69	U32SOS180601	0.0313-0.552	69	2.5	0.52	YES	ASL
7440-47-3	CHROMIUM	1/1	75	75	U32SOS180601	-	75	33.4	28000000 [8]	NO	BSL
7439-92-1	LEAD	22/22	5.3	9800	U32SOS180601	-	9800	62.5	14 [9]	YES	ASL
7439-97-6	MERCURY	1/1	3.3 J	3.3 J	U32SOS180601	-	3.3	0.16	0.033	YES	ASL
7782-49-2	SELENIUM	1/1	0.91	0.91	U32SOS180601	-	0.91	1.2	0.4	NO	BKG
7440-66-6	ZINC	1/1	3500	3500	U32SOS180601	-	3500	37.5	290	YES	ASL
POLYCYCLIC AROMATIC HYDROCARBONS (UG/KG)											
91-57-6	2-METHYLNAPHTHALENE	2/2	3.55 J	20.7	U32SA05SB0101-D	-	20.7	73	140	NO	BSL, BKG
208-96-8	ACENAPHTHYLENE	1/2	5.91 J	5.91 J	U32SA05SB0201	7.78-7.81	5.91	NA	4100 [10]	NO	BSL
120-12-7	ANTHRACENE	2/2	9.72	10.6	U32SA05SB0201	7.81	10.6	260	42000	NO	BSL, BKG
NA	BAP EQUIVALENTS[7]	9/17	23.71	1200	U32SO050101	360-400	1200	NA	NC	NO	NTX
56-55-3	BENZO(A)ANTHRACENE	2/2	18	20.2	U32SA05SB0101	-	20.2	480	10	NO	BKG
50-32-8	BENZO(A)PYRENE	9/17	12.5	1200	U32SO050101	360-400	1200	390	3.5	YES	ASL
205-99-2	BENZO(B)FLUORANTHENE	2/2	30.1	49	U32SA05SB0101	-	49	420	35	NO	BKG
191-24-2	BENZO(G,H,I)PERYLENE	2/2	12.1 J	15 J	U32SA05SB0201	-	15	130	9500 [11]	NO	BSL, BKG
207-08-9	BENZO(K)FLUORANTHENE	2/2	8.98 J	62.2 J	U32SA05SB0101	-	62.2	360	350	NO	BSL, BKG
218-01-9	CHRYSENE	2/2	28	64.8	U32SA05SB0101-D	-	64.8	440	1100	NO	BSL, BKG
53-70-3	DIBENZO(A,H)ANTHRACENE	1/17	4.28 J	5.46 J	U32SA05SB0101-D	7.88-400	5.46	NA	11	NO	BSL
206-44-0	FLUORANTHENE	2/2	28.9	39.3	U32SA05SB0101	-	39.3	1100	70000	NO	BSL, BKG
86-73-7	FLUORENE	1/2	3.89 J	3.89 J	U32SA05SB0101	7.81-7.88	3.89	150	4000	NO	BSL, BKG

TABLE 2-2

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Background Concentration[4]	USEPA Protection of Groundwater SSL [5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
193-39-5	INDENO(1,2,3-CD)PYRENE	2/2	7.81 J	14.2	U32SA05SB0201	-	14.2	100	120	NO	BSL, BKG
91-20-3	NAPHTHALENE	2/2	5.12 J	6.63 J	U32SA05SB0101-D	-	6.63	110	0.47	NO	BKG
85-01-8	PHENANTHRENE	2/2	14.6	82.3	U32SA05SB0101-D	-	82.3	1100	9500 [11]	NO	BSL, BKG
129-00-0	PYRENE	2/2	21.1	28.4	U32SA05SB0101	-	28.4	880	9500	NO	BSL, BKG
PCBS (UG/KG)											
11096-82-5	AROCLOR-1260	25/31	5.8 J	11000	U32SBS090101	38-44.3	11000	NA	24	YES	ASL

Footnotes:

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - 95% UTL for surface soil from Background Soil Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland (Tetra Tech, 2002).
5 - USEPA RSLs for Chemicals at Superfund Sites (November 2011). Dilution attenuation factor = 1. Risk-based SSLs.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and background.
7 - Calculated using half the value of the detection limit for nondetects.
8 - The value is for trivalent chromium.
9 - MCL- based SSL.
10 - The value for acenaphthene is used as a surrogate.
11 - The value for pyrene is used as a surrogate.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Rationale Codes:

For selection as a COPC:
ASL = Above screening level and background

For elimination as a COPC:
BSL = Below screening level
BKG = Below background concentration
NTX = No toxicity criteria

Definitions:

BAP = Benzo(a)pyrene
C = Carcinogen
CAS = Chemical Abstracts Service
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum Contaminant Level
NA = Not Available
RSL = Regional Screening Level
SSL = Soil Screening Level
USEPA = United States Environmental Protection Agency
UTL - Upper Tolerance Limit

TABLE 2-3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Background Concentration[4]	Adjusted USEPA RSL Residential[5]	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
METALS (MG/KG)											
7429-90-5	ALUMINUM	22/22	415	11900	41SB0504	-	11900	35400	7700 N	NO	BKG
7440-38-2	ARSENIC	36/49	0.965 J	328 J	41SB0201	0.5-0.78	328	18.9	0.39 C	YES	ASL
7440-39-3	BARIUM	7/22	54.4	93.9	41SB0105	7.2-43.3	93.9	134	1500 N	NO	BSL, BKG
7440-41-7	BERYLLIUM	5/22	0.3	4.6	41SB0105	0.23-1	4.6	3.3	16 N	NO	BSL
7440-43-9	CADMIUM	2/22	1.2	2	41SB0201	1.2-1.3	2	0.61	7 N	NO	BSL
7440-70-2	CALCIUM	6/22	1430	3480	41SB0504	74.9-1200	3480	2590	NC	NO	NUT
7440-47-3	CHROMIUM	16/22	2.6	27.7	41SB0504	2.5-2.6	27.7	60.1	12000 N[8]	NO	BSL, BKG
7440-48-4	COBALT	8/22	15.9	71.7	41SB0704	3.5-10.4	71.7	133	2.3 N	NO	BKG
7440-50-8	COPPER	15/22	6.6	62.9	41SB0304	2.5-5.9	62.9	48.6	310 N	NO	BSL
7439-89-6	IRON	22/22	481	79600	41SB0504	-	79600	83100	5500 N	NO	BKG
7439-92-1	LEAD	26/26	1.7	46 J	41SB0201	2.5	46	40.5	400	NO	BSL
7439-95-4	MAGNESIUM	5/22	1650	3180	41SB0504	29.2-1150	3180	2640	NC	NO	NUT
7439-96-5	MANGANESE	19/22	4.1	369	41SB0503	1.3-3.3	369	4130	180 N	NO	BKG
7439-97-6	MERCURY	1/22	0.18	0.18	41SB0201	0.1-0.26	0.18	0.18	2.3 N[9]	NO	BSL, BKG
7440-02-0	NICKEL	5/22	13.7	53.1	41SB0704	3.5-7.2	53.1	18.2	150 N	NO	BSL
7440-09-7	POTASSIUM	5/22	1290	3320	41SB0504	213-1170	3320	2610	NC	NO	NUT
7782-49-2	SELENIUM	1/22	0.7 J	0.7 J	41SB0201	0.3-0.7	0.7	13.3	39 N	NO	BSL, BKG
7440-22-4	SILVER	4/22	4.1	10.1	41SB0404	1.2-2	10.1	11.4	39 N	NO	BSL, BKG
7440-62-2	VANADIUM	11/22	11.8	125	41SB0504	3.4-11.1	125	194	39 N	NO	BKG
7440-66-6	ZINC	22/22	4.7	97.2	41SB0504	2.6	97.2	70.4	2300 N	NO	BSL
SEMIVOLATILES (UG/KG)											
91-57-6	2-METHYLNAPHTHALENE	1/22	38 J	38 J	41SB0201	370-470	38	NA	31000 N	NO	BSL
208-96-8	ACENAPHTHYLENE	1/22	82 J	82 J	41SB0402	380-470	82	NA	340000 N[10]	NO	BSL
120-12-7	ANTHRACENE	1/22	90 J	90 J	41SB0402	380-470	90	NA	1700000 N	NO	BSL
NA	BAP EQUIVALENTS[7]	2/22	346	480	41SB0402	390-470	480	NA	15 C	YES	ASL
56-55-3	BENZO(A)ANTHRACENE	1/22	320 J	320 J	41SB0402	380-470	320	NA	150 C	YES	ASL
50-32-8	BENZO(A)PYRENE	2/22	100 J	190 J	41SB0402	390-470	190	NA	15 C	YES	ASL
205-99-2	BENZO(B)FLUORANTHENE	2/22	160 J	560	41SB0402	390-470	560	NA	150 C	YES	ASL
207-08-9	BENZO(K)FLUORANTHENE	1/22	420	420	41SB0402	380-470	420	NA	1500 C	NO	BSL
86-74-8	CARBAZOLE	2/22	48 J	250 J	41SB0201	390-470	250	NA	NC	NO	NTX
218-01-9	CHRYSENE	1/22	520	520	41SB0402	380-470	520	NA	15000 C	NO	BSL
132-64-9	DIBENZOFURAN	1/22	42 J	42 J	41SB0402	380-470	42	NA	7800 N	NO	BSL
84-66-2	DIETHYL PHTHALATE	1/22	12000	12000	41SB0201	370-470	12000	NA	4900000 N	NO	BSL
84-74-2	DI-N-BUTYL PHTHALATE	1/22	3300	3300	41SB0201	370-470	3300	NA	610000 N	NO	BSL
206-44-0	FLUORANTHENE	1/22	640	640	41SB0402	380-470	640	NA	230000 N	NO	BSL
193-39-5	INDENO(1,2,3-CD)PYRENE	1/22	120 J	120 J	41SB0402	380-470	120	NA	150 C	NO	BSL
91-20-3	NAPHTHALENE	1/22	56 J	56 J	41SB0402	380-470	56	NA	3600 C	NO	BSL
85-01-8	PHENANTHRENE	2/22	140 J	350 J	41SB0402	390-470	350	NA	170000 N[11]	NO	BSL
129-00-0	PYRENE	1/22	520	520	41SB0402	380-470	520	NA	170000 N	NO	BSL

TABLE 2-3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	Adjusted USEPA RSL Residential(5)	COPC Flag	Rationale for Contaminant Deletion or Selection(6)
VOLATILES (UG/KG)											
67-64-1	ACETONE	2/22	490	1200	41SB0203	9-220	1200	NA	6100000 N	NO	BSL
75-15-0	CARBON DISULFIDE	6/22	2 J	6 J	41SB0103, 41SB0403	11-13	6	NA	82000 N	NO	BSL
PCBS (UG/KG)											
11096-82-5	AROCLOR-1260	2/26	11 J	67	U32SBS133401	37-47	67	NA	220 C	NO	BSL
PESTICIDES/PCBS (UG/KG)											
72-54-8	4,4'-DDD	2/22	0.86 J	53	41SB0201	3.7-4.7	53	NA	2000 C	NO	BSL
72-55-9	4,4'-DDE	1/22	160	160	41SB0201	3.7-4.7	160	0.68	1400 C	NO	BSL
50-29-3	4,4'-DDT	3/22	5.9	980	41SB0201	3.8-4.7	980	3.9	1700 C	NO	BSL
33213-65-9	ENDOSULFAN II	1/22	1.5 J	1.5 J	41SB0503	3.7-4.7	1.5	NA	37000 N(12)	NO	BSL
72-20-8	ENDRIN	2/22	15	20	41SB0402	3.8-4.7	20	NA	1800 N	NO	BSL
5103-74-2	GAMMA-CHLORDANE	1/22	1.4 J	1.4 J	41SB0201	1.9-2.4	1.4	NA	1600 C(13)	NO	BSL
1024-57-3	HEPTACHLOR EPOXIDE	1/22	2.9	2.9	41SB0503	1.9-2.4	2.9	NA	53 C	NO	BSL
PETROLEUM HYDROCARBONS (MG/KG)											
NA	TOTAL PETROLEUM HYDROCARBONS	5/22	12.5	143	41SB0201	10-12.9	143	39.1	NC	NO	NTX

Footnotes:

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - 95% UTL for clay-like subsurface soil from Background Soil Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland (Tetra Tech, 2002)
5 - USEPA RSLs for Chemicals at Superfund Sites, November 2011. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and background.
7 - Calculated using half the value of the detection limit for nondetects.
8 - The value is for trivalent chromium.
9 - The value is for mercuric chloride (and other mercury salts).
10 - The value for acenaphthene is used as a surrogate.
11 - The value for pyrene is used as a surrogate.
12 - The value for endosulfan is used as a surrogate.
13 - The value for chlordane is used as a surrogate.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Rationale Codes:

For selection as a COPC:
ASL = Above screening level and background

For elimination as a COPC:
BSL = Below screening level
BKG = Below background concentration
NUT = Essential nutrient
NTX = No toxicity criteria

Definitions:

BAP = Benzo(a)pyrene
C = Carcinogen
CAS = Chemical Abstracts Service
COPC = Chemical of potential concern
J = Estimated value
NA = Not Available
NC = No Criteria
RSL = Regional Screening Level
USEPA = United States Environmental Protection Agency
UTL - Upper Tolerance Limit

TABLE 2-4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	USEPA Protection of Groundwater SSL (5)	COPC Flag	Rationale for Contaminant Deletion or Selection(6)
METALS (MG/KG)											
7429-90-5	ALUMINUM	22/22	415	11900	41SB0504	-	11900	35400	23000	NO	BSL, BKG
7440-38-2	ARSENIC	36/49	0.965 J	328 J	41SB0201	0.5-0.78	328	18.9	0.0013	YES	ASL
7440-39-3	BARIUM	7/22	54.4	93.9	41SB0105	7.2-43.3	93.9	134	120	NO	BSL, BKG
7440-41-7	BERYLLIUM	5/22	0.3	4.6	41SB0105	0.23-1	4.6	3.3	13	NO	BSL
7440-43-9	CADMIUM	2/22	1.2	2	41SB0201	1.2-1.3	2	0.61	0.52	YES	ASL
7440-70-2	CALCIUM	6/22	1430	3480	41SB0504	74.9-1200	3480	2590	NC	NO	NUT
7440-47-3	CHROMIUM	16/22	2.6	27.7	41SB0504	2.5-2.6	27.7	60.1	28000000 (8)	NO	BSL, BKG
7440-48-4	COBALT	8/22	15.9	71.7	41SB0704	3.5-10.4	71.7	133	0.21	NO	BKG
7440-50-8	COPPER	15/22	6.6	62.9	41SB0304	2.5-5.9	62.9	48.6	22	YES	ASL
7439-89-6	IRON	22/22	481	79600	41SB0504	-	79600	83100	270	NO	BKG
7439-92-1	LEAD	26/26	1.7	46 J	41SB0201	2.5	46	40.5	14 (9)	YES	ASL
7439-95-4	MAGNESIUM	5/22	1650	3180	41SB0504	29.2-1150	3180	2640	NC	NO	NUT
7439-96-5	MANGANESE	19/22	4.1	369	41SB0503	1.3-3.3	369	4130	21	NO	BKG
7439-97-6	MERCURY	1/22	0.18	0.18	41SB0201	0.1-0.26	0.18	0.18	0.033	NO	BKG
7440-02-0	NICKEL	5/22	13.7	53.1	41SB0704	3.5-7.2	53.1	18.2	20	YES	ASL
7440-09-7	POTASSIUM	5/22	1290	3320	41SB0504	213-1170	3320	2610	NC	NO	NUT
7782-49-2	SELENIUM	1/22	0.7 J	0.7 J	41SB0201	0.3-0.7	0.7	13.3	0.4	NO	BKG
7440-22-4	SILVER	4/22	4.1	10.1	41SB0404	1.2-2	10.1	11.4	0.6	NO	BKG
7440-62-2	VANADIUM	11/22	11.8	125	41SB0504	3.4-11.1	125	194	78	NO	BKG
7440-66-6	ZINC	22/22	4.7	97.2	41SB0504	2.6	97.2	70.4	290	NO	BSL
SEMIVOLATILES (UG/KG)											
91-57-6	2-METHYLNAPHTHALENE	1/22	38 J	38 J	41SB0201	370-470	38	NA	140	NO	BSL
208-96-8	ACENAPHTHYLENE	1/22	82 J	82 J	41SB0402	380-470	82	NA	4100 (10)	NO	BSL
120-12-7	ANTHRACENE	1/22	90 J	90 J	41SB0402	380-470	90	NA	42000	NO	BSL
NA	BAP EQUIVALENTS(7)	2/22	346	480	41SB0402	390-470	480	NA	NC	NO	NTX
56-55-3	BENZO(A)ANTHRACENE	1/22	320 J	320 J	41SB0402	380-470	320	NA	10	YES	ASL
50-32-8	BENZO(A)PYRENE	2/22	100 J	190 J	41SB0402	390-470	190	NA	3.5	YES	ASL
205-99-2	BENZO(B)FLUORANTHENE	2/22	160 J	560	41SB0402	390-470	560	NA	35	YES	ASL
207-08-9	BENZO(K)FLUORANTHENE	1/22	420	420	41SB0402	380-470	420	NA	350	YES	ASL
86-74-8	CARBAZOLE	2/22	48 J	250 J	41SB0201	390-470	250	NA	NC	NO	NTX
218-01-9	CHRYSENE	1/22	520	520	41SB0402	380-470	520	NA	1100	NO	BSL
132-64-9	DIBENZOFURAN	1/22	42 J	42 J	41SB0402	380-470	42	NA	110	NO	BSL
84-66-2	DIETHYL PHTHALATE	1/22	12000	12000	41SB0201	370-470	12000	NA	4700	YES	ASL
84-74-2	DI-N-BUTYL PHTHALATE	1/22	3300	3300	41SB0201	370-470	3300	NA	1700	YES	ASL
206-44-0	FLUORANTHENE	1/22	640	640	41SB0402	380-470	640	NA	70000	NO	BSL
193-39-5	INDENO(1,2,3-CD)PYRENE	1/22	120 J	120 J	41SB0402	380-470	120	NA	120	NO	BSL
91-20-3	NAPHTHALENE	1/22	56 J	56 J	41SB0402	380-470	56	NA	0.47	YES	ASL
85-01-8	PHENANTHRENE	2/22	140 J	350 J	41SB0402	390-470	350	NA	9500 (11)	NO	BSL
129-00-0	PYRENE	1/22	520	520	41SB0402	380-470	520	NA	9500	NO	BSL

TABLE 2-4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

CAS Number	Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	USEPA Protection of Groundwater SSL (5)	COPC Flag	Rationale for Contaminant Deletion or Selection(6)
VOLATILES (UG/KG)											
67-64-1	ACETONE	2/22	490	1200	41SB0203	9-220	1200	NA	2400	NO	BSL
75-15-0	CARBON DISULFIDE	6/22	2 J	6 J	41SB0103, 41SB0403	11-13	6	NA	210	NO	BSL
PCBS (UG/KG)											
11096-82-5	AROCLOR-1260	2/26	11 J	67	U32SBS133401	37-47	67	NA	24	YES	ASL
PESTICIDES/PCBS (UG/KG)											
72-54-8	4,4'-DDD	2/22	0.86 J	53	41SB0201	3.7-4.7	53	NA	66	NO	BSL
72-55-9	4,4'-DDE	1/22	160	160	41SB0201	3.7-4.7	160	0.68	46	YES	ASL
50-29-3	4,4'-DDT	3/22	5.9	980	41SB0201	3.8-4.7	980	3.9	67	YES	ASL
33213-65-9	ENDOSULFAN II	1/22	1.5 J	1.5 J	41SB0503	3.7-4.7	1.5	NA	1100 (12)	NO	BSL
72-20-8	ENDRIN	2/22	15	20	41SB0402	3.8-4.7	20	NA	68	NO	BSL
5103-74-2	GAMMA-CHLORDANE	1/22	1.4 J	1.4 J	41SB0201	1.9-2.4	1.4	NA	13 (13)	NO	BSL
1024-57-3	HEPTACHLOR EPOXIDE	1/22	2.9	2.9	41SB0503	1.9-2.4	2.9	NA	0.068	YES	ASL
PETROLEUM HYDROCARBONS (MG/KG)											
NA	TOTAL PETROLEUM HYDROCARBONS	5/22	12.5	143	41SB0201	10-12.9	143	39.1	NC	NO	NTX

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - 95% UTL for clay-like subsurface soil from Background Soil Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland (Tetra Tech, 2002)
5 - USEPA RSLs for Chemicals at Superfund Sites (November 2011). Dilution attenuation factor = 1. Risk-based SSLs.
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and background.
7 - Calculated using half the value of the detection limit for nondetects.
8 - The value is for trivalent chromium.
9 - MCL-based SSL.
10 - The value for acenaphthene is used as a surrogate.
11 - The value for pyrene is used as a surrogate.
12 - The value for endosulfan is used as a surrogate.
13 - The value for chlordane is used as a surrogate.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Rationale Codes:
For selection as a COPC:
ASL = Above screening level and background

For elimination as a COPC:
BSL = Below screening level
BKG = Below background concentration
NTX = No toxicity criteria

Definitions:
BAP = Benzo(a)pyrene
C = Carcinogen
CAS = Chemical Abstracts Service
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum Contaminant Level
NA = Not Available
RSL = Regional Screening Level
SSL = Soil Screening Level
USEPA = United States Environmental Protection Agency
UTL - Upper Tolerance Limit

TABLE 2-5

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN -DIRECT CONTACT WITH GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Concentration(1)	Maximum Concentration(1)	Sample of Maximum Concentration	Range of Nondetects(2)	Concentration Used for Screening(3)	Background Concentration(4)	Adjusted USEPA Tapwater(5)	USEPA MCL(6)	COPC Flag	Rationale for Contaminant Deletion or Selection(7)
Metals (ug/L)											
ARSENIC	8/10	1.16 J	15.5	S32GW05-0611	1.5	15.5	NA	0.045 C	10	YES	ASL
BERYLLIUM	10/10	0.563 J	10.5	S32GW08-0611	-	10.5	NA	1.6 N	4	YES	ASL
COBALT	10/10	39.9	779	S32GW09-0611	-	779	NA	0.47 N	NC	YES	ASL
Volatile Organic Compounds (ug/L)											
CIS-1,2-DICHLOROETHENE	2/10	0.47 J	0.877 J	S32GW09-0611	0.5-2.5	0.877	NA	2.8 N	70	NO	BSL
TETRACHLOROETHENE	2/10	0.285 J	0.73 J	S32GW09-0611	0.5-2.5	0.73	NA	0.072 C	5	YES	ASL
TRICHLOROETHENE	10/10	1.31	75	S32GW09-0611	-	75	NA	0.26 N(8)	5	YES	ASL

Footnotes:

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background concentrations are not available.
5 - USEPA RSLs for Chemicals at Superfund Sites, November 2011. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - 2011 Edition of the Drinking Water Standards and Health Advisories (USEPA, January 2011).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Ten percent of non-cancer RSL is less than cancer RSL; therefore, presented non-cancer RSL.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:

C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value
MCL = Maximum contaminant level
N = Non-carcinogen
NA = Not Available
NC = No Criteria
RSL = Regional Screening Level
USEPA = United States Environmental Protection Agency

Rationale Codes:

For selection as a COPC:
ASL = Above screening level

For elimination as a COPC:
BSL = Below COPC screening level

TABLE 2-6

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - VAPOR INTRUSION
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Concentration[1]	Maximum Concentration[1]	Sample of Maximum Concentration	Range of Nondetects[2]	Concentration Used for Screening[3]	Background Concentration[4]	Is Chemical Sufficiently Volatile and Toxic?[5]	Vapor Intrusion Criteria[6]	COPC Flag	Rationale for Contaminant Deletion or Selection[7]
Metals (ug/L)											
ARSENIC	8/10	1.16 J	15.5	S32GW05-0611	1.5	15.5	NA	No	NA	NO	NTX
BERYLLIUM	10/10	0.563 J	10.5	S32GW08-0611	-	10.5	NA	No	NA	NO	NTX
COBALT	10/10	39.9	779	S32GW09-0611	-	779	NA	No	NA	NO	NTX
Volatile Organic Compounds (ug/L)											
CIS-1,2-DICHLOROETHENE	2/10	0.47 J	0.877 J	S32GW09-0611	0.5-2.5	0.877	NA	Yes	38 N[8]	NO	BSL
TETRACHLOROETHENE	2/10	0.285 J	0.73 J	S32GW09-0611	0.5-2.5	0.73	NA	Yes	0.57 C	YES	ASL
TRICHLOROETHENE	10/10	1.31	75	S32GW09-0611	-	75	NA	Yes	0.52 N	YES	ASL

Footnotes:
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - Background concentrations are not available.
5 - Appendix A of DoD Vapor Intrusion Handbook, January 2009.
6 - Calculated using methodology presented in Appendix D of USEPA's Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, November 2002. EPA530-F-02-052. Values correspond to a target cancer risk level of 1E-6 or HQ = 0.1 and an attenuation factor of 0.001.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level.
8 - Value is for trans-1,2-dichloroethene.

Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

Definitions:
C = Carcinogen
COPC = Chemical of potential concern
J = Estimated value

N = Non-carcinogen
NA = Not Available
USEPA = United States Environmental Protection Agency

Rationale Codes:
For selection as a COPC:
ASL = Above screening level

For elimination as a COPC:
BSL = Below COPC screening level
NTX = No toxicity criteria

RAGS Part D Table 3

Medium-Specific Exposure Point Concentration Summary

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RAGS PART D TABLE 3
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil (current)

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Surface Soil (current)	Arsenic	mg/kg	82.6	114 (AG)	423 J	114	mg/kg	95% Approximate Gamma UCL	ProUCL 4.1.00
	Cadmium	mg/kg	0.92	1.8 (G)	5.8	1.8	mg/kg	95% KM (t) UCL	ProUCL 4.1.00
	Lead	mg/kg	65.1	149 (LN)	263 J	65.1	mg/kg	Arithmetic Mean	(1)
	Benzo(a)pyrene Equivalents	mg/kg	0.24	0.35 (G)	1.2	0.35	mg/kg	95% KM (BCA) UCL	ProUCL 4.1.00
	Aroclor-1260	mg/kg	0.12	0.25 (G)	0.61	0.25	mg/kg	95% KM (Chebyshev) UCL	ProUCL 4.1.00

For non-detects, one half the sample quantitation limit was used as a proxy concentration.
AG = Approximate Gamma
G = Gamma
LN = Lognormal
NA = Not Applicable

1 - US EPA recommends the average concentration as the EPC for lead.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil (under cap)

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	mg/kg	NA	NA	0.000089	0.000089	mg/kg	Maximum Detected Concentration	(1)
	Arsenic	mg/kg	36.2	68.1 (N)	110 J	68.1	mg/kg	95% Student's-t UCL	ProUCL 4.1.00
	Cadmium	mg/kg	NA	NA	69	69.0	mg/kg	Maximum Detected Concentration	(1)
	Lead	mg/kg	1672	17848 (LN)	9800	1672	mg/kg	Arithmetic Mean	(2)
	Mercury	mg/kg	NA	NA	3.3 J	3.3	mg/kg	Maximum Detected Concentration	(1)
	Zinc	mg/kg	NA	NA	3500	3500	mg/kg	Maximum Detected Concentration	(1)
	Aroclor-1260	mg/kg	3.2	8.0 (N)	11	8.0	mg/kg	95% KM (t) UCL	ProUCL 4.1.00

For non-detects, one half the sample quantitation limit was used as a proxy concentration.

LN = Lognormal
N = Normal
NA = Not Applicable

1 - There were an insufficient number of samples to calculate statistics, therefore the maximum detected concentration was used as the exposure point concentration.
2 - US EPA recommends the average concentration as the EPC for lead.

TABLE 3.3.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil (future)

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Surface Soil (future)	2,3,7,8-TCDD Equivalents	mg/kg	NA	NA	0.000089	0.000089	mg/kg	Maximum Detected Concentration	(1)
	Arsenic	mg/kg	77	143 (LN)	423 J	143	mg/kg	95% H-UCL	ProUCL 4.1.00
	Cadmium	mg/kg	5.2	13.1 (G)	69.0	13.1	mg/kg	95% KM (t) UCL	ProUCL 4.1.00
	Lead	mg/kg	503	2434 (NP)	9800	503	mg/kg	Arithmetic Mean	(2)
	Mercury	mg/kg	NA	NA	3.3 J	3.3	mg/kg	Maximum Detected Concentration	(1)
	Zinc	mg/kg	NA	NA	3500	3500	mg/kg	Maximum Detected Concentration	(1)
	Benzo(a)pyrene Equivalents	mg/kg	0.24	0.36 (G)	1.2	0.36	mg/kg	95% KM (BCA) UCL	ProUCL 4.1.00
	Aroclor-1260	mg/kg	0.62	4.4 (LN)	11.0	4.4	mg/kg	99% KM (Chebyshev) UCL	ProUCL 4.1.00

For non-detects, one half the sample quantitation limit was used as a proxy concentration.
G = Gamma
LN = Lognormal
NA = Not Applicable
NP = Nonparametric

1 - There were an insufficient number of samples to calculate statistics, therefore the maximum detected concentration was used as the exposure point concentration.
2 - US EPA recommends the average concentration as the EPC for lead.

TABLE 3.4.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Subsurface	Arsenic	mg/kg	32.7	110 (LN)	328 J	110	mg/kg	97.5% KM (Chebyshev) UCL	ProUCL 4.1.00
	Benzo(a)pyrene Equivalents	mg/kg	0.27	NA	0.48	0.48	mg/kg	Maximum Detected Concentration	(1)

For non-detects, one half the sample quantitation limit was used as a proxy concentration.
G = Gamma
LN = Lognormal
NA = Not Applicable
N = Normal

1 - There were less than 4 detected results. With less than 4 detections meaningful statistics cannot be computed; therefore, the maximum detected concentration was used as the exposure point concentration.

TABLE 3.5.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Upgradient Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
UXO 32	Arsenic	ug/L	2.5	3.9 (N)	5.1	3.9	ug/L	95% KM (t) UCL	ProUCL version 4.1.00
	Beryllium	ug/L	6.1	8.2 (N)	10.5	8.2	ug/L	95% Student's-t UCL	ProUCL version 4.1.00
	Cobalt	ug/L	371	612 (N)	779	612	ug/L	95% Student's-t UCL	ProUCL version 4.1.00
	Tetrachloroethene	ug/L	0.83	NA	0.73 J	0.73	ug/L	Maximum Detected Concentration	(1)
	Trichloroethene	ug/L	33.9	54.6 (N)	75	54.6	ug/L	95% Student's-t UCL	ProUCL version 4.1.00

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

N - Normal
NA - Not analyzed/Not applicable

1 - There were ≤ 4 detected results, therefore the maximum detected concentration is used as the exposure point concentration.

TABLE 3.6.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Downgradient Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
UXO 32	Arsenic	ug/L	7.4	NA	15.5	15.5	ug/L	Maximum Detected Concentration	(1)
	Beryllium	ug/L	1.9	NA	3.9	3.9	ug/L	Maximum Detected Concentration	(1)
	Cobalt	ug/L	130	NA	219	219	ug/L	Maximum Detected Concentration	(1)
	Tetrachloroethene	ug/L	0.76	NA	0.29 J	0.29	ug/L	Maximum Detected Concentration	(1)
	Trichloroethene	ug/L	16.1	NA	28.2	28.2	ug/L	Maximum Detected Concentration	(1)

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

NA - Not analyzed/Not applicable

1 - There were ≤ 4 detected results, therefore the maximum detected concentration is used as the exposure point concentration.

RAGS Part D Table 4

Values Used For Daily Intake Calculations

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RAGS PART D TABLE 4
VALUES USED FOR DAILY INTAKE CALCULATIONS

Table No.

Reasonable Maximum Exposures

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS- SOILS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	330	mg/day	USEPA, 2002b	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	BW x AT
				EF	Exposure Frequency	250	days/year	USEPA, 2002b	
				ED	Exposure Duration	1	years	USEPA, 2002b	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	250	days/year	USEPA, 2002b	
				ED	Exposure Duration	1	years	USEPA, 2002b	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 4.61E-08 — Cancer Dermal Intake = 1.38E-07

Noncancer Ingestion Intake = 3.23E-06 — Noncancer Dermal Intake = 9.69E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - SOILS TO AIR

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	UXO 32	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	USEPA, 2002b	CA x ET x EF x ED
				EF	Exposure Frequency	250	days/year	USEPA, 2002b	AT x 24 hours/day
				ED	Exposure Duration	1	years	USEPA, 2002b	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.43E+06	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 3.26E-03

Noncancer Inhalation Intake = 2.28E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - GROUNDWATER

INDIAN HEAD, MARYLAND

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

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Construction Workers	Adult	UXO 32	CGW	Chemical Concentration in Groundwater	Max or 95% UCL	ug/L	USEPA, 2002a	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	0.01	L/day	USEPA IV, 2000	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	90	days/year	(1)	BW x AT
				ED	Exposure Duration	1	years	USEPA, 2002b	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Workers	Adult	UXO 32	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	4	hr/event	(1)	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	(1)	
				EF	Exposure Frequency	90	days/year	(1)	For organics if tevent > t*
				ED	Exposure Duration	1	years	(1)	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				BW	Body Weight	70	kg	USEPA, 1989	2 x τ +(1 + 3B + 3B^2)/(1+B^2)
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assumes construction worker is exposed to groundwater for three months during the construction project.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA Region IV, 2000:USEPA Region IV Human Health Risk Assessment Bulletins-- Supplement to RAGS, 2000

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Cancer Dermal Intake = 1.66E-01 Noncancer Dermal Intake = 1.16E+01

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - GROUNDWATER TO AIR

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Construction Workers	Adult	UXO 32	CA	Chemical concentration in air	Calculated	mg/m3	VDEQ, 2004	Exposure Concentration (mg/m^3) =
				CW	Chemical concentration in water.	Average	ug/L	--	
				CF	Conversion Factor	0.001	mg/ug	--	CA x ET x EF x ED
				ET	Exposure Time	4	hours/day	(1)	AT x 24 hours/day
				EF	Exposure Frequency	90	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	CA = CW x CF x VF
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
				VF	Volatilization Factor	Calculated	(mg/m3)/(mg/L)	VDEQ, 2004	

Notes:

1 - Professional judgment. Assumes construction worker is exposed to groundwater for three months during the construction project.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

VDEQ, 2004: Virginia Department of Environmental Quality (VDEQ, online- http://www.deq.state.va.us/vrprisk/homepage.html).

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 5.87E-07

Noncancer Inhalation Intake = 4.11E-05

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.5.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Workers	Adult	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 2002b	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 2002b	BW x AT
				EF	Exposure Frequency	250	days/year	USEPA, 2002b	
				ED	Exposure Duration	25	years	USEPA, 2002b	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
Dermal	Industrial Workers	Adult	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	3300	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	250	days/year	USEPA, 2002b	
				ED	Exposure Duration	25	years	USEPA, 1989	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2002b: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 3.49E-07 Cancer Dermal Intake = 2.31E-06

Noncancer Ingestion Intake = 9.78E-07 Noncancer Dermal Intake = 6.46E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.6.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL TO AIR

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Industrial Workers	Adult	UXO 32	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	8	hours/day	(1)	$\frac{CA \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$
				EF	Exposure Frequency	250	days/year	USEPA, 2002a	
				ED	Exposure Duration	25	years	USEPA, 2002a	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	
				PEF	Particulate Emission Factor	3.23E+09	m3/kg	USEPA 2010	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	87.36898	g/m2-s per kg/m3	USEPA 2010	
				Ut	Equivalent threshold of wind velocity at 7m.	11.32	m/sec	USEPA 2010	
				Um	Mean annual wind speed	4.29	m/sec	USEPA 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA 2010	
				F(x)	Function dependent of Um/Ut	0.0993	unitless	USEPA 2010	

Notes:

1 - Length of typical work day.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2010: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Philadelphia, Pennsylvania.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 8.15E-02 Noncancer Inhalation Intake = 2.28E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.7.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Child	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
Dermal	Recreational User	Child	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume one day a week.

2 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 1.63E-07 Cancer Dermal Intake (Age 0 - 6) = 4.56E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 5.43E-08 Cancer Dermal Intake (Age 0 - 2) = 1.52E-07

Cancer Ingestion Intake (Age 2 - 6) = 1.09E-07 Cancer Dermal Intake (Age 2 - 6) = 3.04E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.90E-06 Noncancer Dermal Intake = 5.32E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.8.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS TO AIR

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational User	Child	UXO 32	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	4	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	52	days/year	(1)	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	2	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(2), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	3.23E+09	m3/kg	USEPA 2010	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	87.36898	g/m2-s per kg/m3	USEPA 2010	
				Ut	Equivalent threshold of wind velocity at 7m.	11.32	m/sec	USEPA 2010	
				Um	Mean annual wind speed	4.29	m/sec	USEPA 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA 2010	
				F(x)	Function dependent of Um/Ut	0.0993	unitless	USEPA 2010	

Notes:

1 - Professional judgment. Assume one day a week.

2 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2010: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Philadelphia, Pennsylvania.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 2.04E-03 Noncancer Inhalation Intake = 2.37E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 6.78E-04

Cancer Inhalation Intake (Age 2 - 6) = 1.36E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.9.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS
INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Adult	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	--	BW x AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Recreational User	Adult	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	52	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Professional judgment. Assume one day a week.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 6.98E-08 Cancer Dermal Intake (Age 6 - 30) = 2.78E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 2.91E-08 Cancer Dermal Intake (Age 6 - 16) = 1.16E-07

Cancer Ingestion Intake Age 16 - 30) = 4.07E-08 Cancer Dermal Intake (Age 16 - 30) = 1.62E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.04E-07 Noncancer Dermal Intake = 8.12E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.10.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS TO AIR

INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Recreational User	Adult	UXO 32	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	4	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	52	days/year	(1)	AT x 24 hours/day
				ED1	Exposure Duration (Age 6 - 16)	10	years	(2), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(2), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	3.23E+09	m3/kg	USEPA 2010	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	87.36898	g/m2-s per kg/m3	USEPA 2010	
				Ut	Equivalent threshold of wind velocity at 7m.	11.32	m/sec	USEPA 2010	
				Um	Mean annual wind speed	4.29	m/sec	USEPA 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA 2010	
				F(x)	Function dependent of Um/Ut	0.0993	unitless	USEPA 2010	

Notes:

1 - Professional judgment. Assume one day a week.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2010: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Philadelphia, Pennsylvania.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 8.14E-03

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 3.39E-03

Cancer Inhalation Intake (Age 16 - 30) = 4.75E-03

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 2.37E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.11.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - SOILS
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	200	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Resident	Child	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	2,800	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 1.10E-06 Cancer Dermal Intake (Age 0 - 6) = 3.07E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.65E-07 Cancer Dermal Intake (Age 0 - 2) = 1.02E-06

Cancer Ingestion Intake (Age 2 - 6) = 7.31E-07 Cancer Dermal Intake (Age 2 - 6) = 2.05E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.28E-05 Noncancer Dermal Intake = 3.58E-05

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.12.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS SOILS TO AIR

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Child	UXO 32	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1991	$\frac{CA \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.10E+10	m3/kg	USEPA 2004	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	73.95045	g/m2-s per kg/m3	USEPA 2010	
				Ut	Equivalent threshold of wind velocity at 7m.	11.32	m/sec	USEPA 2010	
				Um	Mean annual wind speed	3.84	m/sec	USEPA 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA 2010	
				F(x)	Function dependent of Um/Ut	0.0345	unitless	USEPA 2010	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2010: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Philadelphia, Pennsylvania.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 8.22E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 2.74E-02

Cancer Inhalation Intake (Age 2 - 6) = 5.48E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 1.92E+00

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.13.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - GROUNDWATER

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Child	UXO 32	CGW	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002a	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	1	L/day	USEPA, 1991	CGW x CF x IR-GW x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	BW x AT
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	15	kg	USEPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
Dermal	Residents	Child	UXO 32	DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002a	
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	DAevent x EV x EF x ED x SA
				CF	Conversion factor	0.001	L/cm^3	- -	BW x AT
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	For Inorganics
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				tevent	Duration of event	1	hr/event	USEPA, 2004	
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	For organics if tevent <= t*
				SA	Skin Surface Available for Contact	6,600	cm2	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1994	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	2 x τ +(1 + 3B + $3B^2$)/(1+B^2)
				BW	Body Weight	15	kg	USEPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 1994: USEPA Region I Risk Updates, August 1994.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 5.48E-06 Cancer Dermal Intake Time (Age 0 - 6) = 3.62E+01

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.83E-06 Cancer Dermal Intake (Age 0 - 2) = 1.21E+01

Cancer Ingestion Intake (Age 2 - 6) = 3.65E-06 Cancer Dermal Intake (Age 2 - 6) = 2.41E+01

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 6.39E-05 Noncancer Dermal Intake = 4.22E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.14.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	100	mg/day	USEPA, 1991	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	1	unitless	USEPA, 1991	BW x AT
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Resident	Adult	UXO 32	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Dermally Absorbed Dose (mg/kg/day) =
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	
				SA	Skin Surface Available for Contact	5,700	cm2	USEPA, 2004	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2/event	USEPA, 2004	BW x AT
				DABS	Absorption Factor	Chemical Specific	unitless	USEPA, 2004	
				EV	Events Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes.

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources·

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Unit Intake Calculations

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 4.70E-07 Cancer Dermal Intake (Age 6 - 30) = 1.87E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.96E-07 Cancer Dermal Intake (Age 6 - 16) = 7.81E-07

Cancer Ingestion Intake (Age 16 - 30) = 2.74E-07 Cancer Dermal Intake (Age 16 - 30) = 1.09E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.37E-06 Noncancer Dermal Intake = 5.47E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.15.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS TO AIR

INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	UXO 32	CA	Chemical concentration in air	Calculated	mg/m3	USEPA, 2002a	Exposure Concentration (mg/m^3) =
				CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002b	
				ET	Exposure Time	24	hours/day	USEPA, 1991	$\frac{CA \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$
				EF	Exposure Frequency	350	days/year	USEPA, 2002a	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	1.10E+10	m3/kg	USEPA 2004	$PEF = \frac{Q/C \times 3600}{0.036 \times (1 - V) \times (U_m / U_t)^3 \times F(x)}$
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	73.95045	g/m2-s per kg/m3	USEPA 2010	$F(x) = 0.18 * (8x^3 + 12x) * \exp(-x^2)$
				Ut	Equivalent threshold of wind velocity at 7m.	11.32	m/sec	USEPA 2010	
				Um	Mean annual wind speed	3.84	m/sec	USEPA 2010	x = 0.886 * Ut / Um
				V	Fraction of vegetative cover	0.5	unitless	USEPA 2010	
				F(x)	Function dependent of Um/Ut	0.0345	unitless	USEPA 2010	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24.

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2010: Soil Screening Guidance calculation Internet site at http://risk.lsd.ornl.gov/calc_start.htm. Site-specific values for Philadelphia, Pennsylvania.

Unit Intake Calculations

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 3.29E-01

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 9.59E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.37E-01

Cancer Inhalation Intake (Age 16 - 30) = 1.92E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.16.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - GROUNDWATER
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Residents	Adult	UXO 32	CGW	Chemical Concentration in Groundwater	95% UCL or Max	ug/L	USEPA, 2002	Chronic Daily Intake (CDI) (mg/kg/day) =
				CF	Conversion Factor	0.001	mg/ug	--	
				IR-GW	Ingestion Rate of Groundwater	2	L/day	USEPA, 1991	<u>CGW x CF x IR-GW x EF x ED</u>
				EF	Exposure Frequency	350	days/year	USEPA, 1991	BW x AT
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	
Dermal	Residents	Adult	UXO 32	Daevent	Dermally Absorbed Dose per Event	Calculated	mg/cm2-event	USEPA, 2004	Dermally Absorbed Dose (mg/kg/day) =
				Cw	Chemical Concentration in Groundwater	Max or 95% UCL	mg/kg	USEPA, 2002a	<u>DAevent x EV x EF x ED x SA</u>
				FA	Fraction Absorbed	Chemical Specific	unitless	USEPA, 2004	BW x AT
				CF	Conversion factor	0.001	L/cm^3	- -	
				Kp	Permeability coefficient	Chemical Specific	cm/hr	USEPA, 2004	For inorganics
				τ	Lag time	Chemical Specific	hr/event	USEPA, 2004	DAevent = Kp x CW x CF x tevent
				t*	Time it takes to reach steady state	Chemical Specific	hr/event	USEPA, 2004	
				tevent	Duration of event	0.58	hr/event	USEPA, 2004	For organics if tevent <= t*
				B	Bunge model constant	Chemical Specific	unitless	USEPA, 2004	DAevent= 2 x FA x Kp x Cw x CF x sqrt[(6 x τ x tevent)/pi]
				SA	Skin Surface Available for Contact	18,000	cm2	USEPA, 2004	
				EV	Event Frequency	1	events/day	USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	For organics if tevent > t*
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	DAevent =FA x Kp x Cw x CF x [tevent/(1+B) +
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	2 x τ +(1 + 3B + 3B^2)/(1+B^2)
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	USEPA, 1989	

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 1994: USEPA Region I Risk Updates, August 1994.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

<u>Unit Intake Calculations</u>

Ingestion Intake = (IR-GW x EF x ED)/(BW x AT)

Dermal Intake = (SA x EV x EF x ED)/(BW x AT)

<u>Non-Mutagenic Chemicals</u>

Cancer Ingestion Intake (Age 6 - 30) = 9.39E-06 Cancer Dermal Intake (Age 6 - 30) = 8.45E+01

<u>Mutagenic Chemicals</u>

Cancer Ingestion Intake (Age 6 - 16) = 3.91E-06 Cancer Dermal Intake (Age 6 - 16) = 3.52E+01

Cancer Ingestion Intake (Age 16 - 30) = 5.48E-06 Cancer Dermal Intake (Age 16 - 30) = 4.93E+01

<u>Noncarcinogenic Chemicals</u>

Noncancer Ingestion Intake = 2.74E-05 Noncancer Dermal Intake = 2.47E+02

Cancer risk from ingestion = Groundwater concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Groundwater concentration x Cancer Dermal Intake x DAevent x Dermal Cancer Slope Factor

Hazard Index from ingestion = Groundwater concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Groundwater concentration x Noncancer Dermal Intake x DAevent / Dermal Reference Dose

TABLE 4.17.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Residents	Adult	UXO 32	S	Volatile Chemical Generation Rate	Derived	mg/m3-min-shower	Foster&Chrostowski 1987	Exposure Concentration (mg/m^3)=
				K	Mass Transfer Coefficient	Derived	min	Foster&Chrostowski 1987	
				EF	Exposure Frequency	350	showers/year	U.S. EPA, 1991	$\frac{S \times K \times EF \times ED}{AT \times Ra \times CF}$
				ED1	Exposure Duration (Age 6 - 16)	10	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(1), USEPA, 1989, 2005	
				Ra	Air Exchange Rate	0.017	min^{-1}	Foster&Chrostowski 1987	
				CF	Conversion Factor	1440	min/day	--	
				Ds	Shower Duration	30	min	U.S. EPA, 2004	
				Dt	Total Time in Bathroom	60	min	Professional judgement	
				Fr	Shower Water Flow Rate	10	L/min	Foster&Chrostowski 1987	
				Sv	Shower Room Air Volume	12	m^3	Foster&Chrostowski 1987	
				ts	Shower Dropler Drop Time	0.5	sec	Foster&Chrostowski 1987	
				d	Shower Droplet Diameter	1	mm	Foster&Chrostowski 1987	
				T1	Calibration Water Temperature	293	K	Foster&Chrostowski 1987	
				Ts	Shower Water Temperature	318	K	Foster&Chrostowski 1987	
				m1	Water Viscosity at T1	1.002	cp	Foster&Chrostowski 1987	
				ms	Water Viscosity at Ts	0.596	cp	Foster&Chrostowski 1987	
				AT-C	Averaging Time (Cancer)	25550	days	U.S. EPA, 1989	
				AT-N	Averaging Time (Noncancer)	8760	days	U.S. EPA ,1989	

Notes:

1 - Adults were evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults were evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources

U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

U.S. EPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

Foster, S.A. and P.C. Chrostowski, 1987. Inhalation Exposure to Volatile Organic Contaminants in the Shower.

Unit Intake Calculations

Inhalation Intake = (EF x ED x ET)/(AT x Ra x CF)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 1.37E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 4.00E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 5.71E-03

Cancer Inhalation Intake (Age 16 - 30) = 7.99E-03

RAGS Part D Table 5

Non-Cancer Toxicity Data

LIST OF TABLES
RAGS PART D TABLE 5
NON-CANCER TOXICITY DATA

Table No.

TABLE 5-1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal[1]	Absorbed RfD for Dermal[2]		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds										
Tetrachloroethene	Subchronic	1.0E-01	mg/kg/day	1	1.0E-01	mg/kg/day	Liver	100/1	HEAST	7/1997
	Chronic	1.0E-02	mg/kg/day	1	1.0E-02	mg/kg/day	Liver	1000/1	IRIS	11/30/2011
Trichloroethene	Chronic	5.0E-04	mg/kg/day	1	5.0E-04	mg/kg/day	Liver, Kidney	10 to 100/1	IRIS	11/30/2011
Semivolatile Organic Compounds										
Benzo(a)pyrene Equivalents	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs										
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxins/Furans										
2,3,7,8-TCDD Equivalents	Chronic	1.0E-09	mg/kg/day	1	1.0E-09	mg/kg/day	NA	NA	Cal EPA	9/2009
Inorganics										
Arsenic	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Skin, CVS	3/1	IRIS	3/14/2011
Beryllium	Subchronic	5.0E-03	mg/kg/day	0.007	3.5E-05	mg/kg/day	GS	NA	HEAST	7/1997
	Chronic	2.0E-03	mg/kg/day	0.007	1.4E-05	mg/kg/day	GS	300/1	IRIS	11/30/2011
Cadmium	Chronic	1.0E-03	mg/kg/day	0.025	2.5E-05	mg/kg/day	Kidney	10/1	IRIS	3/14/2011
Cobalt	Subchronic	3.0E-03	mg/kg/day	1	3.0E-03	mg/kg/day	Thyroid	300/1	PPRTV	8/25/2008
	Chronic	3.0E-04	mg/kg/day	1	3.0E-04	mg/kg/day	Thyroid	3000/1	PPRTV	8/25/2008
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury[3]	Chronic	3.0E-04	mg/kg/day	0.07	2.1E-05	mg/kg/day	Autoimmune	1000/1	IRIS	3/14/2011
Zinc	Chronic	3.0E-01	mg/kg/day	1	3.0E-01	mg/kg/day	Blood	3/1	IRIS	3/14/2011

Notes:

1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.

3 - Values for mercuric chloride and other mercury salts.

Definitions:

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

CVS = Cardiovascular system

IRIS = Integrated Risk Information System

NA = Not Available.

TABLE 5-2

NON-CANCER TOXICITY DATA -- INHALATION
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD(1)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds									
Tetrachloroethene	Chronic	2.7E-01	mg/m^3	7.7E-02	(mg/kg/day)	CNS	100/1	ATSDR	9/97
Trichloroethene	Subchronic	5.4E-01	mg/m^3	1.5E-01	(mg/kg/day)	Liver, Kidney	300/1	ATSDR	9/1997
	Chronic	2.0E-03	mg/m^3	5.7E-04	(mg/kg/day)	Liver, Kidney	10 to 100/1	IRIS	11/30/2011
Semivolatile Organic Compounds									
Benzo(a)pyrene Equivalents	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs									
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dioxins/Furans									
2,3,7,8-TCDD Equivalents	Chronic	4.0E-08	mg/m3	1.1E-08	(mg/kg/day)	NA	NA	Cal EPA	9/2009
Inorganics									
Arsenic	Chronic	1.5E-05	mg/m3	4.3E-06	(mg/kg/day)	NA	NA	Cal EPA	9/2009
Beryllium	Chronic	2.0E-05	mg/m^3	5.7E-06	(mg/kg/day)	Respiratory	10/1	IRIS	11/30/2011
Cadmium	Chronic	1.0E-05	mg/m3	2.9E-06	(mg/kg/day)	Kidney	9/1	ATSDR	9/2008
Cobalt	Subchronic	2.0E-05	mg/m3	5.7E-06	(mg/kg/day)	Respiratory	100/1	PPRTV	8/25/2008
	Chronic	6.0E-06	mg/m^3	1.7E-06	(mg/kg/day)	Respiratory	300/1	PPRTV	8/25/2008
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury(2)	Chronic	3.0E-05	mg/m^3	8.6E-06	(mg/kg/day)	CNS, Kidney	NA	Cal EPA	9/2009
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

2 - Adjusted IRIS value in accordance with recommendations on IRIS.

2 - Values for mercuric chloride and other mercury salts.

Definitions:

ATSDR = Agency for Toxic Substances and Disease Registry.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

IRIS = Integrated Risk Information System

PPRTV = Provisional Peer Reviewed Toxicity Value.

RAGS Part D Table 6

Cancer Toxicity Data

LIST OF TABLES
RAGS PART D TABLE 6
CANCER TOXICITY DATA

Table No.

TABLE 6-1

CANCER TOXICITY DATA -- ORAL/DERMAL
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal[1]	Absorbed Cancer Slope Factor for Dermal[2]		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds								
Tetrachloroethene	5.4E-01	$(mg/kg/day)^{-1}$	1	5.4E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Trichloroethene - non-mutagen	3.7E-02	$(mg/kg/day)^{-1}$	1	3.7E-02	$(mg/kg/day)^{-1}$	Carcinogenic to humans	IRIS	12/30/2011
Trichloroethene - mutagen	9.3E-03	$(mg/kg/day)^{-1}$	1	9.3E-03	$(mg/kg/day)^{-1}$	Carcinogenic to humans	IRIS	12/30/2011
Semivolatile Organic Compounds								
Benzo(a)pyrene Equivalents	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	3/14/2011
PCBs								
Aroclor-1260	2.00E+00	$(mg/kg/day)^{-1}$	1	2.00E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	9/1996
Dioxins/Furans								
2,3,7,8-TCDD Equivalents	1.30E+05	$(mg/kg/day)^{-1}$	1	1.3E+05	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	Cal EPA	9/2009
Inorganics								
Arsenic	1.5E+00	$(mg/kg/day)^{-1}$	1	1.5E+00	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	3/14/2011
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	B1 / Probable human carcinogen	IRIS	3/14/2011
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	B2 / Probable human carcinogen	IRIS	3/14/2011
Mercury	NA	NA	NA	NA	NA	C / Possible human carcinogen	IRIS	3/14/2011
Zinc	NA	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	IRIS	3/14/2011

Notes:
1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral absorption efficiency for dermal.
Definitions:

IRIS = Integrated Risk Information System.

NA = Not Available.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

USEPA(1) = U.S. EPA, PCBs: Cancer Dose-Response Assessment and Applications to Environmental Mixtures, September 1996, EPA/600/P-96/001F.

TABLE 6-2

CANCER TOXICITY DATA -- INHALATION
HUMAN HEALTH RISK ASSESSMENT - UXO 32
INDIAN HEAD, MARYLAND

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor[1]		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds							
Tetrachloroethene	5.9E-06	$(ug/m^3)^{-1}$	2.1E-02	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Trichloroethene - non-mutagen	3.0E-06	$(ug/m^3)^{-1}$	1.1E-02	$(mg/kg/day)^{-1}$	Carcinogenic to humans	IRIS	12/30/2011
Trichloroethene - mutagen	1.0E-06	$(ug/m^3)^{-1}$	3.5E-03	$(mg/kg/day)^{-1}$	Carcinogenic to humans	IRIS	12/30/2011
Semivolatile Organic Compounds							
Benzo(a)pyrene Equivalents	1.1E-03	$(ug/m^3)^{-1}$	3.9E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
PCBs							
Aroclor-1260	5.7E-04	$(ug/m^3)^{-1}$	2.0E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	9/1996
Dioxins/Furans							
2,3,7,8-TCDD Equivalents	3.80E+01	$(ug/m^3)^{-1}$	1.3E+05	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	Cal EPA	9/2009
Inorganics							
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	1.5E+01	$(mg/kg/day)^{-1}$	A / Known human carcinogen	IRIS	3/14/2011
Beryllium	2.4E-03	$(ug/m^3)^{-1}$	8.4E+00	$(mg/kg/day)^{-1}$	B1 / Probable human carcinogen	IRIS	12/30/2011
Cadmium	1.8E-03	$(ug/m^3)^{-1}$	6.3E+00	$(mg/kg/day)^{-1}$	B1 / Probable human carcinogen	IRIS	3/14/2011
Cobalt	9.0E-03	$(ug/m^3)^{-1}$	3.2E+01	$(mg/kg/day)^{-1}$	NA	PPRTV	8/25/2008
Lead	NA	NA	NA	NA	B2 / Probable human carcinogen	IRIS	3/14/2011
Mercury	NA	NA	NA	NA	C / Possible human carcinogen	IRIS	3/14/2011
Zinc	NA	NA	NA	NA	D / Not classifiable as to human carcinogenicity	NA	NA

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

Definitions:

IRIS = Integrated Risk Information System.

NA = Not Available.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

PPRTV = Provisional Peer Reviewed Toxicity Value.

USEPA(1) = U.S. EPA, PCBs: Cancer Dose-Response Assessment and Applications to Environmental Mixtures, September 1996, EPA/600/P-96/001F.

RAGS Part D Table 7

Calculation of Cancer Risks and Non-Cancer Hazards

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	5.3E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.9E-06	3.7E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.2
				Cadmium	1.80	mg/kg	8.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.8E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.006
				Lead	65.1	mg/kg	3.0E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	1.6E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.2E-07	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	1.2E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	2.3E-08	8.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.0E-06					1.2
			Dermal	Arsenic	114	mg/kg	4.7E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.1E-07	3.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Cadmium	1.80	mg/kg	2.5E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.7E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0007
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	6.3E-09	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	4.6E-08	4.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	4.8E-09	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	9.7E-09	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.7E-07					0.1
		Exposure Point Total									8.8E-06					1.3
	Exposure Medium Total										8.8E-06					1.3
	Air	Surface Soil (current)	Inhalation	Arsenic	8.0E-5	mg/m^3	2.6E-07	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.1E-06	1.8E-05	(mg/m^3)	1.5E-05	(mg/m^3)	1.2
				Cadmium	1.3E-6	mg/m^3	4.1E-09	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	7.4E-09	2.9E-07	(mg/m^3)	2.0E-05	(mg/m^3)	0.01
				Lead	4.6E-5	mg/m^3	1.5E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	2.4E-7	mg/m^3	8.0E-10	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	8.8E-10	5.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.7E-7	mg/m^3	5.7E-10	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	3.3E-10	4.0E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-06					1.2
		Exposure Point Total									1.1E-06					1.2
	Exposure Medium Total										1.1E-06					1.2
Medium Total											9.9E-06					2.6
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	4.1E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	5.3E-07	2.9E-10	(mg/kg/day)	2.0E-08	(mg/kg/day)	0.01
				Arsenic	68.1	mg/kg	3.1E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	4.7E-06	2.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.7
				Cadmium	69.0	mg/kg	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-04	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.2
				Lead	1,672	mg/kg	7.7E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.4E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.005
				Zinc	3,500	mg/kg	1.6E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-02	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.04
				Aroclor-1260	8.00	mg/kg	3.7E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	7.4E-07	2.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.0E-06					1.0
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	3.7E-13	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	4.8E-08	2.6E-11	(mg/kg/day)	2.0E-08	(mg/kg/day)	0.001
				Arsenic	68.1	mg/kg	2.8E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	4.2E-07	2.0E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				Cadmium	69.0	mg/kg	9.5E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.7E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.03
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	4.6E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.2E-07	(mg/kg/day)	1.4E-04	(mg/kg/day)	0.002
				Zinc	3,500	mg/kg	4.8E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.001
				Aroclor-1260	8.00	mg/kg	1.5E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	3.1E-07	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.8E-07					0.10
		Exposure Point Total									6.8E-06					1.1
	Exposure Medium Total										6.8E-06					1.1
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	6.2E-11	mg/m^3	2.0E-13	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	7.7E-09	1.4E-11	(mg/m^3)	4.0E-08	(mg/m^3)	0.0004
				Arsenic	4.8E-5	mg/m^3	1.6E-07	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	6.7E-07	1.1E-05	(mg/m^3)	1.5E-05	(mg/m^3)	0.7
				Cadmium	4.8E-5	mg/m^3	1.6E-07	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	2.8E-07	1.1E-05	(mg/m^3)	2.0E-05	(mg/m^3)	0.6
				Lead	0.001	mg/m^3	3.8E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	2.3E-6	mg/m^3	7.5E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	5.3E-07	(mg/m^3)	3.0E-05	(mg/m^3)	0.02
				Zinc	0.002	mg/m^3	8.0E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	5.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	5.6E-6	mg/m^3	1.8E-08	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	1.0E-08	1.3E-06	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.7E-07					1.3
		Exposure Point Total									9.7E-07					1.3
	Exposure Medium Total										9.7E-07					1.3
Medium Total											7.7E-06					2.4
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	4.1E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	5.3E-07	2.9E-10	(mg/kg/day)	2.0E-08	(mg/kg/day)	0.01
				Arsenic	143	mg/kg	6.6E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	9.9E-06	4.6E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.5

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Cadmium	13.1	mg/kg	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.2E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.04
				Lead	503	mg/kg	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.005
				Zinc	3,500	mg/kg	1.6E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-02	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.04
				Benzo(a)pyrene Equivalents	0.360	mg/kg	1.7E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.2E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	2.0E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	4.1E-07	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-05					1.6
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	3.7E-13	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	4.8E-08	2.6E-11	(mg/kg/day)	2.0E-08	(mg/kg/day)	0.001
				Arsenic	143	mg/kg	5.9E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	8.9E-07	4.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Cadmium	13.1	mg/kg	1.8E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.005
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	4.6E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.2E-07	(mg/kg/day)	1.4E-04	(mg/kg/day)	0.002
				Zinc	3,500	mg/kg	4.8E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.001
				Benzo(a)pyrene Equivalents	0.360	mg/kg	6.5E-09	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	4.7E-08	4.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	8.5E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.7E-07	6.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-06					0.1
		Exposure Point Total									1.2E-05					1.8
	Exposure Medium Total										1.2E-05					1.8
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	6.2E-11	mg/m^3	2.0E-13	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	7.7E-09	1.4E-11	(mg/m^3)	4.0E-08	(mg/m^3)	0.0004
				Arsenic	1.0E-4	mg/m^3	3.3E-07	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.4E-06	2.3E-05	(mg/m^3)	1.5E-05	(mg/m^3)	1.5
				Cadmium	9.2E-6	mg/m^3	3.0E-08	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	5.4E-08	2.1E-06	(mg/m^3)	2.0E-05	(mg/m^3)	0.1
				Lead	3.5E-4	mg/m^3	1.1E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	8.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	2.3E-6	mg/m^3	7.5E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	5.3E-07	(mg/m^3)	3.0E-05	(mg/m^3)	0.02
				Zinc	0.002	mg/m^3	8.0E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	5.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	2.5E-7	mg/m^3	8.2E-10	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	9.0E-10	5.7E-08	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	3.1E-6	mg/m^3	1.0E-08	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	5.7E-09	7.0E-07	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.5E-06					1.6
		Exposure Point Total									1.5E-06					1.6
	Exposure Medium Total										1.5E-06					1.6
Medium Total											1.4E-05					3.4
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Arsenic	110	mg/kg	5.1E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.6E-06	3.6E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.2
				Benzo(a)pyrene Equivalents	0.480	mg/kg	2.2E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.6E-07	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.8E-06					1.2
			Dermal	Arsenic	110	mg/kg	4.6E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	6.9E-07	3.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Benzo(a)pyrene Equivalents	0.480	mg/kg	8.6E-09	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	6.3E-08	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.5E-07					0.1
		Exposure Point Total									8.5E-06					1.3
	Exposure Medium Total										8.5E-06					1.3
	Air	Subsurface Soil	Inhalation	Arsenic	7.7E-5	mg/m^3	2.5E-07	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.1E-06	1.8E-05	(mg/m^3)	1.5E-05	(mg/m^3)	1.2
				Benzo(a)pyrene Equivalents	3.4E-7	mg/m^3	1.1E-09	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.2E-09	7.7E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-06					1.2
		Exposure Point Total									1.1E-06					1.2
	Exposure Medium Total										1.1E-06					1.2
Medium Total											9.6E-06					2.5
Groundwater	Groundwater	Upgradient	Ingestion	Arsenic	3.90	ug/L	2.0E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.9E-09	1.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0005
				Beryllium	8.20	ug/L	4.1E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.9E-07	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.00006
				Cobalt	612	ug/L	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.007
				Tetrachloroethene	0.730	ug/L	3.7E-10	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	2.0E-10	2.6E-08	(mg/kg/day)	1.0E-01	(mg/kg/day)	0.0000003
				Trichloroethene	54.6	ug/L	2.7E-08	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	1.3E-09	1.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.004
			Exp. Route Total								4.4E-09					0.01
			Dermal	Arsenic	3.90	ug/L	2.6E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.9E-09	1.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0006
				Beryllium	8.20	ug/L	5.4E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.8E-07	(mg/kg/day)	3.5E-05	(mg/kg/day)	0.01
				Cobalt	612	ug/L	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
				Tetrachloroethene	0.730	ug/L	2.2E-08	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	1.2E-08	1.6E-06	(mg/kg/day)	1.0E-01	(mg/kg/day)	0.00002

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Trichloroethene	54.6	ug/L	5.3E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	2.4E-08	3.7E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.07
			Exp. Route Total								4.0E-08					0.09
		Exposure Point Total									4.5E-08					0.1
	Exposure Medium Total										4.5E-08					0.1
	Air	Upgradient	Inhalation	Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Beryllium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Tetrachloroethene	2.1E-5	mg/m^3	1.2E-08	(mg/m^3)	5.9E-06	$(ug/m^3)^{-1}$	7.3E-11	8.6E-07	(mg/m^3)	2.7E-01	(mg/m^3)	0.000003
				Trichloroethene	1.76E-03	mg/m^3	1.0E-06	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	4.2E-09	7.2E-05	(mg/m^3)	5.4E-01	(mg/m^3)	0.0001
			Exp. Route Total								4.3E-09					0.0001
		Exposure Point Total									4.3E-09					0.0001
	Exposure Medium Total										4.3E-09					0.0001
Medium Total											4.9E-08					0.1
Groundwater	Groundwater	Downgradient	Ingestion	Arsenic	15.5	ug/L	7.8E-09	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.2E-08	5.5E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Beryllium	3.90	ug/L	2.0E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-07	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.00003
				Cobalt	219	ug/L	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.003
				Tetrachloroethene	0.290	ug/L	1.5E-10	(mg/kg/day)	5.4E-01	$(mg/kg/day)^{-1}$	7.9E-11	1.0E-08	(mg/kg/day)	1.0E-01	(mg/kg/day)	0.0000001
				Trichloroethene	28.2	ug/L	1.4E-08	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	6.5E-10	9.9E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.002
			Exp. Route Total								1.2E-08					0.006
			Dermal	Arsenic	15.5	ug/L	1.0E-08	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-08	7.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Beryllium	3.90	ug/L	2.6E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-07	(mg/kg/day)	3.5E-05	(mg/kg/day)	0.005
				Cobalt	219	ug/L	5.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.001
				Tetrachloroethene	0.290	ug/L	8.9E-09	(mg/kg/day)	5.4E-01	$(mg/kg/day)^{-1}$	4.8E-09	6.2E-07	(mg/kg/day)	1.0E-01	(mg/kg/day)	0.000006
				Trichloroethene	28.2	ug/L	2.7E-07	(mg/kg/day)	4.6E-02	$(mg/kg/day)^{-1}$	1.3E-08	1.9E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.04
			Exp. Route Total								3.3E-08					0.05
		Exposure Point Total									4.5E-08					0.05
	Exposure Medium Total										4.5E-08					0.05
	Air	Downgradient	Inhalation	Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Beryllium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Tetrachloroethene	8.3E-6	mg/m^3	4.9E-09	(mg/m^3)	5.9E-06	$(ug/m^3)^{-1}$	2.9E-11	3.4E-07	(mg/m^3)	2.7E-01	(mg/m^3)	0.000001
				Trichloroethene	9.1E-4	mg/m^3	5.3E-07	(mg/m^3)	4.1E-06	$(ug/m^3)^{-1}$	2.2E-09	3.7E-05	(mg/m^3)	5.4E-01	(mg/m^3)	0.0001
			Exp. Route Total								2.2E-09					0.0001
		Exposure Point Total									2.2E-09					0.0001
	Exposure Medium Total										2.2E-09					0.0001
Medium Total											4.8E-08					0.05

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	4.0E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	6.0E-05	1.1E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Cadmium	1.80	mg/kg	6.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.002
				Lead	65.1	mg/kg	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	1.2E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	8.9E-07	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	8.7E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.7E-07	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.1E-05					0.4
			Dermal	Arsenic	114	mg/kg	7.9E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.2E-05	2.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				Cadmium	1.80	mg/kg	4.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0005
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	1.0E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	7.7E-07	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	8.1E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.6E-07	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.3E-05					0.07
		Exposure Point Total									7.4E-05					0.4
	Exposure Medium Total										7.4E-05					0.4
	Air	Surface Soil (current)	Inhalation	Arsenic	3.5E-8	mg/m^3	2.9E-09	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.2E-08	8.1E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0005
				Cadmium	5.6E-10	mg/m^3	4.5E-11	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	8.2E-11	1.3E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.000006
				Lead	2.0E-8	mg/m^3	1.6E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	4.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	8.8E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	9.7E-12	2.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	7.7E-11	mg/m^3	6.3E-12	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	3.6E-12	1.8E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.2E-08					0.0005
		Exposure Point Total									1.2E-08					0.0005
	Exposure Medium Total										1.2E-08					0.0005
Medium Total											7.4E-05					0.4
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	3.1E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	4.0E-06	8.7E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.09
				Arsenic	68.1	mg/kg	2.4E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.6E-05	6.7E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Cadmium	69.0	mg/kg	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.8E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.07
				Lead	1,672	mg/kg	5.8E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Zinc	3,500	mg/kg	1.2E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.01
				Aroclor-1260	8.00	mg/kg	2.8E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	5.6E-06	7.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.5E-05					0.4
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	6.2E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	8.0E-07	1.7E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.02
				Arsenic	68.1	mg/kg	4.7E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.1E-06	1.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Cadmium	69.0	mg/kg	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.5E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.02
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	7.6E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.01
				Zinc	3,500	mg/kg	8.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.3E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0008
				Aroclor-1260	8.00	mg/kg	2.6E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	5.2E-06	7.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.3E-05					0.09
		Exposure Point Total									5.8E-05					0.5
	Exposure Medium Total										5.8E-05					0.5
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	2.2E-15	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	8.5E-11	6.3E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	2.1E-8	mg/m^3	1.7E-09	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	7.4E-09	4.8E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0003
				Cadmium	2.1E-8	mg/m^3	1.7E-09	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	3.1E-09	4.9E-09	(mg/m^3)	2.0E-05	(mg/m^3)	0.0002
				Lead	5.2E-7	mg/m^3	4.2E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	8.3E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.3E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000008
				Zinc	1.1E-6	mg/m^3	8.8E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	2.5E-9	mg/m^3	2.0E-10	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	1.2E-10	5.7E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-08					0.0006
		Exposure Point Total									1.1E-08					0.0006
	Exposure Medium Total										1.1E-08					0.0006
Medium Total											5.8E-05					0.5
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	3.1E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	4.0E-06	8.7E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.09
				Arsenic	143	mg/kg	5.0E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.5E-05	1.4E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.5

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Cadmium	13.1	mg/kg	4.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.01
				Lead	503	mg/kg	1.8E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Zinc	3,500	mg/kg	1.2E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.01
				Benzo(a)pyrene Equivalents	0.360	mg/kg	1.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.2E-07	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	1.5E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	3.1E-06	4.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.3E-05					0.6
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	6.2E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	8.0E-07	1.7E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.02
				Arsenic	143	mg/kg	9.9E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-05	2.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.09
				Cadmium	13.1	mg/kg	3.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	7.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.01
				Zinc	3,500	mg/kg	8.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0008
				Benzo(a)pyrene Equivalents	0.360	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.9E-07	3.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	1.4E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	2.8E-06	4.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-05					0.1
		Exposure Point Total									1.0E-04					0.7
	Exposure Medium Total										1.0E-04					0.7
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	2.2E-15	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	8.5E-11	6.3E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	4.4E-8	mg/m^3	3.6E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.6E-08	1.0E-08	(mg/m^3)	1.5E-05	(mg/m^3)	0.0007
				Cadmium	4.1E-9	mg/m^3	3.3E-10	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	6.0E-10	9.3E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.00005
				Lead	1.6E-7	mg/m^3	1.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	8.3E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.3E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000008
				Zinc	1.1E-6	mg/m^3	8.8E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	9.1E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.0E-11	2.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.4E-9	mg/m^3	1.1E-10	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	6.3E-11	3.1E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.6E-08					0.0007
		Exposure Point Total									1.6E-08					0.0007
	Exposure Medium Total										1.6E-08					0.0007
Medium Total											1.0E-04					0.7
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Arsenic	110	mg/kg	3.8E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.8E-05	1.1E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Benzo(a)pyrene Equivalents	0.480	mg/kg	1.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-06	4.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.9E-05					0.4
			Dermal	Arsenic	110	mg/kg	7.6E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-05	2.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				Benzo(a)pyrene Equivalents	0.480	mg/kg	1.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-06	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-05					0.07
		Exposure Point Total									7.1E-05					0.4
	Exposure Medium Total										7.1E-05					0.4
	Air	Subsurface Soil	Inhalation	Arsenic	3.4E-8	mg/m^3	2.8E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.2E-08	7.8E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0005
				Benzo(a)pyrene Equivalents	1.5E-10	mg/m^3	1.2E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.3E-11	3.4E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.2E-08					0.0005
		Exposure Point Total									1.2E-08					0.0005
	Exposure Medium Total										1.2E-08					0.0005
Medium Total											7.1E-05					0.4

TABLE 7.3 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	1.9E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.8E-05	2.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.7
				Cadmium	1.80	mg/kg	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.003
				Lead	65.1	mg/kg	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	3.0E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	2.2E-06	6.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	4.1E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	8.1E-08	4.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.0E-05					0.7
			Dermal	Arsenic	114	mg/kg	1.6E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.3E-06	1.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Cadmium	1.80	mg/kg	8.2E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.6E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0004
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	8.1E-07	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	1.6E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	3.2E-08	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.2E-06					0.06
		Exposure Point Total									3.3E-05					0.8
	Exposure Medium Total										3.3E-05					0.8
	Air	Surface Soil (current)	Inhalation	Arsenic	3.5E-8	mg/m^3	7.2E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	3.1E-10	8.4E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00006
				Cadmium	5.6E-10	mg/m^3	1.1E-12	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	2.0E-12	1.3E-11	(mg/m^3)	2.0E-05	(mg/m^3)	0.0000007
				Lead	2.0E-8	mg/m^3	4.1E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	4.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	1.2E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.3E-12	2.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	7.7E-11	mg/m^3	1.6E-13	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	9.0E-14	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.1E-10					0.00006
		Exposure Point Total									3.1E-10					0.00006
	Exposure Medium Total										3.1E-10					0.00006
Medium Total											3.3E-05					0.8
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	1.4E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.9E-06	1.7E-10	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.2
				Arsenic	68.1	mg/kg	1.1E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.7E-05	1.3E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Cadmium	69.0	mg/kg	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-04	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.1
				Lead	1,672	mg/kg	2.7E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.2E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	5.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Zinc	3,500	mg/kg	5.7E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.6E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.02
				Aroclor-1260	8.00	mg/kg	1.3E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	2.6E-06	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-05					0.8
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	1.2E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.6E-07	1.4E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.01
				Arsenic	68.1	mg/kg	9.3E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.4E-06	1.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Cadmium	69.0	mg/kg	3.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.7E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.01
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.008
				Zinc	3,500	mg/kg	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0006
				Aroclor-1260	8.00	mg/kg	5.1E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.0E-06	6.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.6E-06					0.07
		Exposure Point Total									2.4E-05					0.8
	Exposure Medium Total										2.4E-05					0.8
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	5.6E-17	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	2.1E-12	6.5E-16	(mg/m^3)	4.0E-08	(mg/m^3)	0.00000002
				Arsenic	2.1E-8	mg/m^3	4.3E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.8E-10	5.0E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00003
				Cadmium	2.1E-8	mg/m^3	4.3E-11	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	7.8E-11	5.1E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.00003
				Lead	5.2E-7	mg/m^3	1.1E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	2.1E-12	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.4E-11	(mg/m^3)	3.0E-05	(mg/m^3)	0.0000008
				Zinc	1.1E-6	mg/m^3	2.2E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	2.5E-9	mg/m^3	5.0E-12	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	2.9E-12	5.9E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.7E-10					0.00006
		Exposure Point Total									2.7E-10					0.00006
	Exposure Medium Total										2.7E-10					0.00006
Medium Total											2.4E-05					0.8
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	1.4E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.9E-06	1.7E-10	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.2
				Arsenic	143	mg/kg	2.3E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.5E-05	2.7E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.9

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Cadmium	13.1	mg/kg	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.5E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.02
				Lead	503	mg/kg	8.2E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	5.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Zinc	3,500	mg/kg	5.7E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.6E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.02
				Benzo(a)pyrene Equivalents	0.360	mg/kg	3.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	2.3E-06	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	7.2E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.4E-06	8.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.1E-05					1.1
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	1.2E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.6E-07	1.4E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.01
				Arsenic	143	mg/kg	2.0E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.9E-06	2.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.08
				Cadmium	13.1	mg/kg	6.0E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.0E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.008
				Zinc	3,500	mg/kg	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0006
				Benzo(a)pyrene Equivalents	0.360	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	8.3E-07	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	2.8E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	5.6E-07	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.5E-06					0.1
		Exposure Point Total									4.5E-05					1.2
	Exposure Medium Total										4.5E-05					1.2
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	5.6E-17	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	2.1E-12	6.5E-16	(mg/m^3)	4.0E-08	(mg/m^3)	0.00000002
				Arsenic	4.4E-8	mg/m^3	9.0E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	3.9E-10	1.1E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.00007
				Cadmium	4.1E-9	mg/m^3	8.3E-12	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	1.5E-11	9.6E-11	(mg/m^3)	2.0E-05	(mg/m^3)	0.000005
				Lead	1.6E-7	mg/m^3	3.2E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	2.1E-12	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.4E-11	(mg/m^3)	3.0E-05	(mg/m^3)	0.0000008
				Zinc	1.1E-6	mg/m^3	2.2E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	1.2E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.3E-12	2.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.4E-9	mg/m^3	2.8E-12	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	1.6E-12	3.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.1E-10					0.00008
		Exposure Point Total									4.1E-10					0.00008
	Exposure Medium Total										4.1E-10					0.00008
Medium Total											4.5E-05					1.2
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Arsenic	110	mg/kg	1.8E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.7E-05	2.1E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.7
				Benzo(a)pyrene Equivalents	0.480	mg/kg	4.2E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	3.0E-06	9.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.0E-05					0.7
			Dermal	Arsenic	110	mg/kg	1.5E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.3E-06	1.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Benzo(a)pyrene Equivalents	0.480	mg/kg	1.5E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.1E-06	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.4E-06					0.06
		Exposure Point Total									3.3E-05					0.8
	Exposure Medium Total										3.3E-05					0.8
	Air	Subsurface Soil	Inhalation	Arsenic	3.4E-8	mg/m^3	6.9E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	3.0E-10	8.1E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00005
				Benzo(a)pyrene Equivalents	1.5E-10	mg/m^3	1.6E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.8E-12	3.5E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.0E-10					0.00005
		Exposure Point Total									3.0E-10					0.00005
	Exposure Medium Total										3.0E-10					0.00005
Medium Total											3.3E-05					0.8

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	8.0E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.2E-05	2.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.08
				Cadmium	1.80	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.7E-07	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.0004
				Lead	65.1	mg/kg	4.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	4.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-07	7.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	1.7E-08	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	3.5E-08	5.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-05					0.08
			Dermal	Arsenic	114	mg/kg	9.5E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.4E-06	2.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Cadmium	1.80	mg/kg	5.0E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.5E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.00006
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	2.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-07	3.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	9.7E-09	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	1.9E-08	2.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-06					0.009
		Exposure Point Total									1.4E-05					0.09
	Exposure Medium Total										1.4E-05					0.09
	Air	Surface Soil (current)	Inhalation	Arsenic	3.5E-8	mg/m^3	2.9E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.2E-09	8.4E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00006
				Cadmium	5.6E-10	mg/m^3	4.5E-12	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	8.2E-12	1.3E-11	(mg/m^3)	2.0E-05	(mg/m^3)	0.0000007
				Lead	2.0E-8	mg/m^3	1.6E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	4.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	1.6E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.8E-12	2.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	7.7E-11	mg/m^3	6.3E-13	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	3.6E-13	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.2E-09					0.00006
		Exposure Point Total									1.2E-09					0.00006
	Exposure Medium Total										1.2E-09					0.00006
Medium Total											1.4E-05					0.09
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	6.2E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	8.1E-07	1.8E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.02
				Arsenic	68.1	mg/kg	4.8E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.1E-06	1.4E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.05
				Cadmium	69.0	mg/kg	4.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.4E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.01
				Lead	1,672	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.4E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	2.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	6.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Zinc	3,500	mg/kg	2.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	7.1E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.002
				Aroclor-1260	8.00	mg/kg	5.6E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	1.1E-06	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.1E-06					0.08
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	7.4E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	9.7E-08	2.2E-12	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.002
				Arsenic	68.1	mg/kg	5.7E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.5E-07	1.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.006
				Cadmium	69.0	mg/kg	1.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	5.6E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.002
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	9.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.7E-08	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.001
				Zinc	3,500	mg/kg	9.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.8E-05	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.00009
				Aroclor-1260	8.00	mg/kg	3.1E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	6.2E-07	9.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-06					0.01
		Exposure Point Total									1.1E-05					0.09
	Exposure Medium Total										1.1E-05					0.09
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	2.2E-16	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	8.5E-12	6.5E-16	(mg/m^3)	4.0E-08	(mg/m^3)	0.00000002
				Arsenic	2.1E-8	mg/m^3	1.7E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	7.4E-10	5.0E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00003
				Cadmium	2.1E-8	mg/m^3	1.7E-10	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	3.1E-10	5.1E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.00003
				Lead	5.2E-7	mg/m^3	4.2E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	8.3E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	2.4E-11	(mg/m^3)	3.0E-05	(mg/m^3)	0.0000008
				Zinc	1.1E-6	mg/m^3	8.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	2.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	2.5E-9	mg/m^3	2.0E-11	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	1.1E-11	5.9E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-09					0.00006
		Exposure Point Total									1.1E-09					0.00006
	Exposure Medium Total										1.1E-09					0.00006
Medium Total											1.1E-05					0.09
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	6.2E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	8.1E-07	1.8E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.02
				Arsenic	143	mg/kg	1.0E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-05	2.9E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.10

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Cadmium	13.1	mg/kg	9.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.7E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.003
				Lead	503	mg/kg	3.5E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Zinc	3,500	mg/kg	2.4E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.1E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.002
				Benzo(a)pyrene Equivalents	0.360	mg/kg	4.6E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	3.4E-07	7.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	3.1E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	6.1E-07	9.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.7E-05					0.1
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	7.4E-13	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	9.7E-08	2.2E-12	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.002
				Arsenic	143	mg/kg	1.2E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.8E-06	3.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Cadmium	13.1	mg/kg	3.6E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0004
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	9.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.7E-08	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.001
				Zinc	3,500	mg/kg	9.7E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-05	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.00009
				Benzo(a)pyrene Equivalents	0.360	mg/kg	2.4E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.7E-07	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	1.7E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	3.4E-07	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.4E-06					0.02
		Exposure Point Total									1.9E-05					0.1
	Exposure Medium Total										1.9E-05					0.1
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	2.2E-16	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	8.5E-12	6.5E-16	(mg/m^3)	4.0E-08	(mg/m^3)	0.00000002
				Arsenic	4.4E-8	mg/m^3	3.6E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.5E-09	1.1E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.00007
				Cadmium	4.1E-9	mg/m^3	3.3E-11	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	5.9E-11	9.6E-11	(mg/m^3)	2.0E-05	(mg/m^3)	0.000005
				Lead	1.6E-7	mg/m^3	1.3E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	8.3E-12	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.4E-11	(mg/m^3)	3.0E-05	(mg/m^3)	0.0000008
				Zinc	1.1E-6	mg/m^3	8.8E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	1.7E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.8E-12	2.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.4E-9	mg/m^3	1.1E-11	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	6.3E-12	3.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.6E-09					0.00008
		Exposure Point Total									1.6E-09					0.00008
	Exposure Medium Total										1.6E-09					0.00008
Medium Total											1.9E-05					0.1
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Arsenic	110	mg/kg	7.7E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.2E-05	2.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				Benzo(a)pyrene Equivalents	0.480	mg/kg	6.1E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	4.5E-07	9.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-05					0.07
			Dermal	Arsenic	110	mg/kg	9.2E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.4E-06	2.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Benzo(a)pyrene Equivalents	0.480	mg/kg	3.2E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	2.3E-07	5.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-06					0.009
		Exposure Point Total									1.4E-05					0.08
	Exposure Medium Total										1.4E-05					0.08
	Air	Subsurface Soil	Inhalation	Arsenic	3.4E-8	mg/m^3	2.8E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.2E-09	8.1E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00005
				Benzo(a)pyrene Equivalents	1.5E-10	mg/m^3	2.2E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	2.4E-12	3.5E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.2E-09					0.00005
		Exposure Point Total									1.2E-09					0.00005
	Exposure Medium Total										1.2E-09					0.00005
Medium Total											1.4E-05					0.08

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	1.2E-04	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.9E-04	1.5E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	4.9
				Cadmium	1.80	mg/kg	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	2.3E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.02
				Lead	65.1	mg/kg	7.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	8.3E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	2.0E-06	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.5E-05	4.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	2.7E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	5.5E-07	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-04					4.9
			Dermal	Arsenic	114	mg/kg	1.0E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.6E-05	1.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Cadmium	1.80	mg/kg	5.5E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	6.4E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	7.4E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	5.4E-06	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	1.1E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	2.1E-07	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-05					0.4
		Exposure Point Total									2.2E-04					5.3
	Exposure Medium Total										2.2E-04					5.3
	Air	Surface Soil (current)	Inhalation	Arsenic	1.0E-8	mg/m^3	8.5E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	3.7E-09	9.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0007
				Cadmium	1.6E-10	mg/m^3	1.3E-11	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	2.4E-11	1.6E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.000008
				Lead	5.9E-9	mg/m^3	4.9E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	5.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	3.2E-11	mg/m^3	1.4E-11	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.5E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	2.3E-11	mg/m^3	1.9E-12	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	1.1E-12	2.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.7E-09					0.0007
		Exposure Point Total									3.7E-09					0.0007
	Exposure Medium Total										3.7E-09					0.0007
Medium Total											2.2E-04					5.3
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	9.8E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.3E-05	1.1E-09	(mg/kg/day)	1.0E-09	(mg/kg/day)	1.1
				Arsenic	68.1	mg/kg	7.5E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.1E-04	8.7E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	2.9
				Cadmium	69.0	mg/kg	7.6E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	8.8E-04	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.9
				Lead	1,672	mg/kg	1.8E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	2.1E-02	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	3.6E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	4.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Zinc	3,500	mg/kg	3.8E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	4.5E-02	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.1
				Aroclor-1260	8.00	mg/kg	8.8E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.8E-05	1.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.4E-04					5.2
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	8.2E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.1E-06	9.6E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.10
				Arsenic	68.1	mg/kg	6.3E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	9.4E-06	7.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Cadmium	69.0	mg/kg	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	2.5E-06	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.10
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	1.2E-06	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.06
				Zinc	3,500	mg/kg	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	1.3E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.004
				Aroclor-1260	8.00	mg/kg	3.4E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	6.9E-06	4.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.7E-05					0.5
		Exposure Point Total									1.6E-04					5.7
	Exposure Medium Total										1.6E-04					5.7
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	8.1E-15	mg/m^3	6.7E-16	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	2.5E-11	7.8E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	6.2E-9	mg/m^3	5.1E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	2.2E-09	5.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0004
				Cadmium	6.3E-9	mg/m^3	5.2E-10	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	9.3E-10	6.0E-09	(mg/m^3)	2.0E-05	(mg/m^3)	0.0003
				Lead	1.5E-7	mg/m^3	1.2E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	1.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	3.0E-10	mg/m^3	2.5E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	2.9E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000010
				Zinc	3.2E-7	mg/m^3	2.6E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	3.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	7.3E-10	mg/m^3	6.0E-11	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	3.4E-11	7.0E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.2E-09					0.0007
		Exposure Point Total									3.2E-09					0.0007
	Exposure Medium Total										3.2E-09					0.0007
Medium Total											1.6E-04					5.7
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	9.8E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.3E-05	1.1E-09	(mg/kg/day)	1.0E-09	(mg/kg/day)	1.1
				Arsenic	143	mg/kg	1.6E-04	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.4E-04	1.8E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	6.1

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer: Intake/Exposure Concentration Value	Cancer: Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer: Intake/Exposure Concentration Value	Non-Cancer: Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
				Cadmium	13.1	mg/kg	1.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-04	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.2
				Lead	503	mg/kg	5.5E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	3.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Zinc	3,500	mg/kg	3.8E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-02	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.1
				Benzo(a)pyrene Equivalents	0.360	mg/kg	2.1E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-05	4.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	4.8E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	9.6E-06	5.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.7E-04					7.7
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	8.2E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	1.1E-06	9.6E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.10
				Arsenic	143	mg/kg	1.3E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.0E-05	1.5E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.5
				Cadmium	13.1	mg/kg	4.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.02
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-06	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.06
				Zinc	3,500	mg/kg	1.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.004
				Benzo(a)pyrene Equivalents	0.360	mg/kg	7.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.6E-06	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	1.9E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	3.8E-06	2.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.0E-05					0.7
		Exposure Point Total									3.0E-04					8.4
	Exposure Medium Total										3.0E-04					8.4
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	8.1E-15	mg/m^3	6.7E-16	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	2.5E-11	7.8E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	1.3E-8	mg/m^3	1.1E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.6E-09	1.2E-08	(mg/m^3)	1.5E-05	(mg/m^3)	0.0008
				Cadmium	1.2E-9	mg/m^3	9.8E-11	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	1.8E-10	1.1E-09	(mg/m^3)	2.0E-05	(mg/m^3)	0.00006
				Lead	4.6E-8	mg/m^3	3.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	3.0E-10	mg/m^3	2.5E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.9E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000010
				Zinc	3.2E-7	mg/m^3	2.6E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	3.3E-11	mg/m^3	1.4E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.6E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	4.0E-10	mg/m^3	3.3E-11	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	1.9E-11	3.8E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.8E-09					0.0009
		Exposure Point Total									4.8E-09					0.0009
	Exposure Medium Total										4.8E-09					0.0009
Medium Total											3.0E-04					8.4
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Arsenic	110	mg/kg	1.2E-04	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.8E-04	1.4E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	4.7
				Benzo(a)pyrene Equivalents	0.480	mg/kg	2.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-05	6.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-04					4.7
			Dermal	Arsenic	110	mg/kg	1.0E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-05	1.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Benzo(a)pyrene Equivalents	0.480	mg/kg	1.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-06	2.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.3E-05					0.4
		Exposure Point Total									2.2E-04					5.1
	Exposure Medium Total										2.2E-04					5.1
	Air	Subsurface Soil	Inhalation	Arsenic	1.0E-8	mg/m^3	8.2E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.5E-09	9.6E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0006
				Benzo(a)pyrene Equivalents	4.4E-11	mg/m^3	1.9E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.1E-11	4.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.6E-09					0.0006
		Exposure Point Total									3.6E-09					0.0006
	Exposure Medium Total										3.6E-09					0.0006
Medium Total											2.2E-04					5.1
Groundwater	Groundwater	Upgradient	Ingestion	Arsenic	3.90	ug/L	2.1E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	3.2E-05	2.5E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.8
				Beryllium	8.20	ug/L	4.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.3
				Cobalt	612	ug/L	3.4E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-02	(mg/kg/day)	3.0E-04	(mg/kg/day)	130
				Tetrachloroethene	0.730	ug/L	4.0E-06	(mg/kg/day)	5.4E-01	$(mg/kg/day)^{-1}$	2.2E-06	4.7E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.005
				Trichloroethene (Mutagenic)	54.600	ug/L	1.6E-03	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1.5E-05	3.5E-03	(mg/kg/day)	NA	(mg/kg/day)	0.000
				Trichloroethene (Nonmutagenic)	54.6	ug/L	3.0E-04	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.1E-05	3.5E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	7.0
			Exp. Route Total								6.0E-05					138
			Dermal	Arsenic	3.90	ug/L	1.4E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.1E-07	1.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Beryllium	8.20	ug/L	3.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-06	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.2
				Cobalt	612	ug/L	8.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Tetrachloroethene	0.730	ug/L	2.3E-06	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	1.3E-06	2.7E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.003
				Trichloroethene (Mutagenic)	54.600	ug/L	2.6E-04	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	2.4E-06	5.6E-04	(mg/kg/day)	NA	(mg/kg/day)	0.000
				Trichloroethene (Nonmutagenic)	54.6	ug/L	4.8E-05	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.8E-06	5.6E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	1.1
			Exp. Route Total								5.6E-06					1.7
		Exposure Point Total									6.6E-05					140
	Exposure Medium Total										6.6E-05					140
Medium Total											6.6E-05					140
Groundwater	Groundwater	Downgradient	Ingestion	Arsenic	15.5	ug/L	8.5E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.3E-04	9.9E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	3.3
				Beryllium	3.90	ug/L	2.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.5E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.1
				Cobalt	219	ug/L	1.2E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-02	(mg/kg/day)	3.0E-04	(mg/kg/day)	47
				Tetrachloroethene	0.290	ug/L	1.6E-06	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	8.6E-07	1.9E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.002
				Trichloroethene (Mutagenic)	28.200	ug/L	8.2E-04	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	7.7E-06	1.8E-03	(mg/kg/day)	NA	(mg/kg/day)	0.000
				Trichloroethene (Nonmutagenic)	28.2	ug/L	1.5E-04	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	5.7E-06	1.8E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	3.6
			Exp. Route Total								1.4E-04					54
			Dermal	Arsenic	15.5	ug/L	5.6E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	8.4E-07	6.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Beryllium	3.90	ug/L	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-06	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.1
				Cobalt	219	ug/L	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.7E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Tetrachloroethene	0.290	ug/L	9.2E-07	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	5.0E-07	1.1E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.001
				Trichloroethene (Mutagenic)	28.200	ug/L	1.3E-04	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	1.2E-06	2.9E-04	(mg/kg/day)	NA	(mg/kg/day)	0.000
				Trichloroethene (Nonmutagenic)	28.2	ug/L	2.5E-05	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	9.2E-07	2.9E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.6
			Exp. Route Total								3.5E-06					0.8
		Exposure Point Total									1.5E-04					55
	Exposure Medium Total										1.5E-04					55
Medium Total											1.5E-04					55

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	5.4E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.0E-05	1.6E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.5
				Cadmium	1.80	mg/kg	8.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.5E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.002
				Lead	65.1	mg/kg	3.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	8.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	3.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.2E-06	4.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	1.2E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	2.3E-07	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.3E-05					0.5
			Dermal	Arsenic	114	mg/kg	6.4E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.6E-06	1.9E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Cadmium	1.80	mg/kg	3.4E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	9.8E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0004
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	1.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-06	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	6.6E-08	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	1.3E-07	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-05					0.06
		Exposure Point Total									9.4E-05					0.6
	Exposure Medium Total										9.4E-05					0.6
	Air	Surface Soil (current)	Inhalation	Arsenic	1.0E-8	mg/m^3	3.4E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.5E-08	9.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0007
				Cadmium	1.6E-10	mg/m^3	5.4E-11	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	9.7E-11	1.6E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.000008
				Lead	5.9E-9	mg/m^3	1.9E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	5.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	3.2E-11	mg/m^3	1.9E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.1E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	2.3E-11	mg/m^3	7.5E-12	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	4.3E-12	2.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.5E-08					0.0007
		Exposure Point Total									1.5E-08					0.0007
	Exposure Medium Total										1.5E-08					0.0007
Medium Total											9.4E-05					0.6
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	4.2E-11	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	5.4E-06	1.2E-10	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.1
				Arsenic	68.1	mg/kg	3.2E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.8E-05	9.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				Cadmium	69.0	mg/kg	3.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	9.5E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.09
				Lead	1,672	mg/kg	7.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.3E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	4.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Zinc	3,500	mg/kg	1.6E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	4.8E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.02
				Aroclor-1260	8.00	mg/kg	3.8E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	7.5E-06	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.1E-05					0.6
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	5.0E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	6.5E-07	1.5E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.01
				Arsenic	68.1	mg/kg	3.8E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.7E-06	1.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Cadmium	69.0	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.8E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.02
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	6.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.8E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.009
				Zinc	3,500	mg/kg	6.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.9E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0006
				Aroclor-1260	8.00	mg/kg	2.1E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	4.2E-06	6.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-05					0.08
		Exposure Point Total									7.2E-05					0.6
	Exposure Medium Total										7.2E-05					0.6
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	8.1E-15	mg/m^3	2.7E-15	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	1.0E-10	7.8E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	6.2E-9	mg/m^3	2.0E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	8.8E-09	5.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0004
				Cadmium	6.3E-9	mg/m^3	2.1E-09	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	3.7E-09	6.0E-09	(mg/m^3)	2.0E-05	(mg/m^3)	0.0003
				Lead	1.5E-7	mg/m^3	5.0E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	3.0E-10	mg/m^3	9.9E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	2.9E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000010
				Zinc	3.2E-7	mg/m^3	1.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	3.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	7.3E-10	mg/m^3	2.4E-10	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	1.4E-10	7.0E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-08					0.0007
		Exposure Point Total									1.3E-08					0.0007
	Exposure Medium Total										1.3E-08					0.0007
Medium Total											7.2E-05					0.6
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	4.2E-11	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	5.4E-06	1.2E-10	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.1
				Arsenic	143	mg/kg	6.7E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.0E-04	2.0E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.7

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
				Cadmium	13.1	mg/kg	6.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.02
				Lead	503	mg/kg	2.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Zinc	3,500	mg/kg	1.6E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.02
				Benzo(a)pyrene Equivalents	0.360	mg/kg	3.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-06	4.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	2.1E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	4.1E-06	6.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-04					0.8
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	5.0E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	6.5E-07	1.5E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.01
				Arsenic	143	mg/kg	8.0E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.2E-05	2.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.08
				Cadmium	13.1	mg/kg	2.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.2E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	6.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.009
				Zinc	3,500	mg/kg	6.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0006
				Benzo(a)pyrene Equivalents	0.360	mg/kg	1.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-06	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	1.2E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	2.3E-06	3.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-05					0.1
		Exposure Point Total									1.3E-04					0.9
	Exposure Medium Total										1.3E-04					0.9
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	8.1E-15	mg/m^3	2.7E-15	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	1.0E-10	7.8E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	1.3E-8	mg/m^3	4.3E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.8E-08	1.2E-08	(mg/m^3)	1.5E-05	(mg/m^3)	0.0008
				Cadmium	1.2E-9	mg/m^3	3.9E-10	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	7.0E-10	1.1E-09	(mg/m^3)	2.0E-05	(mg/m^3)	0.00006
				Lead	4.6E-8	mg/m^3	1.5E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	3.0E-10	mg/m^3	9.9E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.9E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000010
				Zinc	3.2E-7	mg/m^3	1.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	3.3E-11	mg/m^3	2.0E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.2E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	4.0E-10	mg/m^3	1.3E-10	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	7.5E-11	3.8E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.9E-08					0.0009
		Exposure Point Total									1.9E-08					0.0009
	Exposure Medium Total										1.9E-08					0.0009
Medium Total											1.3E-04					0.9
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Arsenic	110	mg/kg	5.2E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.7E-05	1.5E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.5
				Benzo(a)pyrene Equivalents	0.480	mg/kg	4.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.0E-06	6.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.1E-05					0.5
			Dermal	Arsenic	110	mg/kg	6.2E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.3E-06	1.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Benzo(a)pyrene Equivalents	0.480	mg/kg	2.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-06	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-05					0.06
		Exposure Point Total									9.1E-05					0.6
	Exposure Medium Total										9.1E-05					0.6
	Air	Subsurface Soil	Inhalation	Arsenic	1.0E-8	mg/m^3	3.3E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.4E-08	9.6E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0006
				Benzo(a)pyrene Equivalents	4.4E-11	mg/m^3	2.6E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.9E-11	4.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.4E-08					0.0006
		Exposure Point Total									1.4E-08					0.0006
	Exposure Medium Total										1.4E-08					0.0006
Medium Total											9.1E-05					0.6
Groundwater	Groundwater	Upgradient	Ingestion	Arsenic	3.90	ug/L	3.7E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.5E-05	1.1E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Beryllium	8.20	ug/L	7.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.1
				Cobalt	612	ug/L	5.7E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-02	(mg/kg/day)	3.0E-04	(mg/kg/day)	56
				Tetrachloroethene	0.730	ug/L	6.9E-06	(mg/kg/day)	5.4E-01	$(mg/kg/day)^{-1}$	3.7E-06	2.0E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.002
				Trichloroethene (Mutagenic)	54.600	ug/L	9.4E-04	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	8.7E-06	1.5E-03	(mg/kg/day)	NA	(mg/kg/day)	0.000
				Trichloroethene (Nonmutagenic)	54.6	ug/L	5.1E-04	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.9E-05	1.5E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	3.0
			Exp. Route Total								8.6E-05					59
			Dermal	Arsenic	3.90	ug/L	1.9E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.9E-07	5.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Beryllium	8.20	ug/L	4.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-06	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.08
				Cobalt	612	ug/L	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Tetrachloroethene	0.730	ug/L	4.1E-06	(mg/kg/day)	5.4E-01	$(mg/kg/day)^{-1}$	2.2E-06	1.2E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.001
				Trichloroethene (Mutagenic)	54.600	ug/L	1.6E-04	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1.5E-06	2.5E-04	(mg/kg/day)	NA	(mg/kg/day)	0.000
				Trichloroethene (Nonmutagenic)	54.6	ug/L	8.6E-05	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	3.2E-06	2.5E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.5
			Exp. Route Total								7.2E-06					0.7
		Exposure Point Total									9.3E-05					60
	Exposure Medium Total										9.3E-05					60
	Air	Upgradient	Inhalation	Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Beryllium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	6.0E-06	(mg/m^3)	--
				Tetrachloroethene	0.001	mg/m^3	1.4E-05	(mg/m^3)	5.9E-06	$(ug/m^3)^{-1}$	8.3E-08	4.1E-05	(mg/m^3)	2.7E-01	(mg/m^3)	0.0002
				Trichloroethene (Mutagenic)	0.085	mg/m^3	2.1E-03	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	2.1E-06	3.4E-03	(mg/m^3)	NA	(mg/m^3)	0.0000
				Trichloroethene (Nonmutagenic)	0.085	mg/m^3	1.2E-03	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	3.6E-06	3.4E-03	(mg/m^3)	2.0E-03	(mg/m^3)	1.7
			Exp. Route Total								5.8E-06					1.7
		Exposure Point Total									5.8E-06					1.7
	Exposure Medium Total										5.8E-06					1.7
Medium Total											9.9E-05					62
Groundwater	Groundwater	Downgradient	Ingestion	Arsenic	15.5	ug/L	1.5E-04	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-04	4.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.4
				Beryllium	3.90	ug/L	3.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.05
				Cobalt	219	ug/L	2.1E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	20
				Tetrachloroethene	0.290	ug/L	2.7E-06	(mg/kg/day)	5.4E-01	$(mg/kg/day)^{-1}$	1.5E-06	7.9E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0008
				Trichloroethene (Mutagenic)	28.200	ug/L	4.9E-04	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	4.5E-06	7.7E-04	(mg/kg/day)	NA	(mg/kg/day)	0.0000
				Trichloroethene (Nonmutagenic)	28.2	ug/L	2.6E-04	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	9.7E-06	7.7E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	1.5
			Exp. Route Total								2.3E-04					23
			Dermal	Arsenic	15.5	ug/L	7.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-06	2.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				Beryllium	3.90	ug/L	1.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-07	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.04
				Cobalt	219	ug/L	4.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Tetrachloroethene	0.290	ug/L	1.6E-06	(mg/kg/day)	5.4E-01	$(mg/kg/day)^{-1}$	8.9E-07	4.8E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0005
				Trichloroethene (Mutagenic)	28.200	ug/L	8.2E-05	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	7.6E-07	1.3E-04	(mg/kg/day)	NA	(mg/kg/day)	0.0
				Trichloroethene (Nonmutagenic)	28.2	ug/L	4.5E-05	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.6E-06	1.3E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.3
			Exp. Route Total								4.4E-06					0.3
		Exposure Point Total									2.4E-04					23
	Exposure Medium Total										2.4E-04					23
	Air	Downgradient	Inhalation	Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Beryllium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	6.0E-06	(mg/m^3)	--
				Tetrachloroethene	4.1E-4	mg/m^3	5.6E-06	(mg/m^3)	5.9E-06	$(ug/m^3)^{-1}$	3.3E-08	1.6E-05	(mg/m^3)	2.7E-01	(mg/m^3)	0.00006
				Trichloroethene (Mutagenic)	4.4E-2	mg/m^3	1.1E-03	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	1.1E-06	1.8E-03	(mg/m^3)	NA	(mg/m^3)	0.00000
				Trichloroethene (Nonmutagenic)	0.044	mg/m^3	6.0E-04	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	1.9E-06	1.8E-03	(mg/m^3)	2.0E-03	(mg/m^3)	0.9
			Exp. Route Total								3.0E-06					0.9
		Exposure Point Total									3.0E-06					0.9
	Exposure Medium Total										3.0E-06					0.9
Medium Total											2.4E-04					24

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	5.3E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.9E-06	3.7E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.2
				Cadmium	1.80	mg/kg	8.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.8E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.006
				Lead	65.1	mg/kg	3.0E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	1.6E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.2E-07	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	1.2E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	2.3E-08	8.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.0E-06					1.2
			Dermal	Arsenic	114	mg/kg	4.7E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.1E-07	3.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Cadmium	1.80	mg/kg	2.5E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.7E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0007
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	6.3E-09	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	4.6E-08	4.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	4.8E-09	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	9.7E-09	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.7E-07					0.1
		Exposure Point Total									8.8E-06					1.3
	Exposure Medium Total										8.8E-06					1.3
	Air	Surface Soil (current)	Inhalation	Arsenic	8.0E-5	mg/m^3	2.6E-07	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.1E-06	1.8E-05	(mg/m^3)	1.5E-05	(mg/m^3)	1.2
				Cadmium	1.3E-6	mg/m^3	4.1E-09	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	7.4E-09	2.9E-07	(mg/m^3)	2.0E-05	(mg/m^3)	0.01
				Lead	4.6E-5	mg/m^3	1.5E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	2.4E-7	mg/m^3	8.0E-10	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	8.8E-10	5.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.7E-7	mg/m^3	5.7E-10	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	3.3E-10	4.0E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-06					1.2
		Exposure Point Total									1.1E-06					1.2
	Exposure Medium Total										1.1E-06					1.2
Medium Total											9.9E-06					2.6
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	4.1E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	5.3E-07	2.9E-10	(mg/kg/day)	2.0E-08	(mg/kg/day)	0.01
				Arsenic	68.1	mg/kg	3.1E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	4.7E-06	2.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.7
				Cadmium	69.0	mg/kg	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-04	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.2
				Lead	1,672	mg/kg	7.7E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.4E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.005
				Zinc	3,500	mg/kg	1.6E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-02	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.04
				Aroclor-1260	8.00	mg/kg	3.7E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	7.4E-07	2.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.0E-06					1.0
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	3.7E-13	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	4.8E-08	2.6E-11	(mg/kg/day)	2.0E-08	(mg/kg/day)	0.001
				Arsenic	68.1	mg/kg	2.8E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	4.2E-07	2.0E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				Cadmium	69.0	mg/kg	9.5E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.7E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.03
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	4.6E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.2E-07	(mg/kg/day)	1.4E-04	(mg/kg/day)	0.002
				Zinc	3,500	mg/kg	4.8E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.001
				Aroclor-1260	8.00	mg/kg	1.5E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	3.1E-07	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.8E-07					0.10
		Exposure Point Total									6.8E-06					1.1
	Exposure Medium Total										6.8E-06					1.1
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	6.2E-11	mg/m^3	2.0E-13	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	7.7E-09	1.4E-11	(mg/m^3)	4.0E-08	(mg/m^3)	0.0004
				Arsenic	4.8E-5	mg/m^3	1.6E-07	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	6.7E-07	1.1E-05	(mg/m^3)	1.5E-05	(mg/m^3)	0.7
				Cadmium	4.8E-5	mg/m^3	1.6E-07	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	2.8E-07	1.1E-05	(mg/m^3)	2.0E-05	(mg/m^3)	0.6
				Lead	0.001	mg/m^3	3.8E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	2.3E-6	mg/m^3	7.5E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	5.3E-07	(mg/m^3)	3.0E-05	(mg/m^3)	0.02
				Zinc	0.002	mg/m^3	8.0E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	5.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	5.6E-6	mg/m^3	1.8E-08	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	1.0E-08	1.3E-06	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.7E-07					1.3
		Exposure Point Total									9.7E-07					1.3
	Exposure Medium Total										9.7E-07					1.3
Medium Total											7.7E-06					2.4
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	4.1E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	5.3E-07	2.9E-10	(mg/kg/day)	2.0E-08	(mg/kg/day)	0.01
				Arsenic	143	mg/kg	6.6E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	9.9E-06	4.6E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.5

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
				Cadmium	13.1	mg/kg	6.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.04
				Lead	503	mg/kg	2.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.005
				Zinc	3,500	mg/kg	1.6E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-02	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.04
				Benzo(a)pyrene Equivalents	0.360	mg/kg	1.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	2.0E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	4.1E-07	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-05					1.6
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	3.7E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	4.8E-08	2.6E-11	(mg/kg/day)	2.0E-08	(mg/kg/day)	0.001
				Arsenic	143	mg/kg	5.9E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.9E-07	4.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Cadmium	13.1	mg/kg	1.8E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.005
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	4.6E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-07	(mg/kg/day)	1.4E-04	(mg/kg/day)	0.002
				Zinc	3,500	mg/kg	4.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.001
				Benzo(a)pyrene Equivalents	0.360	mg/kg	6.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.7E-08	4.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	8.5E-08	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	1.7E-07	6.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-06					0.1
		Exposure Point Total									1.2E-05					1.8
	Exposure Medium Total										1.2E-05					1.8
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	6.2E-11	mg/m^3	2.0E-13	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	7.7E-09	1.4E-11	(mg/m^3)	4.0E-08	(mg/m^3)	0.0004
				Arsenic	1.0E-4	mg/m^3	3.3E-07	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.4E-06	2.3E-05	(mg/m^3)	1.5E-05	(mg/m^3)	1.5
				Cadmium	9.2E-6	mg/m^3	3.0E-08	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	5.4E-08	2.1E-06	(mg/m^3)	2.0E-05	(mg/m^3)	0.1
				Lead	3.5E-4	mg/m^3	1.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	2.3E-6	mg/m^3	7.5E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.3E-07	(mg/m^3)	3.0E-05	(mg/m^3)	0.02
				Zinc	0.002	mg/m^3	8.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	2.5E-7	mg/m^3	8.2E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	9.0E-10	5.7E-08	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	3.1E-6	mg/m^3	1.0E-08	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	5.7E-09	7.0E-07	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.5E-06					1.6
		Exposure Point Total									1.5E-06					1.6
	Exposure Medium Total										1.5E-06					1.6
Medium Total											1.4E-05					3.4
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Aluminum	4,820	mg/kg	2.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.02
				Arsenic	110	mg/kg	5.1E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.6E-06	3.6E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.2
				Cobalt	18.9	mg/kg	8.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.02
				Iron	9,742	mg/kg	4.5E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.04
				Manganese	122	mg/kg	5.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.02
				Vanadium	27.4	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.02
				Benzo(a)pyrene Equivalents	0.480	mg/kg	2.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-07	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.8E-06					1.3
			Dermal	Aluminum	4,820	mg/kg	6.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0005
				Arsenic	110	mg/kg	4.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	6.9E-07	3.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Cobalt	18.9	mg/kg	2.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.0006
				Iron	9,742	mg/kg	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.4E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.001
				Manganese	122	mg/kg	1.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.01
				Vanadium	27.4	mg/kg	3.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0005
				Benzo(a)pyrene Equivalents	0.480	mg/kg	8.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.3E-08	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.5E-07					0.1
		Exposure Point Total									8.5E-06					1.4
	Exposure Medium Total										8.5E-06					1.4
	Air	Subsurface Soil	Inhalation	Aluminum	0.003	mg/m^3	1.1E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.7E-04	(mg/m^3)	5.0E-03	(mg/m^3)	0.2
				Arsenic	7.7E-5	mg/m^3	2.5E-07	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.1E-06	1.8E-05	(mg/m^3)	1.5E-05	(mg/m^3)	1.2
				Cobalt	1.3E-5	mg/m^3	4.3E-08	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	3.9E-07	3.0E-06	(mg/m^3)	2.0E-05	(mg/m^3)	0.2
				Iron	0.007	mg/m^3	2.2E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-03	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	8.5E-5	mg/m^3	2.8E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-05	(mg/m^3)	5.0E-05	(mg/m^3)	0.4
				Vanadium	1.9E-5	mg/m^3	6.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.4E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	3.4E-7	mg/m^3	1.1E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.2E-09	7.7E-08	(mg/m^3)	NA	(mg/m^3)	--

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
			Exp. Route Total								1.5E-06					1.9
		Exposure Point Total									1.5E-06					1.9
	Exposure Medium Total										1.5E-06					1.9
Medium Total											1.0E-05					3.3
Groundwater	Groundwater	Upgradient	Ingestion	Arsenic	3.90	ug/L	2.0E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.9E-09	1.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0005
				Beryllium	8.20	ug/L	4.1E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.9E-07	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.00006
				Cobalt	612	ug/L	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.007
				Tetrachloroethene	0.730	ug/L	3.7E-10	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	2.0E-10	2.6E-08	(mg/kg/day)	1.0E-01	(mg/kg/day)	0.0000003
				Trichloroethene	54.6	ug/L	2.7E-08	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	1.3E-09	1.9E-06	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.004
			Exp. Route Total								4.4E-09					0.01
			Dermal	Arsenic	3.90	ug/L	2.6E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.9E-09	1.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0006
				Beryllium	8.20	ug/L	5.4E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.8E-07	(mg/kg/day)	3.5E-05	(mg/kg/day)	0.01
				Cobalt	612	ug/L	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-05	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.004
				Tetrachloroethene	0.730	ug/L	2.2E-08	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	1.2E-08	1.6E-06	(mg/kg/day)	1.0E-01	(mg/kg/day)	0.00002
				Trichloroethene	54.6	ug/L	5.3E-07	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	2.4E-08	3.7E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.07
			Exp. Route Total								4.0E-08					0.09
		Exposure Point Total									4.5E-08					0.1
	Exposure Medium Total										4.5E-08					0.1
	Air	Upgradient	Inhalation	Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Beryllium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Tetrachloroethene	2.1E-5	mg/m^3	1.2E-08	(mg/m^3)	5.9E-06	(ug/m^3)$^{-1}$	7.3E-11	8.6E-07	(mg/m^3)	2.7E-01	(mg/m^3)	0.000003
				Trichloroethene	0.002	mg/m^3	1.0E-06	(mg/m^3)	4.1E-06	(ug/m^3)$^{-1}$	4.2E-09	7.2E-05	(mg/m^3)	5.4E-01	(mg/m^3)	0.0001
			Exp. Route Total								4.3E-09					0.0001
		Exposure Point Total									4.3E-09					0.0001
	Exposure Medium Total										4.3E-09					0.0001
Medium Total											4.9E-08					0.1
Groundwater	Groundwater	Downgradient	Ingestion	Arsenic	15.5	ug/L	7.8E-09	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.2E-08	5.5E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Beryllium	3.90	ug/L	2.0E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-07	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.00003
				Cobalt	219	ug/L	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.7E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.003
				Tetrachloroethene	0.290	ug/L	1.5E-10	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	7.9E-11	1.0E-08	(mg/kg/day)	1.0E-01	(mg/kg/day)	0.0000001
				Trichloroethene	28.2	ug/L	1.4E-08	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	6.5E-10	9.9E-07	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.002
			Exp. Route Total								1.2E-08					0.006
			Dermal	Arsenic	15.5	ug/L	1.0E-08	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.5E-08	7.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Beryllium	3.90	ug/L	2.6E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-07	(mg/kg/day)	3.5E-05	(mg/kg/day)	0.005
				Cobalt	219	ug/L	5.8E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.1E-06	(mg/kg/day)	3.0E-03	(mg/kg/day)	0.001
				Tetrachloroethene	0.290	ug/L	8.9E-09	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	4.8E-09	6.2E-07	(mg/kg/day)	1.0E-01	(mg/kg/day)	0.000006
				Trichloroethene	28.2	ug/L	2.7E-07	(mg/kg/day)	4.6E-02	(mg/kg/day)$^{-1}$	1.3E-08	1.9E-05	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.04
			Exp. Route Total								3.3E-08					0.05
		Exposure Point Total									4.5E-08					0.05
	Exposure Medium Total										4.5E-08					0.05
	Air	Downgradient	Inhalation	Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Beryllium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Tetrachloroethene	8.3E-6	mg/m^3	4.9E-09	(mg/m^3)	5.9E-06	(ug/m^3)$^{-1}$	2.9E-11	3.4E-07	(mg/m^3)	2.7E-01	(mg/m^3)	0.000001
				Trichloroethene	9.1E-4	mg/m^3	5.3E-07	(mg/m^3)	4.1E-06	(ug/m^3)$^{-1}$	2.2E-09	3.7E-05	(mg/m^3)	5.4E-01	(mg/m^3)	0.0001
			Exp. Route Total								2.2E-09					0.0001
		Exposure Point Total									2.2E-09					0.0001
	Exposure Medium Total										2.2E-09					0.0001
Medium Total											4.8E-08					0.05
										Total of Receptor Risks Across All Media	4.1E-05				Total of Receptor Hazards Across All Media	12

TABLE 7.8.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	4.0E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	6.0E-05	1.1E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Cadmium	1.80	mg/kg	6.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.002
				Lead	65.1	mg/kg	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	1.2E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	8.9E-07	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	8.7E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.7E-07	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.1E-05					0.4
			Dermal	Arsenic	114	mg/kg	7.9E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.2E-05	2.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				Cadmium	1.80	mg/kg	4.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0005
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	1.0E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	7.7E-07	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	8.1E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.6E-07	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.3E-05					0.07
		Exposure Point Total									7.4E-05					0.4
	Exposure Medium Total										7.4E-05					0.4
	Air	Surface Soil (current)	Inhalation	Arsenic	3.5E-8	mg/m^3	2.9E-09	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.2E-08	8.1E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0005
				Cadmium	5.6E-10	mg/m^3	4.5E-11	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	8.2E-11	1.3E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.000006
				Lead	2.0E-8	mg/m^3	1.6E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	4.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	8.8E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	9.7E-12	2.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	7.7E-11	mg/m^3	6.3E-12	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	3.6E-12	1.8E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.2E-08					0.0005
		Exposure Point Total									1.2E-08					0.0005
	Exposure Medium Total										1.2E-08					0.0005
Medium Total											7.4E-05					0.4
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	3.1E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	4.0E-06	8.7E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.09
				Arsenic	68.1	mg/kg	2.4E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.6E-05	6.7E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Cadmium	69.0	mg/kg	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.8E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.07
				Lead	1,672	mg/kg	5.8E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Zinc	3,500	mg/kg	1.2E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.01
				Aroclor-1260	8.00	mg/kg	2.8E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	5.6E-06	7.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.5E-05					0.4
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	6.2E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	8.0E-07	1.7E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.02
				Arsenic	68.1	mg/kg	4.7E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.1E-06	1.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Cadmium	69.0	mg/kg	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.5E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.02
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	7.6E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.01
				Zinc	3,500	mg/kg	8.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.3E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0008
				Aroclor-1260	8.00	mg/kg	2.6E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	5.2E-06	7.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.3E-05					0.09
		Exposure Point Total									5.8E-05					0.5
	Exposure Medium Total										5.8E-05					0.5
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	2.2E-15	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	8.5E-11	6.3E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	2.1E-8	mg/m^3	1.7E-09	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	7.4E-09	4.8E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0003
				Cadmium	2.1E-8	mg/m^3	1.7E-09	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	3.1E-09	4.9E-09	(mg/m^3)	2.0E-05	(mg/m^3)	0.0002
				Lead	5.2E-7	mg/m^3	4.2E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	8.3E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.3E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000008
				Zinc	1.1E-6	mg/m^3	8.8E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	2.5E-9	mg/m^3	2.0E-10	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	1.2E-10	5.7E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-08					0.0006
		Exposure Point Total									1.1E-08					0.0006
	Exposure Medium Total										1.1E-08					0.0006
Medium Total											5.8E-05					0.5
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	3.1E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	4.0E-06	8.7E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.09
				Arsenic	143	mg/kg	5.0E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.5E-05	1.4E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.5

TABLE 7.8.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Cadmium	13.1	mg/kg	4.6E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.01
				Lead	503	mg/kg	1.8E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Zinc	3,500	mg/kg	1.2E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.01
				Benzo(a)pyrene Equivalents	0.360	mg/kg	1.3E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	9.2E-07	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	1.5E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	3.1E-06	4.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.3E-05					0.6
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	6.2E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	8.0E-07	1.7E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.02
				Arsenic	143	mg/kg	9.9E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.5E-05	2.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.09
				Cadmium	13.1	mg/kg	3.0E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.5E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	7.6E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.01
				Zinc	3,500	mg/kg	8.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.3E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0008
				Benzo(a)pyrene Equivalents	0.360	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	7.9E-07	3.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	1.4E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	2.8E-06	4.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-05					0.1
		Exposure Point Total									1.0E-04					0.7
	Exposure Medium Total										1.0E-04					0.7
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	2.2E-15	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	8.5E-11	6.3E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	4.4E-8	mg/m^3	3.6E-09	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.6E-08	1.0E-08	(mg/m^3)	1.5E-05	(mg/m^3)	0.0007
				Cadmium	4.1E-9	mg/m^3	3.3E-10	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	6.0E-10	9.3E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.00005
				Lead	1.6E-7	mg/m^3	1.3E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	8.3E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.3E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000008
				Zinc	1.1E-6	mg/m^3	8.8E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	9.1E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.0E-11	2.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.4E-9	mg/m^3	1.1E-10	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	6.3E-11	3.1E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.6E-08					0.0007
		Exposure Point Total									1.6E-08					0.0007
	Exposure Medium Total										1.6E-08					0.0007
Medium Total											1.0E-04					0.7
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Aluminum	4,820	mg/kg	1.7E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.7E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.005
				Arsenic	110	mg/kg	3.8E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	5.8E-05	1.1E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Cobalt	18.9	mg/kg	6.6E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Iron	9,742	mg/kg	3.4E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.5E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.01
				Manganese	122	mg/kg	4.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.005
				Vanadium	27.4	mg/kg	9.6E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.7E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.005
				Benzo(a)pyrene Equivalents	0.480	mg/kg	1.7E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.2E-06	4.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.9E-05					0.4
			Dermal	Aluminum	4,820	mg/kg	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.1E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0003
				Arsenic	110	mg/kg	7.6E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.1E-05	2.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				Cobalt	18.9	mg/kg	4.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				Iron	9,742	mg/kg	2.2E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.3E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0009
				Manganese	122	mg/kg	2.8E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.9E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.008
				Vanadium	27.4	mg/kg	6.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0004
				Benzo(a)pyrene Equivalents	0.480	mg/kg	1.4E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.1E-06	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-05					0.08
		Exposure Point Total									7.1E-05					0.5
	Exposure Medium Total										7.1E-05					0.5
	Air	Subsurface Soil	Inhalation	Aluminum	1.5E-6	mg/m^3	1.2E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.4E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.00007
				Arsenic	3.4E-8	mg/m^3	2.8E-09	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.2E-08	7.8E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0005
				Cobalt	5.9E-9	mg/m^3	4.8E-10	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	4.3E-09	1.3E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0002
				Iron	3.0E-6	mg/m^3	2.5E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	6.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	3.8E-8	mg/m^3	3.1E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	8.6E-09	(mg/m^3)	5.0E-05	(mg/m^3)	0.0002
				Vanadium	8.5E-9	mg/m^3	6.9E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.9E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.5E-10	mg/m^3	1.2E-11	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.3E-11	3.4E-11	(mg/m^3)	NA	(mg/m^3)	--

TABLE 7.8.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
			Exp. Route Total								1.6E-08					0.0010
		Exposure Point Total									1.6E-08					0.0010
	Exposure Medium Total										1.6E-08					0.0010
Medium Total											7.1E-05					0.5
										Total of Receptor Risks Across All Media	3.1E-04				Total of Receptor Hazards Across All Media	2.2

TABLE 7.9.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	1.9E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.8E-05	2.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.7
				Cadmium	1.80	mg/kg	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.003
				Lead	65.1	mg/kg	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	3.0E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	2.2E-06	6.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	4.1E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	8.1E-08	4.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.0E-05					0.7
			Dermal	Arsenic	114	mg/kg	1.6E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.3E-06	1.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Cadmium	1.80	mg/kg	8.2E-10	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.6E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0004
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	8.1E-07	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	1.6E-08	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	3.2E-08	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.2E-06					0.06
		Exposure Point Total									3.3E-05					0.8
	Exposure Medium Total										3.3E-05					0.8
	Air	Surface Soil (current)	Inhalation	Arsenic	3.5E-8	mg/m^3	7.2E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	3.1E-10	8.4E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00006
				Cadmium	5.6E-10	mg/m^3	1.1E-12	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	2.0E-12	1.3E-11	(mg/m^3)	2.0E-05	(mg/m^3)	0.0000007
				Lead	2.0E-8	mg/m^3	4.1E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	4.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	1.2E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.3E-12	2.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	7.7E-11	mg/m^3	1.6E-13	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	9.0E-14	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.1E-10					0.00006
		Exposure Point Total									3.1E-10					0.00006
	Exposure Medium Total										3.1E-10					0.00006
Medium Total											3.3E-05					0.8
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	1.4E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.9E-06	1.7E-10	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.2
				Arsenic	68.1	mg/kg	1.1E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.7E-05	1.3E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Cadmium	69.0	mg/kg	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-04	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.1
				Lead	1,672	mg/kg	2.7E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.2E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	5.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Zinc	3,500	mg/kg	5.7E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.6E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.02
				Aroclor-1260	8.00	mg/kg	1.3E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	2.6E-06	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-05					0.8
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	1.2E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.6E-07	1.4E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.01
				Arsenic	68.1	mg/kg	9.3E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.4E-06	1.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Cadmium	69.0	mg/kg	3.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.7E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.01
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.008
				Zinc	3,500	mg/kg	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0006
				Aroclor-1260	8.00	mg/kg	5.1E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.0E-06	6.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.6E-06					0.07
		Exposure Point Total									2.4E-05					0.8
	Exposure Medium Total										2.4E-05					0.8
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	5.6E-17	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	2.1E-12	6.5E-16	(mg/m^3)	4.0E-08	(mg/m^3)	0.00000002
				Arsenic	2.1E-8	mg/m^3	4.3E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.8E-10	5.0E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00003
				Cadmium	2.1E-8	mg/m^3	4.3E-11	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	7.8E-11	5.1E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.00003
				Lead	5.2E-7	mg/m^3	1.1E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	2.1E-12	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.4E-11	(mg/m^3)	3.0E-05	(mg/m^3)	0.0000008
				Zinc	1.1E-6	mg/m^3	2.2E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	2.5E-9	mg/m^3	5.0E-12	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	2.9E-12	5.9E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.7E-10					0.00006
		Exposure Point Total									2.7E-10					0.00006
	Exposure Medium Total										2.7E-10					0.00006
Medium Total											2.4E-05					0.8
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	1.4E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.9E-06	1.7E-10	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.2
				Arsenic	143	mg/kg	2.3E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.5E-05	2.7E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.9

TABLE 7.9.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
				Cadmium	13.1	mg/kg	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	2.5E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.02
				Lead	503	mg/kg	8.2E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	9.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	5.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	6.3E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Zinc	3,500	mg/kg	5.7E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	6.6E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.02
				Benzo(a)pyrene Equivalents	0.360	mg/kg	3.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	2.3E-06	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	7.2E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.4E-06	8.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.1E-05					1.1
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	1.2E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.6E-07	1.4E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.01
				Arsenic	143	mg/kg	2.0E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.9E-06	2.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.08
				Cadmium	13.1	mg/kg	6.0E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	7.0E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	1.8E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.008
				Zinc	3,500	mg/kg	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	1.9E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0006
				Benzo(a)pyrene Equivalents	0.360	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	8.3E-07	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	2.8E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	5.6E-07	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.5E-06					0.1
		Exposure Point Total									4.5E-05					1.2
	Exposure Medium Total										4.5E-05					1.2
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	5.6E-17	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	2.1E-12	6.5E-16	(mg/m^3)	4.0E-08	(mg/m^3)	0.00000002
				Arsenic	4.4E-8	mg/m^3	9.0E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	3.9E-10	1.1E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.00007
				Cadmium	4.1E-9	mg/m^3	8.3E-12	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	1.5E-11	9.6E-11	(mg/m^3)	2.0E-05	(mg/m^3)	0.000005
				Lead	1.6E-7	mg/m^3	3.2E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	3.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	2.1E-12	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	2.4E-11	(mg/m^3)	3.0E-05	(mg/m^3)	0.0000008
				Zinc	1.1E-6	mg/m^3	2.2E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	2.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	1.2E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.3E-12	2.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.4E-9	mg/m^3	2.8E-12	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	1.6E-12	3.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.1E-10					0.00008
		Exposure Point Total									4.1E-10					0.00008
	Exposure Medium Total										4.1E-10					0.00008
Medium Total											4.5E-05					1.2
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Aluminum	4,820	mg/kg	7.8E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	9.2E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.009
				Arsenic	110	mg/kg	1.8E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.7E-05	2.1E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.7
				Cobalt	18.9	mg/kg	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	3.6E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Iron	9,742	mg/kg	1.6E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	1.9E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.03
				Manganese	122	mg/kg	2.0E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	2.3E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.010
				Vanadium	27.4	mg/kg	4.5E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	5.2E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.01
				Benzo(a)pyrene Equivalents	0.480	mg/kg	4.2E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	3.0E-06	9.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.0E-05					0.9
			Dermal	Aluminum	4,820	mg/kg	2.2E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	2.6E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0003
				Arsenic	110	mg/kg	1.5E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.3E-06	1.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Cobalt	18.9	mg/kg	8.6E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	1.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Iron	9,742	mg/kg	4.4E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	5.2E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0007
				Manganese	122	mg/kg	5.6E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	6.5E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.007
				Vanadium	27.4	mg/kg	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	--	1.5E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0003
				Benzo(a)pyrene Equivalents	0.480	mg/kg	1.5E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.1E-06	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.4E-06					0.07
		Exposure Point Total									3.3E-05					0.9
	Exposure Medium Total										3.3E-05					0.9
	Air	Subsurface Soil	Inhalation	Aluminum	1.5E-6	mg/m^3	3.0E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	3.5E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.000007
				Arsenic	3.4E-8	mg/m^3	6.9E-11	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	3.0E-10	8.1E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00005
				Cobalt	5.9E-9	mg/m^3	1.2E-11	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	1.1E-10	1.4E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00002
				Iron	3.0E-6	mg/m^3	6.1E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	7.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	3.8E-8	mg/m^3	7.7E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	9.0E-10	(mg/m^3)	5.0E-05	(mg/m^3)	0.00002
				Vanadium	8.5E-9	mg/m^3	1.7E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	--	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.5E-10	mg/m^3	1.6E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.8E-12	3.5E-12	(mg/m^3)	NA	(mg/m^3)	--

TABLE 7.9.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
			Exp. Route Total								4.1E-10					0.0001
		Exposure Point Total									4.1E-10					0.0001
	Exposure Medium Total										4.1E-10					0.0001
Medium Total											3.3E-05					0.9
							Total of Receptor Risks Across All Media				1.4E-04	Total of Receptor Hazards Across All Media				3.8

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	8.0E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.2E-05	2.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.08
				Cadmium	1.80	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-07	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.0004
				Lead	65.1	mg/kg	4.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	4.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-07	7.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	1.7E-08	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	3.5E-08	5.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-05					0.08
			Dermal	Arsenic	114	mg/kg	9.5E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.4E-06	2.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Cadmium	1.80	mg/kg	5.0E-10	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.00006
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	2.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-07	3.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	9.7E-09	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	1.9E-08	2.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-06					0.009
		Exposure Point Total									1.4E-05					0.09
	Exposure Medium Total										1.4E-05					0.09
	Air	Surface Soil (current)	Inhalation	Arsenic	3.5E-8	mg/m^3	2.9E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.2E-09	8.4E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00006
				Cadmium	5.6E-10	mg/m^3	4.5E-12	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	8.2E-12	1.3E-11	(mg/m^3)	2.0E-05	(mg/m^3)	0.0000007
				Lead	2.0E-8	mg/m^3	1.6E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	1.6E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.8E-12	2.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	7.7E-11	mg/m^3	6.3E-13	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	3.6E-13	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.2E-09					0.00006
		Exposure Point Total									1.2E-09					0.00006
	Exposure Medium Total										1.2E-09					0.00006
Medium Total											1.4E-05					0.09
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	6.2E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	8.1E-07	1.8E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.02
				Arsenic	68.1	mg/kg	4.8E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	7.1E-06	1.4E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.05
				Cadmium	69.0	mg/kg	4.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.01
				Lead	1,672	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	2.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Zinc	3,500	mg/kg	2.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.1E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.002
				Aroclor-1260	8.00	mg/kg	5.6E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	1.1E-06	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.1E-06					0.08
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	7.4E-13	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	9.7E-08	2.2E-12	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.002
				Arsenic	68.1	mg/kg	5.7E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.5E-07	1.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.006
				Cadmium	69.0	mg/kg	1.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.002
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	9.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-08	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.001
				Zinc	3,500	mg/kg	9.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-05	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.00009
				Aroclor-1260	8.00	mg/kg	3.1E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	6.2E-07	9.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-06					0.01
		Exposure Point Total									1.1E-05					0.09
	Exposure Medium Total										1.1E-05					0.09
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	2.2E-16	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	8.5E-12	6.5E-16	(mg/m^3)	4.0E-08	(mg/m^3)	0.00000002
				Arsenic	2.1E-8	mg/m^3	1.7E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	7.4E-10	5.0E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00003
				Cadmium	2.1E-8	mg/m^3	1.7E-10	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	3.1E-10	5.1E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.00003
				Lead	5.2E-7	mg/m^3	4.2E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	8.3E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-11	(mg/m^3)	3.0E-05	(mg/m^3)	0.0000008
				Zinc	1.1E-6	mg/m^3	8.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	2.5E-9	mg/m^3	2.0E-11	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	1.1E-11	5.9E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-09					0.00006
		Exposure Point Total									1.1E-09					0.00006
	Exposure Medium Total										1.1E-09					0.00006
Medium Total											1.1E-05					0.09
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	6.2E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	8.1E-07	1.8E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.02
				Arsenic	143	mg/kg	1.0E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-05	2.9E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.10

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Cadmium	13.1	mg/kg	9.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.7E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.003
				Lead	503	mg/kg	3.5E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Zinc	3,500	mg/kg	2.4E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.1E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.002
				Benzo(a)pyrene Equivalents	0.360	mg/kg	4.6E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	3.4E-07	7.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	3.1E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	6.1E-07	9.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.7E-05					0.1
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	7.4E-13	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	9.7E-08	2.2E-12	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.002
				Arsenic	143	mg/kg	1.2E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.8E-06	3.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Cadmium	13.1	mg/kg	3.6E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0004
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	9.2E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.7E-08	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.001
				Zinc	3,500	mg/kg	9.7E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.8E-05	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.00009
				Benzo(a)pyrene Equivalents	0.360	mg/kg	2.4E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.7E-07	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	1.7E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	3.4E-07	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.4E-06					0.02
		Exposure Point Total									1.9E-05					0.1
	Exposure Medium Total										1.9E-05					0.1
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	2.8E-14	mg/m^3	2.2E-16	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	8.5E-12	6.5E-16	(mg/m^3)	4.0E-08	(mg/m^3)	0.00000002
				Arsenic	4.4E-8	mg/m^3	3.6E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.5E-09	1.1E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.00007
				Cadmium	4.1E-9	mg/m^3	3.3E-11	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	5.9E-11	9.6E-11	(mg/m^3)	2.0E-05	(mg/m^3)	0.000005
				Lead	1.6E-7	mg/m^3	1.3E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.0E-9	mg/m^3	8.3E-12	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.4E-11	(mg/m^3)	3.0E-05	(mg/m^3)	0.0000008
				Zinc	1.1E-6	mg/m^3	8.8E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.1E-10	mg/m^3	1.7E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.8E-12	2.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	1.4E-9	mg/m^3	1.1E-11	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	6.3E-12	3.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.6E-09					0.00008
		Exposure Point Total									1.6E-09					0.00008
	Exposure Medium Total										1.6E-09					0.00008
Medium Total											1.9E-05					0.1
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Aluminum	4,820	mg/kg	3.4E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.8E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0010
				Arsenic	110	mg/kg	7.7E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.2E-05	2.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.07
				Cobalt	18.9	mg/kg	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				Iron	9,742	mg/kg	6.8E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.003
				Manganese	122	mg/kg	8.5E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.5E-05	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.001
				Vanadium	27.4	mg/kg	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.6E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.001
				Benzo(a)pyrene Equivalents	0.480	mg/kg	6.1E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	4.5E-07	9.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-05					0.09
			Dermal	Aluminum	4,820	mg/kg	1.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.9E-05	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.00004
				Arsenic	110	mg/kg	9.2E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.4E-06	2.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				Cobalt	18.9	mg/kg	5.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0005
				Iron	9,742	mg/kg	2.7E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.9E-05	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0001
				Manganese	122	mg/kg	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.9E-07	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.001
				Vanadium	27.4	mg/kg	7.6E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-07	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.00004
				Benzo(a)pyrene Equivalents	0.480	mg/kg	3.2E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	2.3E-07	5.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-06					0.01
		Exposure Point Total									1.4E-05					0.1
	Exposure Medium Total										1.4E-05					0.1
	Air	Subsurface Soil	Inhalation	Aluminum	1.5E-6	mg/m^3	1.2E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.5E-08	(mg/m^3)	5.0E-03	(mg/m^3)	0.000007
				Arsenic	3.4E-8	mg/m^3	2.8E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.2E-09	8.1E-10	(mg/m^3)	1.5E-05	(mg/m^3)	0.00005
				Cobalt	5.9E-9	mg/m^3	4.8E-11	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	4.3E-10	1.4E-10	(mg/m^3)	6.0E-06	(mg/m^3)	0.00002
				Iron	3.0E-6	mg/m^3	2.5E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	7.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	3.8E-8	mg/m^3	3.1E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	9.0E-10	(mg/m^3)	5.0E-05	(mg/m^3)	0.00002
				Vanadium	8.5E-9	mg/m^3	6.9E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	1.5E-10	mg/m^3	2.2E-12	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	2.4E-12	3.5E-12	(mg/m^3)	NA	(mg/m^3)	--

TABLE 7.10.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
			Exp. Route Total								1.6E-09					0.0001
		Exposure Point Total									1.6E-09					0.0001
	Exposure Medium Total										1.6E-09					0.0001
Medium Total											1.4E-05					0.1
										Total of Receptor Risks Across All Media	5.7E-05				Total of Receptor Hazards Across All Media	0.4

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	1.2E-04	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.9E-04	1.5E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	4.9
				Cadmium	1.80	mg/kg	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.3E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.02
				Lead	65.1	mg/kg	7.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.3E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	2.0E-06	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.5E-05	4.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	2.7E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	5.5E-07	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-04					4.9
			Dermal	Arsenic	114	mg/kg	1.0E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.6E-05	1.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Cadmium	1.80	mg/kg	5.5E-09	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.4E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	7.4E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	5.4E-06	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	1.1E-07	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	2.1E-07	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-05					0.4
		Exposure Point Total									2.2E-04					5.3
	Exposure Medium Total										2.2E-04					5.3
	Air	Surface Soil (current)	Inhalation	Arsenic	1.0E-8	mg/m^3	8.5E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	3.7E-09	9.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0007
				Cadmium	1.6E-10	mg/m^3	1.3E-11	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	2.4E-11	1.6E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.000008
				Lead	5.9E-9	mg/m^3	4.9E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	5.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	3.2E-11	mg/m^3	1.4E-11	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	1.5E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	2.3E-11	mg/m^3	1.9E-12	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	1.1E-12	2.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.7E-09					0.0007
		Exposure Point Total									3.7E-09					0.0007
	Exposure Medium Total										3.7E-09					0.0007
Medium Total											2.2E-04					5.3
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	9.8E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.3E-05	1.1E-09	(mg/kg/day)	1.0E-09	(mg/kg/day)	1.1
				Arsenic	68.1	mg/kg	7.5E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.1E-04	8.7E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	2.9
				Cadmium	69.0	mg/kg	7.6E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.8E-04	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.9
				Lead	1,672	mg/kg	1.8E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-02	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	3.6E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Zinc	3,500	mg/kg	3.8E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.5E-02	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.1
				Aroclor-1260	8.00	mg/kg	8.8E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	1.8E-05	1.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.4E-04					5.2
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	8.2E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.1E-06	9.6E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.10
				Arsenic	68.1	mg/kg	6.3E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	9.4E-06	7.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.2
				Cadmium	69.0	mg/kg	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.5E-06	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.10
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-06	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.06
				Zinc	3,500	mg/kg	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.004
				Aroclor-1260	8.00	mg/kg	3.4E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	6.9E-06	4.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.7E-05					0.5
		Exposure Point Total									1.6E-04					5.7
	Exposure Medium Total										1.6E-04					5.7
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	8.1E-15	mg/m^3	6.7E-16	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	2.5E-11	7.8E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	6.2E-9	mg/m^3	5.1E-10	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	2.2E-09	5.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0004
				Cadmium	6.3E-9	mg/m^3	5.2E-10	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	9.3E-10	6.0E-09	(mg/m^3)	2.0E-05	(mg/m^3)	0.0003
				Lead	1.5E-7	mg/m^3	1.2E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	3.0E-10	mg/m^3	2.5E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.9E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000010
				Zinc	3.2E-7	mg/m^3	2.6E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	7.3E-10	mg/m^3	6.0E-11	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	3.4E-11	7.0E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.2E-09					0.0007
		Exposure Point Total									3.2E-09					0.0007
	Exposure Medium Total										3.2E-09					0.0007
Medium Total											1.6E-04					5.7
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	9.8E-11	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	1.3E-05	1.1E-09	(mg/kg/day)	1.0E-09	(mg/kg/day)	1.1
				Arsenic	143	mg/kg	1.6E-04	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.4E-04	1.8E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	6.1

TABLE 7.11.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Cadmium	13.1	mg/kg	1.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.7E-04	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.2
				Lead	503	mg/kg	5.5E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	6.4E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	3.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	4.2E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Zinc	3,500	mg/kg	3.8E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	4.5E-02	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.1
				Benzo(a)pyrene Equivalents	0.360	mg/kg	2.1E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-05	4.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	4.8E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	9.6E-06	5.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.7E-04					7.7
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	8.2E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	1.1E-06	9.6E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.10
				Arsenic	143	mg/kg	1.3E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.0E-05	1.5E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.5
				Cadmium	13.1	mg/kg	4.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	4.7E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.02
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.2E-06	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.06
				Zinc	3,500	mg/kg	1.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.3E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.004
				Benzo(a)pyrene Equivalents	0.360	mg/kg	7.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.6E-06	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	1.9E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	3.8E-06	2.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.0E-05					0.7
		Exposure Point Total									3.0E-04					8.4
	Exposure Medium Total										3.0E-04					8.4
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	6.1E-15	mg/m^3	6.7E-16	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	2.5E-11	7.8E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	1.3E-8	mg/m^3	1.1E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	4.6E-09	1.2E-08	(mg/m^3)	1.5E-05	(mg/m^3)	0.0008
				Cadmium	1.2E-9	mg/m^3	9.8E-11	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	1.8E-10	1.1E-09	(mg/m^3)	2.0E-05	(mg/m^3)	0.00006
				Lead	4.6E-8	mg/m^3	3.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	4.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	3.0E-10	mg/m^3	2.5E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	2.9E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000010
				Zinc	3.2E-7	mg/m^3	2.6E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	3.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	3.3E-11	mg/m^3	1.4E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.6E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	4.0E-10	mg/m^3	3.3E-11	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	1.9E-11	3.8E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.8E-09					0.0009
		Exposure Point Total									4.8E-09					0.0009
	Exposure Medium Total										4.8E-09					0.0009
Medium Total											3.0E-04					8.4
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Aluminum	4,820	mg/kg	5.3E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	6.2E-02	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.06
				Arsenic	110	mg/kg	1.2E-04	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.8E-04	1.4E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	4.7
				Cobalt	18.9	mg/kg	2.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	2.4E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.8
				Iron	9,742	mg/kg	1.1E-02	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.2E-01	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.2
				Manganese	122	mg/kg	1.3E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.6E-03	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.06
				Vanadium	27.4	mg/kg	3.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.5E-04	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.07
				Benzo(a)pyrene Equivalents	0.480	mg/kg	2.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-05	6.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-04					5.9
			Dermal	Aluminum	4,820	mg/kg	1.5E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	1.7E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.002
				Arsenic	110	mg/kg	1.0E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.5E-05	1.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Cobalt	18.9	mg/kg	5.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	6.8E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Iron	9,742	mg/kg	3.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	3.5E-03	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.005
				Manganese	122	mg/kg	3.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	4.4E-05	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.05
				Vanadium	27.4	mg/kg	8.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	--	9.8E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.002
				Benzo(a)pyrene Equivalents	0.480	mg/kg	1.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-06	2.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.3E-05					0.5
		Exposure Point Total									2.2E-04					6.3
	Exposure Medium Total										2.2E-04					6.3
	Air	Subsurface Soil	Inhalation	Aluminum	4.4E-7	mg/m^3	3.6E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	4.2E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.00008
				Arsenic	1.0E-8	mg/m^3	8.2E-10	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	3.5E-09	9.6E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0006
				Cobalt	1.7E-9	mg/m^3	1.4E-10	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	1.3E-09	1.6E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0003
				Iron	8.9E-7	mg/m^3	7.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	8.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.1E-8	mg/m^3	9.1E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	1.1E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0002
				Vanadium	2.5E-9	mg/m^3	2.0E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	--	2.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	4.4E-11	mg/m^3	1.9E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.1E-11	4.2E-11	(mg/m^3)	NA	(mg/m^3)	--

TABLE 7.11.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
			Exp. Route Total								4.8E-09					0.001
		Exposure Point Total									4.8E-09					0.001
	Exposure Medium Total										4.8E-09					0.001
Medium Total											2.2E-04					6.3
Groundwater	Groundwater	Upgradient	Ingestion	Arsenic	3.90	ug/L	2.1E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	3.2E-05	2.5E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.8
				Beryllium	8.20	ug/L	4.5E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.2E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.3
				Cobalt	612	ug/L	3.4E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.9E-02	(mg/kg/day)	3.0E-04	(mg/kg/day)	130
				Tetrachloroethene	0.730	ug/L	4.0E-06	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	2.2E-06	4.7E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.005
				Trichloroethene (Mutagenic)	54.6	ug/L	1.6E-03	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	1.5E-05	3.5E-03	(mg/kg/day)	NA	(mg/kg/day)	0.0
				Trichloroethene (Nonmutagenic)	54.6	ug/L	3.0E-04	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.1E-05	3.5E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	7.0
			Exp. Route Total								6.0E-05					138
			Dermal	Arsenic	3.90	ug/L	1.4E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	2.1E-07	1.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				Beryllium	8.20	ug/L	3.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.5E-06	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.2
				Cobalt	612	ug/L	8.9E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				Tetrachloroethene	0.730	ug/L	2.3E-06	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	1.3E-06	2.7E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.003
				Trichloroethene (Mutagenic)	54.6	ug/L	1.2E-05	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	1.2E-07	2.7E-05	(mg/kg/day)	NA	(mg/kg/day)	0.0
				Trichloroethene (Nonmutagenic)	54.6	ug/L	4.8E-05	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	1.8E-06	5.6E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	1.1
			Exp. Route Total								3.4E-06					1.7
		Exposure Point Total									6.3E-05					140
	Exposure Medium Total										6.3E-05					140
Medium Total											6.3E-05					140
Groundwater	Groundwater	Downgradient	Ingestion	Arsenic	15.5	ug/L	8.5E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.3E-04	9.9E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	3.3
				Beryllium	3.90	ug/L	2.1E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.5E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.1
				Cobalt	219	ug/L	1.2E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-02	(mg/kg/day)	3.0E-04	(mg/kg/day)	47
				Tetrachloroethene	0.290	ug/L	1.6E-06	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	8.6E-07	1.9E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.002
				Trichloroethene (Mutagenic)	28.2	ug/L	8.2E-04	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	7.7E-06	1.8E-03	(mg/kg/day)	NA	(mg/kg/day)	0.0
				Trichloroethene (Nonmutagenic)	28.2	ug/L	1.5E-04	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	5.7E-06	1.8E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	3.6
			Exp. Route Total								1.4E-04					54
			Dermal	Arsenic	15.5	ug/L	5.6E-07	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	8.4E-07	6.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Beryllium	3.90	ug/L	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.6E-06	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.1
				Cobalt	219	ug/L	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.7E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Tetrachloroethene	0.290	ug/L	9.2E-07	(mg/kg/day)	5.4E-01	(mg/kg/day)$^{-1}$	5.0E-07	1.1E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.001
				Trichloroethene (Mutagenic)	28.2	ug/L	4.9E-06	(mg/kg/day)	9.3E-03	(mg/kg/day)$^{-1}$	4.6E-08	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	0.0
				Trichloroethene (Nonmutagenic)	28.2	ug/L	2.5E-05	(mg/kg/day)	3.7E-02	(mg/kg/day)$^{-1}$	9.2E-07	2.9E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.6
			Exp. Route Total								2.3E-06					0.8
		Exposure Point Total									1.4E-04					55
	Exposure Medium Total										1.4E-04					55
Medium Total											1.4E-04					55
										Total of Receptor Risks Across All Media	1.1E-03				Total of Receptor Hazards Across All Media	220

TABLE 7.12.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil (current)	Ingestion	Arsenic	114	mg/kg	5.4E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	8.0E-05	1.6E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.5
				Cadmium	1.80	mg/kg	8.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-06	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.002
				Lead	65.1	mg/kg	3.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	3.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.2E-06	4.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	1.2E-07	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	2.3E-07	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.3E-05					0.5
			Dermal	Arsenic	114	mg/kg	6.4E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	9.6E-06	1.9E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Cadmium	1.80	mg/kg	3.4E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.8E-09	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.0004
				Lead	65.1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene Equivalents	0.350	mg/kg	1.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-06	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	0.250	mg/kg	6.6E-08	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	1.3E-07	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-05					0.06
		Exposure Point Total									9.4E-05					0.6
	Exposure Medium Total										9.4E-05					0.6
	Air	Surface Soil (current)	Inhalation	Arsenic	1.0E-8	mg/m^3	3.4E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	1.5E-08	9.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0007
				Cadmium	1.6E-10	mg/m^3	5.4E-11	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	9.7E-11	1.6E-10	(mg/m^3)	2.0E-05	(mg/m^3)	0.000008
				Lead	5.9E-9	mg/m^3	1.9E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	3.2E-11	mg/m^3	1.9E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.1E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	2.3E-11	mg/m^3	7.5E-12	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	4.3E-12	2.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.5E-08					0.0007
		Exposure Point Total									1.5E-08					0.0007
	Exposure Medium Total										1.5E-08					0.0007
Medium Total											9.4E-05					0.6
Surface Soil	Surface Soil	Surface Soil (under cap)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	4.2E-11	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	5.4E-06	1.2E-10	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.1
				Arsenic	68.1	mg/kg	3.2E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	4.8E-05	9.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.3
				Cadmium	69.0	mg/kg	3.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.09
				Lead	1,672	mg/kg	7.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Zinc	3,500	mg/kg	1.6E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.02
				Aroclor-1260	8.00	mg/kg	3.8E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	7.5E-06	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.1E-05					0.6
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	5.0E-12	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	6.5E-07	1.5E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.01
				Arsenic	68.1	mg/kg	3.8E-06	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.7E-06	1.1E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Cadmium	69.0	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-07	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.02
				Lead	1,672	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	6.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.009
				Zinc	3,500	mg/kg	6.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0006
				Aroclor-1260	8.00	mg/kg	2.1E-06	(mg/kg/day)	2.0E+00	$(mg/kg/day)^{-1}$	4.2E-06	6.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-05					0.08
		Exposure Point Total									7.2E-05					0.6
	Exposure Medium Total										7.2E-05					0.6
	Air	Surface Soil (under cap)	Inhalation	2,3,7,8-TCDD Equivalents	8.1E-15	mg/m^3	2.7E-15	(mg/m^3)	3.8E+01	$(ug/m^3)^{-1}$	1.0E-10	7.8E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	6.2E-9	mg/m^3	2.0E-09	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	8.8E-09	5.9E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0004
				Cadmium	6.3E-9	mg/m^3	2.1E-09	(mg/m^3)	1.8E-03	$(ug/m^3)^{-1}$	3.7E-09	6.0E-09	(mg/m^3)	2.0E-05	(mg/m^3)	0.0003
				Lead	1.5E-7	mg/m^3	5.0E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	3.0E-10	mg/m^3	9.9E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.9E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000010
				Zinc	3.2E-7	mg/m^3	1.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	7.3E-10	mg/m^3	2.4E-10	(mg/m^3)	5.7E-04	$(ug/m^3)^{-1}$	1.4E-10	7.0E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-08					0.0007
		Exposure Point Total									1.3E-08					0.0007
	Exposure Medium Total										1.3E-08					0.0007
Medium Total											7.2E-05					0.6
Surface Soil	Surface Soil	Surface Soil (future)	Ingestion	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	4.2E-11	(mg/kg/day)	1.3E+05	$(mg/kg/day)^{-1}$	5.4E-06	1.2E-10	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.1
				Arsenic	143	mg/kg	6.7E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.0E-04	2.0E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.7

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
				Cadmium	13.1	mg/kg	6.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-05	(mg/kg/day)	1.0E-03	(mg/kg/day)	0.02
				Lead	503	mg/kg	2.4E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.02
				Zinc	3,500	mg/kg	1.6E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.8E-03	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.02
				Benzo(a)pyrene Equivalents	0.360	mg/kg	3.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	2.3E-06	4.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	2.1E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	4.1E-06	6.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-04					0.8
			Dermal	2,3,7,8-TCDD Equivalents	8.9E-5	mg/kg	5.0E-12	(mg/kg/day)	1.3E+05	(mg/kg/day)$^{-1}$	6.5E-07	1.5E-11	(mg/kg/day)	1.0E-09	(mg/kg/day)	0.01
				Arsenic	143	mg/kg	8.0E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	1.2E-05	2.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.08
				Cadmium	13.1	mg/kg	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.2E-08	(mg/kg/day)	2.5E-05	(mg/kg/day)	0.003
				Lead	503	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Mercury	3.30	mg/kg	6.2E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-07	(mg/kg/day)	2.1E-05	(mg/kg/day)	0.009
				Zinc	3,500	mg/kg	6.6E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.9E-04	(mg/kg/day)	3.0E-01	(mg/kg/day)	0.0006
				Benzo(a)pyrene Equivalents	0.360	mg/kg	1.6E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.2E-06	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Aroclor-1260	4.40	mg/kg	1.2E-06	(mg/kg/day)	2.0E+00	(mg/kg/day)$^{-1}$	2.3E-06	3.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-05					0.1
		Exposure Point Total									1.3E-04					0.9
	Exposure Medium Total										1.3E-04					0.9
	Air	Surface Soil (future)	Inhalation	2,3,7,8-TCDD Equivalents	8.1E-15	mg/m^3	2.7E-15	(mg/m^3)	3.8E+01	(ug/m^3)$^{-1}$	1.0E-10	7.8E-15	(mg/m^3)	4.0E-08	(mg/m^3)	0.0000002
				Arsenic	1.3E-8	mg/m^3	4.3E-09	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.8E-08	1.2E-08	(mg/m^3)	1.5E-05	(mg/m^3)	0.0008
				Cadmium	1.2E-9	mg/m^3	3.9E-10	(mg/m^3)	1.8E-03	(ug/m^3)$^{-1}$	7.0E-10	1.1E-09	(mg/m^3)	2.0E-05	(mg/m^3)	0.00006
				Lead	4.6E-8	mg/m^3	1.5E-08	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	4.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	3.0E-10	mg/m^3	9.9E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.9E-10	(mg/m^3)	3.0E-05	(mg/m^3)	0.000010
				Zinc	3.2E-7	mg/m^3	1.0E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	3.3E-11	mg/m^3	2.0E-11	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	2.2E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Aroclor-1260	4.0E-10	mg/m^3	1.3E-10	(mg/m^3)	5.7E-04	(ug/m^3)$^{-1}$	7.5E-11	3.8E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.9E-08					0.0009
		Exposure Point Total									1.9E-08					0.0009
	Exposure Medium Total										1.9E-08					0.0009
Medium Total											1.3E-04					0.9
Subsurface Soil	Subsurface Soil	Subsurface Soil	Ingestion	Aluminum	4,820	mg/kg	2.3E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.6E-03	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.007
				Arsenic	110	mg/kg	5.2E-05	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	7.7E-05	1.5E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.5
				Cobalt	18.9	mg/kg	8.9E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.6E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.09
				Iron	9,742	mg/kg	4.6E-03	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-02	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.02
				Manganese	122	mg/kg	5.7E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.7E-04	(mg/kg/day)	2.4E-02	(mg/kg/day)	0.007
				Vanadium	27.4	mg/kg	1.3E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.8E-05	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.008
				Benzo(a)pyrene Equivalents	0.480	mg/kg	4.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	3.0E-06	6.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.1E-05					0.6
			Dermal	Aluminum	4,820	mg/kg	9.0E-05	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.6E-04	(mg/kg/day)	1.0E+00	(mg/kg/day)	0.0003
				Arsenic	110	mg/kg	6.2E-06	(mg/kg/day)	1.5E+00	(mg/kg/day)$^{-1}$	9.3E-06	1.8E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.06
				Cobalt	18.9	mg/kg	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				Iron	9,742	mg/kg	1.8E-04	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.3E-04	(mg/kg/day)	7.0E-01	(mg/kg/day)	0.0008
				Manganese	122	mg/kg	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.7E-06	(mg/kg/day)	9.6E-04	(mg/kg/day)	0.007
				Vanadium	27.4	mg/kg	5.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-06	(mg/kg/day)	5.0E-03	(mg/kg/day)	0.0003
				Benzo(a)pyrene Equivalents	0.480	mg/kg	2.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.6E-06	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-05					0.07
		Exposure Point Total									9.1E-05					0.7
	Exposure Medium Total										9.1E-05					0.7
	Air	Subsurface Soil	Inhalation	Aluminum	4.4E-7	mg/m^3	1.4E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	4.2E-07	(mg/m^3)	5.0E-03	(mg/m^3)	0.00008
				Arsenic	1.0E-8	mg/m^3	3.3E-09	(mg/m^3)	4.3E-03	(ug/m^3)$^{-1}$	1.4E-08	9.6E-09	(mg/m^3)	1.5E-05	(mg/m^3)	0.0006
				Cobalt	1.7E-9	mg/m^3	5.6E-10	(mg/m^3)	9.0E-03	(ug/m^3)$^{-1}$	5.1E-09	1.6E-09	(mg/m^3)	6.0E-06	(mg/m^3)	0.0003
				Iron	8.9E-7	mg/m^3	2.9E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	8.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Manganese	1.1E-8	mg/m^3	3.6E-09	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.1E-08	(mg/m^3)	5.0E-05	(mg/m^3)	0.0002
				Vanadium	2.5E-9	mg/m^3	8.2E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene Equivalents	4.4E-11	mg/m^3	2.6E-11	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	2.9E-11	4.2E-11	(mg/m^3)	NA	(mg/m^3)	--

TABLE 7.12.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD/RfC Value	RfD/RfC Units	Hazard Quotient
			Exp. Route Total								1.9E-08					0.001
		Exposure Point Total									1.9E-08					0.001
	Exposure Medium Total										1.9E-08					0.001
Medium Total											9.1E-05					0.7
Groundwater	Groundwater	Upgradient	Ingestion	Arsenic	3.90	ug/L	3.7E-05	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	5.5E-05	1.1E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.4
				Beryllium	8.20	ug/L	7.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.1
				Cobalt	612	ug/L	5.7E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-02	(mg/kg/day)	3.0E-04	(mg/kg/day)	56
				Tetrachloroethene	0.730	ug/L	6.9E-06	(mg/kg/day)	5.4E-01	$(mg/kg/day)^{-1}$	3.7E-06	2.0E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.002
				Trichloroethene (Mutagenic)	54.600	ug/L	9.4E-04	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	8.7E-06	1.5E-03	(mg/kg/day)	NA	(mg/kg/day)	0.000
				Trichloroethene (Nonmutagenic)	54.6	ug/L	5.1E-04	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.9E-05	1.5E-03	(mg/kg/day)	5.0E-04	(mg/kg/day)	3.0
			Exp. Route Total								8.6E-05					59
			Dermal	Arsenic	3.90	ug/L	1.9E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.9E-07	5.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				Beryllium	8.20	ug/L	4.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-06	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.08
				Cobalt	612	ug/L	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.1
				Tetrachloroethene	0.730	ug/L	4.1E-06	(mg/kg/day)	5.4E-01	$(mg/kg/day)^{-1}$	2.2E-06	1.2E-05	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.001
				Trichloroethene (Mutagenic)	54.600	ug/L	1.6E-04	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	1.5E-06	2.5E-04	(mg/kg/day)	NA	(mg/kg/day)	0.000
				Trichloroethene (Nonmutagenic)	54.6	ug/L	8.6E-05	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	3.2E-06	2.5E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.5
			Exp. Route Total								7.2E-06					0.7
		Exposure Point Total									9.3E-05					60
	Exposure Medium Total										9.3E-05					60
	Air	Upgradient	Inhalation	Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Beryllium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	6.0E-06	(mg/m^3)	--
				Tetrachloroethene	0.001	mg/m^3	1.4E-05	(mg/m^3)	5.9E-06	$(ug/m^3)^{-1}$	8.3E-08	4.1E-05	(mg/m^3)	2.7E-01	(mg/m^3)	0.0002
				Trichloroethene (Mutagenic)	0.085	mg/m^3	2.1E-03	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	2.1E-06	3.4E-03	(mg/m^3)	NA	(mg/m^3)	0.0000
				Trichloroethene (Nonmutagenic)	0.085	mg/m^3	1.2E-03	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	3.6E-06	3.4E-03	(mg/m^3)	2.0E-03	(mg/m^3)	1.7
			Exp. Route Total								5.8E-06					1.7
		Exposure Point Total									5.8E-06					1.7
	Exposure Medium Total										5.8E-06					1.7
Medium Total											9.9E-05					62
Groundwater	Groundwater	Downgradient	Ingestion	Arsenic	15.5	ug/L	1.5E-04	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-04	4.2E-04	(mg/kg/day)	3.0E-04	(mg/kg/day)	1.4
				Beryllium	3.90	ug/L	3.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	2.0E-03	(mg/kg/day)	0.05
				Cobalt	219	ug/L	2.1E-03	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-03	(mg/kg/day)	3.0E-04	(mg/kg/day)	20
				Tetrachloroethene	0.290	ug/L	2.7E-06	(mg/kg/day)	5.4E-01	$(mg/kg/day)^{-1}$	1.5E-06	7.9E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0008
				Trichloroethene (Mutagenic)	28.200	ug/L	4.9E-04	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	4.5E-06	7.7E-04	(mg/kg/day)	NA	(mg/kg/day)	0.0000
				Trichloroethene (Nonmutagenic)	28.2	ug/L	2.6E-04	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	9.7E-06	7.7E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	1.5
			Exp. Route Total								2.3E-04					23
			Dermal	Arsenic	15.5	ug/L	7.6E-07	(mg/kg/day)	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-06	2.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				Beryllium	3.90	ug/L	1.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-07	(mg/kg/day)	1.4E-05	(mg/kg/day)	0.04
				Cobalt	219	ug/L	4.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.04
				Tetrachloroethene	0.290	ug/L	1.6E-06	(mg/kg/day)	5.4E-01	$(mg/kg/day)^{-1}$	8.9E-07	4.8E-06	(mg/kg/day)	1.0E-02	(mg/kg/day)	0.0005
				Trichloroethene (Mutagenic)	28.200	ug/L	8.2E-05	(mg/kg/day)	9.3E-03	$(mg/kg/day)^{-1}$	7.6E-07	1.3E-04	(mg/kg/day)	NA	(mg/kg/day)	0.0000
				Trichloroethene (Nonmutagenic)	28.2	ug/L	4.5E-05	(mg/kg/day)	3.7E-02	$(mg/kg/day)^{-1}$	1.6E-06	1.3E-04	(mg/kg/day)	5.0E-04	(mg/kg/day)	0.3
			Exp. Route Total								4.4E-06					0.3
		Exposure Point Total									2.4E-04					23
	Exposure Medium Total										2.4E-04					23
	Air	Downgradient	Inhalation	Arsenic	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	4.3E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	1.5E-05	(mg/m^3)	--
				Beryllium	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	2.4E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	2.0E-05	(mg/m^3)	--
				Cobalt	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	9.0E-03	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	6.0E-06	(mg/m^3)	--
				Tetrachloroethene	4.1E-4	mg/m^3	5.6E-06	(mg/m^3)	5.9E-06	$(ug/m^3)^{-1}$	3.3E-08	1.6E-05	(mg/m^3)	2.7E-01	(mg/m^3)	0.00006
				Trichloroethene (Mutagenic)	4.4E-2	mg/m^3	1.1E-03	(mg/m^3)	1.0E-06	$(ug/m^3)^{-1}$	1.1E-06	1.8E-03	(mg/m^3)	NA	(mg/m^3)	0.00000
				Trichloroethene (Nonmutagenic)	0.044	mg/m^3	6.0E-04	(mg/m^3)	3.1E-06	$(ug/m^3)^{-1}$	1.9E-06	1.8E-03	(mg/m^3)	2.0E-03	(mg/m^3)	0.9
			Exp. Route Total								3.0E-06					0.9
		Exposure Point Total									3.0E-06					0.9

TABLE 7.12.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
	Exposure Medium Total										3.0E-06					0.9
Medium Total											2.4E-04					24
										Total of Receptor Risks Across All Media	7.3E-04				Total of Receptor Hazards Across All Media	89

RAGS Part D Table 9

Summary of Receptor Risks and Hazards for COPCs

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RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	8E-06	--	7E-07	--	9E-06	Skin, CVS	1	--	0.1	1
			Cadmium	- -	--	- -	--	- -	Kidney	0.006	--	0.0007	0.007
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	1E-07	--	5E-08	--	2E-07	NA	--	--	--	--
			Aroclor-1260	2E-08	--	1E-08	--	3E-08	NA	--	--	--	--
			Chemical Total	8E-06	--	8E-07	--	9E-06		1	--	0.1	1
		Exposure Point Total						9E-06					1
	Exposure Medium Total							9E-06					1
	Air	Surface Soil (current)	Arsenic	--	1E-06	--	--	1E-06	NA	--	1	--	1
			Cadmium	--	7E-09	--	--	7E-09	None Reported	--	0.01	--	0.01
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	9E-10	--	--	9E-10	NA	--	--	--	--
			Aroclor-1260	--	3E-10	--	--	3E-10	NA	--	--	--	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	1	- -	1
		Exposure Point Total						1E-06					1
	Exposure Medium Total							1E-06					1
Medium Total								1E-05					3
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	5E-07	--	5E-08	--	6E-07	Developmental	0.01	--	0.001	0.02
			Arsenic	5E-06	--	4E-07	--	5E-06	Skin, CVS	0.7	--	0.07	0.8
			Cadmium	- -	--	- -	--	- -	Kidney	0.2	--	0.03	0.2
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.005	--	0.002	0.008
			Zinc	- -	--	- -	--	- -	Blood	0.04	--	0.001	0.04
			Aroclor-1260	7E-07	--	3E-07	--	1E-06	NA	--	--	--	--
			Chemical Total	6E-06	--	8E-07	--	7E-06		1	--	0.10	1
		Exposure Point Total						7E-06					1
	Exposure Medium Total							7E-06					1
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	8E-09	--	--	8E-09	NA	--	0.0004	--	0.0004
			Arsenic	--	7E-07	--	--	7E-07	NA	--	0.7	--	0.7
			Cadmium	--	3E-07	--	--	3E-07	None Reported	--	0.6	--	0.6
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.02	--	0.02
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	1E-08	--	--	1E-08	NA	--	--	--	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	1	- -	1
		Exposure Point Total						1E-06					1
	Exposure Medium Total							1E-06					1
Medium Total								8E-06					2
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	5E-07	--	5E-08	--	6E-07	Developmental	0.01	--	0.001	0.02
			Arsenic	1E-05	--	9E-07	--	1E-05	Skin, CVS	2	--	0.1	2
			Cadmium	- -	--	- -	--	- -	Kidney	0.04	--	0.005	0.05
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.005	--	0.002	0.008
			Zinc	- -	--	- -	--	- -	Blood	0.04	--	0.001	0.04
			Benzo(a)pyrene Equivalents	1E-07	--	5E-08	--	2E-07	NA	--	--	--	--
			Aroclor-1260	4E-07	--	2E-07	--	6E-07	NA	--	--	--	--
			Chemical Total	1E-05	--	1E-06	--	1E-05		2	--	0.1	2
		Exposure Point Total						1E-05					2
	Exposure Medium Total							1E-05					2
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	8E-09	--	--	8E-09	NA	--	0.0004	--	0.0004

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Arsenic	--	1E-06	--	--	1E-06	NA	--	2	--	2
			Cadmium	--	5E-08	--	--	5E-08	None Reported	--	0.1	--	0.1
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.02	--	0.02
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	9E-10	--	--	9E-10	NA	--	--	--	--
			Aroclor-1260	--	6E-09	--	--	6E-09	NA	--	--	--	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	2	- -	2
		Exposure Point Total						1E-06					2
	Exposure Medium Total							1E-06					2
Medium Total								1E-05					3
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	8E-06	--	7E-07	--	8E-06	Skin, CVS	1	--	0.1	1
			Benzo(a)pyrene Equivalents	2E-07	--	6E-08	--	2E-07	NA	--	--	--	--
			Chemical Total	8E-06	--	7E-07	--	9E-06		1	--	0.1	1
		Exposure Point Total						9E-06					1
	Exposure Medium Total							9E-06					1
	Air	Subsurface Soil	Arsenic	--	1E-06	--	--	1E-06	NA	--	1	--	1
			Benzo(a)pyrene Equivalents	--	1E-09	--	--	1E-09	NA	--	--	--	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	1	- -	1
		Exposure Point Total						1E-06					1
	Exposure Medium Total							1E-06					1
Medium Total								1E-05					2
Groundwater	Groundwater	Upgradient	Arsenic	3E-09	--	4E-09	--	7E-09	Skin, CVS	0.0005	--	0.0006	0.001
			Beryllium	- -	--	- -	--	- -	GS	0.00006	--	0.01	0.01
			Cobalt	- -	--	- -	--	- -	Thyroid	0.007	--	0.004	0.01
			Tetrachloroethene	2E-10	--	1E-08	--	1E-08	Liver	0.0000003	--	0.00002	0.00002
			Trichloroethene	1E-09	--	2E-08	--	3E-08	/S, Fetotoxicity, Immu	0.004	--	0.07	0.08
			Chemical Total	4E-09	--	4E-08	--	4E-08		0.01	--	0.09	0.1
		Exposure Point Total						4E-08					0.1
	Exposure Medium Total							4E-08					0.1
	Air	Upgradient	Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Tetrachloroethene	--	7E-11	--	--	7E-11	CNS	--	0.000003	--	0.000003
			Trichloroethene	--	4E-09	--	--	4E-09	CNS	--	0.0001	--	0.0001
			Chemical Total	--	4E-09	--	--	4E-09		- -	0.0001	- -	0.0001
		Exposure Point Total						4E-09					0.0001
	Exposure Medium Total							4E-09					0.0001
Medium Total								4E-08					0.1
Groundwater	Groundwater	Downgradient	Arsenic	1E-08	--	2E-08	--	3E-08	Skin, CVS	0.002	--	0.002	0.004
			Beryllium	- -	--	- -	--	- -	GS	0.00003	--	0.005	0.005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.003	--	0.001	0.004
			Tetrachloroethene	8E-11	--	5E-09	--	5E-09	Liver	0.0000001	--	0.000006	0.000006
			Trichloroethene	7E-10	--	1E-08	--	1E-08	/S, Fetotoxicity, Immu	0.002	--	0.04	0.04
			Chemical Total	1E-08	--	3E-08	--	5E-08		0.006	--	0.05	0.05
		Exposure Point Total						5E-08					0.05
	Exposure Medium Total							5E-08					0.05
	Air	Downgradient	Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Tetrachloroethene	--	3E-11	--	--	3E-11	CNS	--	0.000001	--	0.000001
			Trichloroethene	--	2E-09	--	--	2E-09	CNS	--	0.0001	--	0.0001
			Chemical Total	--	2E-09	--	--	2E-09		- -	0.0001	- -	0.0001
		Exposure Point Total						2E-09					0.0001
	Exposure Medium Total							2E-09					0.0001
Medium Total								5E-08					0.05

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk: Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Non-Carcinogenic Hazard Quotient: Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	6E-05	--	1E-05	--	7E-05	Skin, CVS	0.4	--	0.07	0.4
			Cadmium	- -	--	- -	--	- -	Kidney	0.002	--	0.0005	0.002
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	9E-07	--	8E-07	--	2E-06	NA	--	--	--	--
			Aroclor-1260	2E-07	--	2E-07	--	3E-07	NA	--	--	--	--
			Chemical Total	6E-05	--	1E-05	--	7E-05		0.4	--	0.07	0.4
		Exposure Point Total						7E-05					0.4
	Exposure Medium Total							7E-05					0.4
	Air	Surface Soil (current)	Arsenic	--	1E-08	--	--	1E-08	NA	--	0.0005	--	0.0005
			Cadmium	--	8E-11	--	--	8E-11	None Reported	--	0.000006	--	0.000006
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Aroclor-1260	--	4E-12	--	--	4E-12	NA	--	--	--	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0005	- -	0.0005
		Exposure Point Total						1E-08					0.0005
	Exposure Medium Total							1E-08					0.0005
Medium Total								7E-05					0.4
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	4E-06	--	8E-07	--	5E-06	Developmental	0.09	--	0.02	0.1
			Arsenic	4E-05	--	7E-06	--	4E-05	Skin, CVS	0.2	--	0.04	0.3
			Cadmium	- -	--	- -	--	- -	Kidney	0.07	--	0.02	0.09
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.01	--	0.01	0.02
			Zinc	- -	--	- -	--	- -	Blood	0.01	--	0.0008	0.01
			Aroclor-1260	6E-06	--	5E-06	--	1E-05	NA	--	--	--	--
			Chemical Total	5E-05	--	1E-05	--	6E-05		0.4	--	0.09	0.5
		Exposure Point Total						6E-05					0.5
	Exposure Medium Total							6E-05					0.5
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	9E-11	--	--	9E-11	NA	--	0.0000002	--	0.0000002
			Arsenic	--	7E-09	--	--	7E-09	NA	--	0.0003	--	0.0003
			Cadmium	--	3E-09	--	--	3E-09	None Reported	--	0.0002	--	0.0002
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.000008	--	0.000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	1E-10	--	--	1E-10	NA	--	--	--	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0006	- -	0.0006
		Exposure Point Total						1E-08					0.0006
	Exposure Medium Total							1E-08					0.0006
Medium Total								6E-05					0.5
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	4E-06	--	8E-07	--	5E-06	Developmental	0.09	--	0.02	0.1
			Arsenic	7E-05	--	1E-05	--	9E-05	Skin, CVS	0.5	--	0.09	0.6
			Cadmium	- -	--	- -	--	- -	Kidney	0.01	--	0.003	0.02
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.01	--	0.01	0.02
			Zinc	- -	--	- -	--	- -	Blood	0.01	--	0.0008	0.01
			Benzo(a)pyrene Equivalents	9E-07	--	8E-07	--	2E-06	NA	--	--	--	--
			Aroclor-1260	3E-06	--	3E-06	--	6E-06	NA	--	--	--	--
			Chemical Total	8E-05	--	2E-05	--	1E-04		0.6	--	0.1	0.7
		Exposure Point Total						1E-04					0.7
	Exposure Medium Total							1E-04					0.7
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	9E-11	--	--	9E-11	NA	--	0.0000002	--	0.0000002

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Arsenic	--	2E-08	--	--	2E-08	NA	--	0.0007	--	0.0007
			Cadmium	--	6E-10	--	--	6E-10	None Reported	--	0.00005	--	0.00005
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.000008	--	0.000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Aroclor-1260	--	6E-11	--	--	6E-11	NA	--	--	--	--
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.0007	- -	0.0007
		Exposure Point Total						2E-08					0.0007
	Exposure Medium Total							2E-08					0.0007
Medium Total								1E-04					0.7
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	6E-05	--	1E-05	--	7E-05	Skin, CVS	0.4	--	0.07	0.4
			Benzo(a)pyrene Equivalents	1E-06	--	1E-06	--	2E-06	NA	--	--	--	--
			Chemical Total	6E-05	--	1E-05	--	7E-05		0.4	--	0.07	0.4
		Exposure Point Total						7E-05					0.4
	Exposure Medium Total							7E-05					0.4
	Air	Subsurface Soil	Arsenic	--	1E-08	--	--	1E-08	NA	--	0.0005	--	0.0005
			Benzo(a)pyrene Equivalents	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0005	- -	0.0005
		Exposure Point Total						1E-08					0.0005
	Exposure Medium Total							1E-08					0.0005
Medium Total								7E-05					0.4

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	3E-05	--	2E-06	--	3E-05	Skin, CVS	0.7	--	0.06	0.8
			Cadmium	- -	--	- -	--	- -	Kidney	0.003	--	0.0004	0.004
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	2E-06	--	8E-07	--	3E-06	NA	--	--	--	--
			Aroclor-1260	8E-08	--	3E-08	--	1E-07	NA	--	--	--	--
			Chemical Total	3E-05	--	3E-06	--	3E-05		0.7	--	0.06	0.8
		Exposure Point Total						3E-05					0.8
	Exposure Medium Total							3E-05					0.8
	Air	Surface Soil (current)	Arsenic	--	3E-10	--	--	3E-10	NA	--	0.00006	--	0.00006
			Cadmium	--	2E-12	--	--	2E-12	None Reported	--	0.0000007	--	0.0000007
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Aroclor-1260	--	9E-14	--	--	9E-14	NA	--	--	--	--
			Chemical Total	--	3E-10	--	--	3E-10		- -	0.00006	- -	0.00006
		Exposure Point Total						3E-10					0.00006
	Exposure Medium Total							3E-10					0.00006
Medium Total								3E-05					0.8
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	2E-06	--	2E-07	--	2E-06	Developmental	0.2	--	0.01	0.2
			Arsenic	2E-05	--	1E-06	--	2E-05	Skin, CVS	0.4	--	0.04	0.5
			Cadmium	- -	--	- -	--	- -	Kidney	0.1	--	0.01	0.1
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.02	--	0.008	0.03
			Zinc	- -	--	- -	--	- -	Blood	0.02	--	0.0006	0.02
			Aroclor-1260	3E-06	--	1E-06	--	4E-06	NA	--	--	--	--
			Chemical Total	2E-05	--	3E-06	--	2E-05		0.8	--	0.07	0.8
		Exposure Point Total						2E-05					0.8
	Exposure Medium Total							2E-05					0.8
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	2E-12	--	--	2E-12	NA	--	0.00000002	--	0.00000002
			Arsenic	--	2E-10	--	--	2E-10	NA	--	0.00003	--	0.00003
			Cadmium	--	8E-11	--	--	8E-11	None Reported	--	0.00003	--	0.00003
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.0000008	--	0.0000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	3E-12	--	--	3E-12	NA	--	--	--	--
			Chemical Total	--	3E-10	--	--	3E-10		- -	0.00006	- -	0.00006
		Exposure Point Total						3E-10					0.00006
	Exposure Medium Total							3E-10					0.00006
Medium Total								2E-05					0.8
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	2E-06	--	2E-07	--	2E-06	Developmental	0.2	--	0.01	0.2
			Arsenic	3E-05	--	3E-06	--	4E-05	Skin, CVS	0.9	--	0.08	1.0
			Cadmium	- -	--	- -	--	- -	Kidney	0.02	--	0.003	0.03
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.02	--	0.008	0.03
			Zinc	- -	--	- -	--	- -	Blood	0.02	--	0.0006	0.02
			Benzo(a)pyrene Equivalents	2E-06	--	8E-07	--	3E-06	NA	--	--	--	--
			Aroclor-1260	1E-06	--	6E-07	--	2E-06	NA	--	--	--	--
			Chemical Total	4E-05	--	4E-06	--	5E-05		1	--	0.1	1
		Exposure Point Total						5E-05					1
	Exposure Medium Total							5E-05					1
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	2E-12	--	--	2E-12	NA	--	0.00000002	--	0.00000002

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Arsenic	--	4E-10	--	--	4E-10	NA	--	0.00007	--	0.00007
			Cadmium	--	1E-11	--	--	1E-11	None Reported	--	0.000005	--	0.000005
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.0000008	--	0.0000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Aroclor-1260	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Chemical Total	--	4E-10	--	--	4E-10		- -	0.00008	- -	0.00008
		Exposure Point Total						4E-10					0.00008
	Exposure Medium Total							4E-10					0.00008
Medium Total								5E-05					1
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	3E-05	--	2E-06	--	3E-05	Skin, CVS	0.7	--	0.06	0.8
			Benzo(a)pyrene Equivalents	3E-06	--	1E-06	--	4E-06	NA	--	--	--	--
			Chemical Total	3E-05	--	3E-06	--	3E-05		0.7	--	0.06	0.8
		Exposure Point Total						3E-05					0.8
	Exposure Medium Total							3E-05					0.8
	Air	Subsurface Soil	Arsenic	--	3E-10	--	--	3E-10	NA	--	0.00005	--	0.00005
			Benzo(a)pyrene Equivalents	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Chemical Total	--	3E-10	--	--	3E-10		- -	0.00005	- -	0.00005
		Exposure Point Total						3E-10					0.00005
	Exposure Medium Total							3E-10					0.00005
Medium Total								3E-05					0.8

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	1E-05	--	1E-06	--	1E-05	Skin, CVS	0.08	--	0.009	0.09
			Cadmium	- -	--	- -	--	- -	Kidney	0.0004	--	0.00006	0.0004
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	3E-07	--	2E-07	--	5E-07	NA	--	--	--	--
			Aroclor-1260	3E-08	--	2E-08	--	5E-08	NA	--	--	--	--
			Chemical Total	1E-05	--	2E-06	--	1E-05		0.08	--	0.009	0.09
		Exposure Point Total						1E-05					0.09
	Exposure Medium Total							1E-05					0.09
	Air	Surface Soil (current)	Arsenic	--	1E-09	--	--	1E-09	NA	--	0.00006	--	0.00006
			Cadmium	--	8E-12	--	--	8E-12	None Reported	--	0.0000007	--	0.0000007
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Aroclor-1260	--	4E-13	--	--	4E-13	NA	--	--	--	--
			Chemical Total	--	1E-09	--	--	1E-09		- -	0.00006	- -	0.00006
		Exposure Point Total						1E-09					0.00006
	Exposure Medium Total							1E-09					0.00006
Medium Total								1E-05					0.09
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	8E-07	--	1E-07	--	9E-07	Developmental	0.02	--	0.002	0.02
			Arsenic	7E-06	--	9E-07	--	8E-06	Skin, CVS	0.05	--	0.006	0.05
			Cadmium	- -	--	- -	--	- -	Kidney	0.01	--	0.002	0.02
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.002	--	0.001	0.004
			Zinc	- -	--	- -	--	- -	Blood	0.002	--	0.00009	0.002
			Aroclor-1260	1E-06	--	6E-07	--	2E-06	NA	--	--	--	--
			Chemical Total	9E-06	--	2E-06	--	1E-05		0.08	--	0.01	0.09
		Exposure Point Total						1E-05					0.09
	Exposure Medium Total							1E-05					0.09
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	9E-12	--	--	9E-12	NA	--	0.00000002	--	0.00000002
			Arsenic	--	7E-10	--	--	7E-10	NA	--	0.00003	--	0.00003
			Cadmium	--	3E-10	--	--	3E-10	None Reported	--	0.00003	--	0.00003
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.0000008	--	0.0000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Chemical Total	--	1E-09	--	--	1E-09		- -	0.00006	- -	0.00006
		Exposure Point Total						1E-09					0.00006
	Exposure Medium Total							1E-09					0.00006
Medium Total								1E-05					0.09
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	8E-07	--	1E-07	--	9E-07	Developmental	0.02	--	0.002	0.02
			Arsenic	1E-05	--	2E-06	--	2E-05	Skin, CVS	0.10	--	0.01	0.1
			Cadmium	- -	--	- -	--	- -	Kidney	0.003	--	0.0004	0.003
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.002	--	0.001	0.004
			Zinc	- -	--	- -	--	- -	Blood	0.002	--	0.00009	0.002
			Benzo(a)pyrene Equivalents	3E-07	--	2E-07	--	5E-07	NA	--	--	--	--
			Aroclor-1260	6E-07	--	3E-07	--	1E-06	NA	--	--	--	--
			Chemical Total	2E-05	--	2E-06	--	2E-05		0.1	--	0.02	0.1
		Exposure Point Total						2E-05					0.1
	Exposure Medium Total							2E-05					0.1
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	9E-12	--	--	9E-12	NA	--	0.00000002	--	0.00000002

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Arsenic	--	2E-09	--	--	2E-09	NA	--	0.00007	--	0.00007
			Cadmium	--	6E-11	--	--	6E-11	None Reported	--	0.000005	--	0.000005
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.0000008	--	0.0000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Aroclor-1260	--	6E-12	--	--	6E-12	NA	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		- -	0.00008	- -	0.00008
		Exposure Point Total						2E-09					0.00008
	Exposure Medium Total							2E-09					0.00008
Medium Total								2E-05					0.1
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	1E-05	--	1E-06	--	1E-05	Skin, CVS	0.07	--	0.009	0.08
			Benzo(a)pyrene Equivalents	4E-07	--	2E-07	--	7E-07	NA	--	--	--	--
			Chemical Total	1E-05	--	2E-06	--	1E-05		0.07	--	0.009	0.08
		Exposure Point Total						1E-05					0.08
	Exposure Medium Total							1E-05					0.08
	Air	Subsurface Soil	Arsenic	--	1E-09	--	--	1E-09	NA	--	0.00005	--	0.00005
			Benzo(a)pyrene Equivalents	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Chemical Total	--	1E-09	--	--	1E-09		- -	0.00005	- -	0.00005
		Exposure Point Total						1E-09					0.00005
	Exposure Medium Total							1E-09					0.00005
Medium Total								1E-05					0.08

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Lifelong

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	4E-05	--	4E-06	--	4E-05
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Benzo(a)pyrene Equivalents	3E-06	--	1E-06	--	4E-06
			Aroclor-1260	1E-07	--	5E-08	--	2E-07
			Chemical Total	4E-05	--	5E-06	--	5E-05
		Exposure Point Total						5E-05
	Exposure Medium Total							5E-05
	Air	Surface Soil (current)	Arsenic	--	2E-09	--	--	2E-09
			Cadmium	--	1E-11	--	--	1E-11
			Lead	--	- -	--	--	- -
			Benzo(a)pyrene Equivalents	--	3E-12	--	--	3E-12
			Aroclor-1260	--	4E-13	--	--	4E-13
			Chemical Total	--	2E-09	--	--	2E-09
		Exposure Point Total						2E-09
	Exposure Medium Total							2E-09
Medium Total								5E-05
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	3E-06	--	3E-07	--	3E-06
			Arsenic	2E-05	--	2E-06	--	3E-05
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			Zinc	- -	--	- -	--	- -
			Aroclor-1260	4E-06	--	2E-06	--	5E-06
			Chemical Total	3E-05	--	4E-06	--	3E-05
		Exposure Point Total						3E-05
	Exposure Medium Total							3E-05
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	1E-11	--	--	1E-11
			Arsenic	--	9E-10	--	--	9E-10
			Cadmium	--	4E-10	--	--	4E-10
			Lead	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			Zinc	--	- -	--	--	- -
			Aroclor-1260	--	1E-11	--	--	1E-11
			Chemical Total	--	1E-09	--	--	1E-09
		Exposure Point Total						1E-09
	Exposure Medium Total							1E-09
Medium Total								3E-05
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	3E-06	--	3E-07	--	3E-06
			Arsenic	5E-05	--	5E-06	--	5E-05
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			Zinc	- -	--	- -	--	- -
			Benzo(a)pyrene Equivalents	3E-06	--	1E-06	--	4E-06
			Aroclor-1260	2E-06	--	9E-07	--	3E-06
			Chemical Total	6E-05	--	7E-06	--	6E-05
		Exposure Point Total						6E-05
	Exposure Medium Total							6E-05
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	1E-11	--	--	1E-11

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Lifelong

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
			Arsenic	--	2E-09	--	--	2E-09
			Cadmium	--	7E-11	--	--	7E-11
			Lead	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			Zinc	--	- -	--	--	- -
			Benzo(a)pyrene Equivalents	--	3E-12	--	--	3E-12
			Aroclor-1260	--	8E-12	--	--	8E-12
			Chemical Total	--	2E-09	--	--	2E-09
		Exposure Point Total						2E-09
	Exposure Medium Total							2E-09
Medium Total								6E-05
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	4E-05	--	4E-06	--	4E-05
			Benzo(a)pyrene Equivalents	3E-06	--	1E-06	--	5E-06
			Chemical Total	4E-05	--	5E-06	--	5E-05
		Exposure Point Total						5E-05
	Exposure Medium Total							5E-05
	Air	Subsurface Soil	Arsenic	--	1E-09	--	--	1E-09
			Benzo(a)pyrene Equivalents	--	4E-12	--	--	4E-12
			Chemical Total	--	1E-09	--	--	1E-09
		Exposure Point Total						1E-09
	Exposure Medium Total							1E-09
Medium Total								5E-05

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	2E-04	--	2E-05	--	2E-04	Skin, CVS	5	--	0.4	5
			Cadmium	- -	--	- -	--	- -	Kidney	0.02	--	0.003	0.03
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	1E-05	--	5E-06	--	2E-05	NA	--	--	--	--
			Aroclor-1260	5E-07	--	2E-07	--	8E-07	NA	--	--	--	--
			Chemical Total	2E-04	--	2E-05	--	2E-04		5	--	0.4	5
		Exposure Point Total						2E-04					5
	Exposure Medium Total							2E-04					5
	Air	Surface Soil (current)	Arsenic	--	4E-09	--	--	4E-09	NA	--	0.0007	--	0.0007
			Cadmium	--	2E-11	--	--	2E-11	None Reported	--	0.000008	--	0.000008
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Aroclor-1260	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Chemical Total	--	4E-09	--	--	4E-09		- -	0.0007	- -	0.0007
		Exposure Point Total						4E-09					0.0007
	Exposure Medium Total							4E-09					0.0007
Medium Total								2E-04					5
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	1E-05	--	1E-06	--	1E-05	Developmental	1	--	0.10	1
			Arsenic	1E-04	--	9E-06	--	1E-04	Skin, CVS	3	--	0.2	3
			Cadmium	- -	--	- -	--	- -	Kidney	0.9	--	0.10	1.0
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.1	--	0.06	0.2
			Zinc	- -	--	- -	--	- -	Blood	0.1	--	0.004	0.2
			Aroclor-1260	2E-05	--	7E-06	--	2E-05	NA	--	--	--	--
			Chemical Total	1E-04	--	2E-05	--	2E-04		5	--	0.5	6
		Exposure Point Total						2E-04					6
	Exposure Medium Total							2E-04					6
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	3E-11	--	--	3E-11	NA	--	0.0000002	--	0.0000002
			Arsenic	--	2E-09	--	--	2E-09	NA	--	0.0004	--	0.0004
			Cadmium	--	9E-10	--	--	9E-10	None Reported	--	0.0003	--	0.0003
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.000010	--	0.000010
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	3E-11	--	--	3E-11	NA	--	--	--	--
			Chemical Total	--	3E-09	--	--	3E-09		- -	0.0007	- -	0.0007
		Exposure Point Total						3E-09					0.0007
	Exposure Medium Total							3E-09					0.0007
Medium Total								2E-04					6
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	1E-05	--	1E-06	--	1E-05	Developmental	1	--	0.10	1
			Arsenic	2E-04	--	2E-05	--	3E-04	Skin, CVS	6	--	0.5	7
			Cadmium	- -	--	- -	--	- -	Kidney	0.2	--	0.02	0.2
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.1	--	0.06	0.2
			Zinc	- -	--	- -	--	- -	Blood	0.1	--	0.004	0.2
			Benzo(a)pyrene Equivalents	2E-05	--	6E-06	--	2E-05	NA	--	--	--	--
			Aroclor-1260	1E-05	--	4E-06	--	1E-05	NA	--	--	--	--
			Chemical Total	3E-04	--	3E-05	--	3E-04		8	--	0.7	8
		Exposure Point Total						3E-04					8
	Exposure Medium Total							3E-04					8
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	3E-11	--	--	3E-11	NA	--	0.0000002	--	0.0000002

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk: Ingestion	Carcinogenic Risk: Inhalation	Carcinogenic Risk: Dermal	Carcinogenic Risk: External (Radiation)	Carcinogenic Risk: Exposure Routes Total	Non-Carcinogenic Hazard Quotient: Primary Target Organ(s)	Non-Carcinogenic Hazard Quotient: Ingestion	Non-Carcinogenic Hazard Quotient: Inhalation	Non-Carcinogenic Hazard Quotient: Dermal	Non-Carcinogenic Hazard Quotient: Exposure Routes Total
			Arsenic	--	5E-09	--	--	5E-09	NA	--	0.0008	--	0.0008
			Cadmium	--	2E-10	--	--	2E-10	None Reported	--	0.00006	--	0.00006
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.000010	--	0.000010
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Aroclor-1260	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Chemical Total	--	5E-09	--	--	5E-09		- -	0.0009	- -	0.0009
		Exposure Point Total						5E-09					0.0009
	Exposure Medium Total							5E-09					0.0009
Medium Total								3E-04					8
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	2E-04	--	2E-05	--	2E-04	Skin, CVS	5	--	0.4	5
			Benzo(a)pyrene Equivalents	2E-05	--	7E-06	--	3E-05	NA	--	--	--	--
			Chemical Total	2E-04	--	2E-05	--	2E-04		5	--	0.4	5
		Exposure Point Total						2E-04					5
	Exposure Medium Total							2E-04					5
	Air	Subsurface Soil	Arsenic	--	4E-09	--	--	4E-09	NA	--	0.0006	--	0.0006
			Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Chemical Total	--	4E-09	--	--	4E-09		- -	0.0006	- -	0.0006
		Exposure Point Total						4E-09					0.0006
	Exposure Medium Total							4E-09					0.0006
Medium Total								2E-04					5
Groundwater	Groundwater	Upgradient	Arsenic	3E-05	--	2E-07	--	3E-05	Skin, CVS	0.8	--	0.005	0.8
			Beryllium	- -	--	- -	--	- -	GS	0.3	--	0.2	0.5
			Cobalt	- -	--	- -	--	- -	Thyroid	130	--	0.3	131
			Tetrachloroethene	2E-06	--	1E-06	--	3E-06	Liver	0.005	--	0.003	0.007
			Trichloroethene (Mutagenic)	1E-05	--	2E-06	--	2E-05	0	0.000	--	0.000	0.000
			Trichloroethene (Nonmutagenic	1E-05	--	2E-06	--	1E-05	Liver, Kidney	7	--	1	8
			Chemical Total	6E-05	--	6E-06	--	7E-05		138	--	2	140
		Exposure Point Total						7E-05					140
	Exposure Medium Total							7E-05					140
Medium Total								7E-05					140
Groundwater	Groundwater	Downgradient	Arsenic	1E-04	--	8E-07	--	1E-04	Skin, CVS	3	--	0.02	3
			Beryllium	- -	--	- -	--	- -	GS	0.1	--	0.1	0.2
			Cobalt	- -	--	- -	--	- -	Thyroid	47	--	0.1	47
			Tetrachloroethene	9E-07	--	5E-07	--	1E-06	Liver	0.002	--	0.001	0.003
			Trichloroethene (Mutagenic)	8E-06	--	1E-06	--	9E-06	0	0.000	--	0.000	0.000
			Trichloroethene (Nonmutagenic	6E-06	--	9E-07	--	7E-06	Liver, Kidney	4	--	0.6	4
			Chemical Total	1E-04	--	3E-06	--	1E-04		54	--	0.8	55
		Exposure Point Total						1E-04					55
	Exposure Medium Total							1E-04					55
Medium Total								1E-04					55

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	8E-05	--	1E-05	--	9E-05	Skin, CVS	0.5	--	0.06	0.6
			Cadmium	- -	--	- -	--	- -	Kidney	0.002	--	0.0004	0.003
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	2E-06	--	1E-06	--	3E-06	NA	--	--	--	--
			Aroclor-1260	2E-07	--	1E-07	--	4E-07	NA	--	--	--	--
			Chemical Total	8E-05	--	1E-05	--	9E-05		0.5	--	0.06	0.6
		Exposure Point Total						9E-05					0.6
	Exposure Medium Total							9E-05					0.6
	Air	Surface Soil (current)	Arsenic	--	1E-08	--	--	1E-08	NA	--	0.0007	--	0.0007
			Cadmium	--	1E-10	--	--	1E-10	None Reported	--	0.000008	--	0.000008
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Aroclor-1260	--	4E-12	--	--	4E-12	NA	--	--	--	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0007	- -	0.0007
		Exposure Point Total						1E-08					0.0007
	Exposure Medium Total							1E-08					0.0007
Medium Total								9E-05					0.6
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	5E-06	--	7E-07	--	6E-06	Developmental	0.1	--	0.01	0.1
			Arsenic	5E-05	--	6E-06	--	5E-05	Skin, CVS	0.3	--	0.04	0.3
			Cadmium	- -	--	- -	--	- -	Kidney	0.09	--	0.02	0.1
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.02	--	0.009	0.02
			Zinc	- -	--	- -	--	- -	Blood	0.02	--	0.0006	0.02
			Aroclor-1260	8E-06	--	4E-06	--	1E-05	NA	--	--	--	--
			Chemical Total	6E-05	--	1E-05	--	7E-05		0.6	--	0.08	0.6
		Exposure Point Total						7E-05					0.6
	Exposure Medium Total							7E-05					0.6
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	1E-10	--	--	1E-10	NA	--	0.0000002	--	0.0000002
			Arsenic	--	9E-09	--	--	9E-09	NA	--	0.0004	--	0.0004
			Cadmium	--	4E-09	--	--	4E-09	None Reported	--	0.0003	--	0.0003
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.000010	--	0.000010
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	1E-10	--	--	1E-10	NA	--	--	--	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0007	- -	0.0007
		Exposure Point Total						1E-08					0.0007
	Exposure Medium Total							1E-08					0.0007
Medium Total								7E-05					0.6
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	5E-06	--	7E-07	--	6E-06	Developmental	0.1	--	0.01	0.1
			Arsenic	1E-04	--	1E-05	--	1E-04	Skin, CVS	0.7	--	0.08	0.7
			Cadmium	- -	--	- -	--	- -	Kidney	0.02	--	0.003	0.02
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.02	--	0.009	0.02
			Zinc	- -	--	- -	--	- -	Blood	0.02	--	0.0006	0.02
			Benzo(a)pyrene Equivalents	2E-06	--	1E-06	--	3E-06	NA	--	--	--	--
			Aroclor-1260	4E-06	--	2E-06	--	6E-06	NA	--	--	--	--
			Chemical Total	1E-04	--	2E-05	--	1E-04		0.8	--	0.1	0.9
		Exposure Point Total						1E-04					0.9
	Exposure Medium Total							1E-04					0.9
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	1E-10	--	--	1E-10	NA	--	0.0000002	--	0.0000002

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Arsenic	--	2E-08	--	--	2E-08	NA	--	0.0008	--	0.0008
			Cadmium	--	7E-10	--	--	7E-10	None Reported	--	0.00006	--	0.00006
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.000010	--	0.000010
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Aroclor-1260	--	7E-11	--	--	7E-11	NA	--	--	--	--
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.0009	- -	0.0009
		Exposure Point Total						2E-08					0.0009
	Exposure Medium Total							2E-08					0.0009
Medium Total								1E-04					0.9
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	8E-05	--	9E-06	--	9E-05	Skin, CVS	0.5	--	0.06	0.6
			Benzo(a)pyrene Equivalents	3E-06	--	2E-06	--	5E-06	NA	--	--	--	--
			Chemical Total	8E-05	--	1E-05	--	9E-05		0.5	--	0.06	0.6
		Exposure Point Total						9E-05					0.6
	Exposure Medium Total							9E-05					0.6
	Air	Subsurface Soil	Arsenic	--	1E-08	--	--	1E-08	NA	--	0.0006	--	0.0006
			Benzo(a)pyrene Equivalents	--	3E-11	--	--	3E-11	NA	--	--	--	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0006	- -	0.0006
		Exposure Point Total						1E-08					0.0006
	Exposure Medium Total							1E-08					0.0006
Medium Total								9E-05					0.6
Groundwater	Groundwater	Upgradient	Arsenic	5E-05	--	3E-07	--	6E-05	Skin, CVS	0.4	--	0.002	0.4
			Beryllium	- -	--	- -	--	- -	GS	0.1	--	0.08	0.2
			Cobalt	- -	--	- -	--	- -	Thyroid	56	--	0.1	56
			Tetrachloroethene	4E-06	--	2E-06	--	6E-06	Liver	0.002	--	0.001	0.003
			Trichloroethene (Mutagenic)	9E-06	--	1E-06	--	1E-05	0	0.000	--	0.000	0.000
			Trichloroethene (Nonmutagenic	2E-05	--	3E-06	--	2E-05	Liver, Kidney	3	--	0.5	3
			Chemical Total	9E-05	--	7E-06	--	9E-05		59	--	0.7	60
		Exposure Point Total						9E-05					60
	Exposure Medium Total							9E-05					60
	Air	Upgradient	Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Tetrachloroethene	--	8E-08	--	--	8E-08	CNS	--	0.0002	--	0.0002
			Trichloroethene (Mutagenic)	--	2E-06	--	--	2E-06	0	--	0.0000	--	0.0000
			Trichloroethene (Nonmutagenic	--	4E-06	--	--	4E-06	Liver, Kidney	--	2	--	2
			Chemical Total	--	6E-06	--	--	6E-06		- -	2	- -	2
		Exposure Point Total						6E-06					2
	Exposure Medium Total							6E-06					2
Medium Total								9E-05					60
Groundwater	Groundwater	Downgradient	Arsenic	2E-04	--	1E-06	--	2E-04	Skin, CVS	1	--	0.007	1
			Beryllium	- -	--	- -	--	- -	GS	0.05	--	0.04	0.09
			Cobalt	- -	--	- -	--	- -	Thyroid	20	--	0.04	20
			Tetrachloroethene	1E-06	--	9E-07	--	2E-06	Liver	0.0008	--	0.0005	0.001
			Trichloroethene (Mutagenic)	5E-06	--	8E-07	--	5E-06	0	0.0000	--	0.0000	0.000
			Trichloroethene (Nonmutagenic	1E-05	--	2E-06	--	1E-05	Liver, Kidney	2	--	0.3	2
			Chemical Total	2E-04	--	4E-06	--	2E-04		23	--	0.3	23
		Exposure Point Total						2E-04					23

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Exposure Medium Total							2E-04					23
	Air	Downgradient	Arsenic	--	--	--	--	--	NA	--	--	--	--
			Beryllium	--	--	--	--	--	Respiratory	--	--	--	--
			Cobalt	--	--	--	--	--	Respiratory	--	--	--	--
			Tetrachloroethene	--	3E-08	--	--	3E-08	CNS	--	0.00006	--	0.00006
			Trichloroethene (Mutagenic)	--	1E-06	--	--	1E-06	0	--	0.00000	--	0.00000
			Trichloroethene (Nonmutagenic	--	2E-06	--	--	2E-06	Liver, Kidney	--	0.9	--	0.9
			Chemical Total	--	3E-06	--	--	3E-06		--	0.9	--	0.9
		Exposure Point Total						3E-06					0.9
	Exposure Medium Total							3E-06					0.9
Medium Total								2E-04					23

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Lifelong

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	3E-04	--	3E-05	--	3E-04
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Benzo(a)pyrene Equivalents	2E-05	--	7E-06	--	2E-05
			Aroclor-1260	8E-07	--	3E-07	--	1E-06
			Chemical Total	3E-04	--	3E-05	--	3E-04
		Exposure Point Total						3E-04
	Exposure Medium Total							3E-04
	Air	Surface Soil (current)	Arsenic	--	2E-08	--	--	2E-08
			Cadmium	--	1E-10	--	--	1E-10
			Lead	--	- -	--	--	- -
			Benzo(a)pyrene Equivalents	--	4E-11	--	--	4E-11
			Aroclor-1260	--	5E-12	--	--	5E-12
			Chemical Total	--	2E-08	--	--	2E-08
		Exposure Point Total						2E-08
	Exposure Medium Total							2E-08
Medium Total								3E-04
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	2E-05	--	2E-06	--	2E-05
			Arsenic	2E-04	--	2E-05	--	2E-04
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			Zinc	- -	--	- -	--	- -
			Aroclor-1260	3E-05	--	1E-05	--	4E-05
			Chemical Total	2E-04	--	3E-05	--	2E-04
		Exposure Point Total						2E-04
	Exposure Medium Total							2E-04
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	1E-10	--	--	1E-10
			Arsenic	--	1E-08	--	--	1E-08
			Cadmium	--	5E-09	--	--	5E-09
			Lead	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			Zinc	--	- -	--	--	- -
			Aroclor-1260	--	2E-10	--	--	2E-10
			Chemical Total	--	2E-08	--	--	2E-08
		Exposure Point Total						2E-08
	Exposure Medium Total							2E-08
Medium Total								2E-04
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	2E-05	--	2E-06	--	2E-05
			Arsenic	3E-04	--	3E-05	--	4E-04
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			Zinc	- -	--	- -	--	- -
			Benzo(a)pyrene Equivalents	2E-05	--	7E-06	--	2E-05
			Aroclor-1260	1E-05	--	6E-06	--	2E-05
			Chemical Total	4E-04	--	5E-05	--	4E-04
		Exposure Point Total						4E-04
	Exposure Medium Total							4E-04
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	1E-10	--	--	1E-10

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Lifelong

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
			Arsenic	--	2E-08	--	--	2E-08
			Cadmium	--	9E-10	--	--	9E-10
			Lead	--	--	--	--	--
			Mercury	--	--	--	--	--
			Zinc	--	--	--	--	--
			Benzo(a)pyrene Equivalents	--	4E-11	--	--	4E-11
			Aroclor-1260	--	9E-11	--	--	9E-11
			Chemical Total	--	2E-08	--	--	2E-08
		Exposure Point Total						2E-08
	Exposure Medium Total							2E-08
Medium Total								4E-04
Subsurface Soil	Subsurface Soil	Subsurface Soil	Arsenic	3E-04	--	2E-05	--	3E-04
			Benzo(a)pyrene Equivalents	2E-05	--	9E-06	--	3E-05
			Chemical Total	3E-04	--	3E-05	--	3E-04
		Exposure Point Total						3E-04
	Exposure Medium Total							3E-04
	Air	Subsurface Soil	Arsenic	--	2E-08	--	--	2E-08
			Benzo(a)pyrene Equivalents	--	5E-11	--	--	5E-11
			Chemical Total	--	2E-08	--	--	2E-08
		Exposure Point Total						2E-08
	Exposure Medium Total							2E-08
Medium Total								3E-04
Groundwater	Groundwater	Upgradient	Arsenic	9E-05	--	5E-07	--	9E-05
			Beryllium	--	--	--	--	--
			Cobalt	--	--	--	--	--
			Tetrachloroethene	6E-06	--	3E-06	--	9E-06
			Trichloroethene (Mutagenic)	2E-05	--	4E-06	--	3E-05
			Trichloroethene (Nonmutagenic	3E-05	--	5E-06	--	3E-05
			Chemical Total	1E-04	--	1E-05	--	2E-04
		Exposure Point Total						2E-04
	Exposure Medium Total							2E-04
	Air	Upgradient	Arsenic	--	--	--	--	--
			Beryllium	--	--	--	--	--
			Cobalt	--	--	--	--	--
			Tetrachloroethene	--	8E-08	--	--	8E-08
			Trichloroethene (Mutagenic)	--	2E-06	--	--	2E-06
			Trichloroethene (Nonmutagenic	--	4E-06	--	--	4E-06
			Chemical Total	--	6E-06	--	--	6E-06
		Exposure Point Total						6E-06
	Exposure Medium Total							6E-06
Medium Total								2E-04
Groundwater	Groundwater	Downgradient	Arsenic	3E-04	--	2E-06	--	3E-04
			Beryllium	--	--	--	--	--
			Cobalt	--	--	--	--	--
			Tetrachloroethene	2E-06	--	1E-06	--	4E-06
			Trichloroethene (Mutagenic)	1E-05	--	2E-06	--	1E-05
			Trichloroethene (Nonmutagenic	2E-05	--	3E-06	--	2E-05
			Chemical Total	4E-04	--	8E-06	--	4E-04
		Exposure Point Total						4E-04

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Lifelong

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk									
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total					
	Exposure Medium Total							4E-04					
	Air	Downgradient	Arsenic	--	- -	--	--	- -					
			Beryllium	--	- -	--	--	- -					
			Cobalt	--	- -	--	--	- -					
			Tetrachloroethene	--	3E-08	--	--	3E-08					
			Trichloroethene (Mutagenic)	--	1E-06	--	--	1E-06					
			Trichloroethene (Nonmutagenic	--	2E-06	--	--	2E-06					
			Chemical Total	--	3E-06	--	--	3E-06					
		Exposure Point Total						3E-06					
	Exposure Medium Total							3E-06					
Medium Total								4E-04					

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	8E-06	--	7E-07	--	9E-06	Skin, CVS	1	--	0.1	1
			Cadmium	- -	--	- -	--	- -	Kidney	0.006	--	0.0007	0.007
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	1E-07	--	5E-08	--	2E-07	NA	--	--	--	--
			Aroclor-1260	2E-08	--	1E-08	--	3E-08	NA	--	--	--	--
			Chemical Total	8E-06	--	8E-07	--	9E-06		1	--	0.1	1
		Exposure Point Total						9E-06					1
	Exposure Medium Total							9E-06					1
	Air	Surface Soil (current)	Arsenic	--	1E-06	--	--	1E-06	NA	--	1	--	1
			Cadmium	--	7E-09	--	--	7E-09	None Reported	--	0.01	--	0.01
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	9E-10	--	--	9E-10	NA	--	--	--	--
			Aroclor-1260	--	3E-10	--	--	3E-10	NA	--	--	--	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	1	- -	1
		Exposure Point Total						1E-06					1
	Exposure Medium Total							1E-06					1
Medium Total								1E-05					3
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	5E-07	--	5E-08	--	6E-07	Developmental	0.01	--	0.001	0.02
			Arsenic	5E-06	--	4E-07	--	5E-06	Skin, CVS	0.7	--	0.07	0.8
			Cadmium	- -	--	- -	--	- -	Kidney	0.2	--	0.03	0.2
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.005	--	0.002	0.008
			Zinc	- -	--	- -	--	- -	Blood	0.04	--	0.001	0.04
			Aroclor-1260	7E-07	--	3E-07	--	1E-06	NA	--	--	--	--
			Chemical Total	6E-06	--	8E-07	--	7E-06		1	--	0.10	1
		Exposure Point Total						7E-06					1
	Exposure Medium Total							7E-06					1
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	8E-09	--	--	8E-09	NA	--	0.0004	--	0.0004
			Arsenic	--	7E-07	--	--	7E-07	NA	--	0.7	--	0.7
			Cadmium	--	3E-07	--	--	3E-07	None Reported	--	0.6	--	0.6
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.02	--	0.02
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	1E-08	--	--	1E-08	NA	--	--	--	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	1	- -	1
		Exposure Point Total						1E-06					1
	Exposure Medium Total							1E-06					1
Medium Total								8E-06					2
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	5E-07	--	5E-08	--	6E-07	Developmental	0.01	--	0.001	0.02
			Arsenic	1E-05	--	9E-07	--	1E-05	Skin, CVS	2	--	0.1	2
			Cadmium	- -	--	- -	--	- -	Kidney	0.04	--	0.005	0.05
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.005	--	0.002	0.008
			Zinc	- -	--	- -	--	- -	Blood	0.04	--	0.001	0.04
			Benzo(a)pyrene Equivalents	1E-07	--	5E-08	--	2E-07	NA	--	--	--	--
			Aroclor-1260	4E-07	--	2E-07	--	6E-07	NA	--	--	--	--
			Chemical Total	1E-05	--	1E-06	--	1E-05		2	--	0.1	2
		Exposure Point Total						1E-05					2
	Exposure Medium Total							1E-05					2
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	8E-09	--	--	8E-09	NA	--	0.0004	--	0.0004

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Arsenic	--	1E-06	--	--	1E-06	NA	--	2	--	2
			Cadmium	--	5E-08	--	--	5E-08	None Reported	--	0.1	--	0.1
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.02	--	0.02
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	9E-10	--	--	9E-10	NA	--	--	--	--
			Aroclor-1260	--	6E-09	--	--	6E-09	NA	--	--	--	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	2	- -	2
		Exposure Point Total						1E-06					2
	Exposure Medium Total							1E-06					2
Medium Total								1E-05					3
Subsurface Soil	Subsurface Soil	Subsurface Soil	Aluminum	- -	--	- -	--	- -	CNS	0.02	--	0.0005	0.02
			Arsenic	8E-06	--	7E-07	--	8E-06	Skin, CVS	1	--	0.1	1
			Cobalt	- -	--	- -	--	- -	Thyroid	0.02	--	0.0006	0.02
			Iron	- -	--	- -	--	- -	GS	0.04	--	0.001	0.05
			Manganese	- -	--	- -	--	- -	CNS	0.02	--	0.01	0.03
			Vanadium	- -	--	- -	--	- -	Kidney	0.02	--	0.0005	0.02
			Benzo(a)pyrene Equivalents	2E-07	--	6E-08	--	2E-07	NA	--	--	--	--
			Chemical Total	8E-06	--	7E-07	--	9E-06		1	--	0.1	1
		Exposure Point Total						9E-06					1
	Exposure Medium Total							9E-06					1
	Air	Subsurface Soil	Aluminum	--	- -	--	--	- -	CNS	--	0.2	--	0.2
			Arsenic	--	1E-06	--	--	1E-06	NA	--	1	--	1
			Cobalt	--	4E-07	--	--	4E-07	Respiratory	--	0.2	--	0.2
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.4	--	0.4
			Vanadium	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	1E-09	--	--	1E-09	NA	--	--	--	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	2	- -	2
		Exposure Point Total						1E-06					2
	Exposure Medium Total							1E-06					2
Medium Total								1E-05					3
Groundwater	Groundwater	Upgradient	Arsenic	3E-09	--	4E-09	--	7E-09	Skin, CVS	0.0005	--	0.0006	0.001
			Beryllium	- -	--	- -	--	- -	GS	0.00006	--	0.01	0.01
			Cobalt	- -	--	- -	--	- -	Thyroid	0.007	--	0.004	0.01
			Tetrachloroethene	2E-10	--	1E-08	--	1E-08	Liver	0.0000003	--	0.00002	0.00002
			Trichloroethene	1E-09	--	2E-08	--	3E-08	/S, Fetotoxicity, Immu	0.004	--	0.07	0.08
			Chemical Total	4E-09	--	4E-08	--	4E-08		0.01	--	0.09	0.1
		Exposure Point Total						4E-08					0.1
	Exposure Medium Total							4E-08					0.1
	Air	Upgradient	Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Tetrachloroethene	--	7E-11	--	--	7E-11	CNS	--	0.000003	--	0.000003
			Trichloroethene	--	4E-09	--	--	4E-09	CNS	--	0.0001	--	0.0001
			Chemical Total	--	4E-09	--	--	4E-09		- -	0.0001	- -	0.0001
		Exposure Point Total						4E-09					0.0001
	Exposure Medium Total							4E-09					0.0001
Medium Total								4E-08					0.1

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Downgradient	Arsenic	1E-08	--	2E-08	--	3E-08	Skin, CVS	0.002	--	0.002	0.004
			Beryllium	- -	--	- -	--	- -	GS	0.00003	--	0.005	0.005
			Cobalt	- -	--	- -	--	- -	Thyroid	0.003	--	0.001	0.004
			Tetrachloroethene	8E-11	--	5E-09	--	5E-09	Liver	0.0000001	--	0.000006	0.000006
			Trichloroethene	7E-10	--	1E-08	--	1E-08	/S, Fetotoxicity, Immu	0.002	--	0.04	0.04
			Chemical Total	1E-08	--	3E-08	--	5E-08		0.006	--	0.05	0.05
		Exposure Point Total						5E-08					0.05
	Exposure Medium Total							5E-08					0.05
	Air	Downgradient	Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Tetrachloroethene	--	3E-11	--	--	3E-11	CNS	--	0.000001	--	0.000001
			Trichloroethene	--	2E-09	--	--	2E-09	CNS	--	0.0001	--	0.0001
			Chemical Total	--	2E-09	--	--	2E-09		- -	0.0001	- -	0.0001
		Exposure Point Total						2E-09					0.0001
	Exposure Medium Total							2E-09					0.0001
Medium Total								5E-08					0.05

TABLE 9.10.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	6E-05	--	1E-05	--	7E-05	Skin, CVS	0.4	--	0.07	0.4
			Cadmium	- -	--	- -	--	- -	Kidney	0.002	--	0.0005	0.002
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	9E-07	--	8E-07	--	2E-06	NA	--	--	--	--
			Aroclor-1260	2E-07	--	2E-07	--	3E-07	NA	--	--	--	--
			Chemical Total	6E-05	--	1E-05	--	7E-05		0.4	--	0.07	0.4
		Exposure Point Total						7E-05					0.4
	Exposure Medium Total							7E-05					0.4
	Air	Surface Soil (current)	Arsenic	--	1E-08	--	--	1E-08	NA	--	0.0005	--	0.0005
			Cadmium	--	8E-11	--	--	8E-11	None Reported	--	0.000006	--	0.000006
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Aroclor-1260	--	4E-12	--	--	4E-12	NA	--	--	--	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0005	- -	0.0005
		Exposure Point Total						1E-08					0.0005
	Exposure Medium Total							1E-08					0.0005
Medium Total								7E-05					0.4
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	4E-06	--	8E-07	--	5E-06	Developmental	0.09	--	0.02	0.1
			Arsenic	4E-05	--	7E-06	--	4E-05	Skin, CVS	0.2	--	0.04	0.3
			Cadmium	- -	--	- -	--	- -	Kidney	0.07	--	0.02	0.09
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.01	--	0.01	0.02
			Zinc	- -	--	- -	--	- -	Blood	0.01	--	0.0008	0.01
			Aroclor-1260	6E-06	--	5E-06	--	1E-05	NA	--	--	--	--
			Chemical Total	5E-05	--	1E-05	--	6E-05		0.4	--	0.09	0.5
		Exposure Point Total						6E-05					0.5
	Exposure Medium Total							6E-05					0.5
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	9E-11	--	--	9E-11	NA	--	0.0000002	--	0.0000002
			Arsenic	--	7E-09	--	--	7E-09	NA	--	0.0003	--	0.0003
			Cadmium	--	3E-09	--	--	3E-09	None Reported	--	0.0002	--	0.0002
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.000008	--	0.000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	1E-10	--	--	1E-10	NA	--	--	--	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0006	- -	0.0006
		Exposure Point Total						1E-08					0.0006
	Exposure Medium Total							1E-08					0.0006
Medium Total								6E-05					0.5
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	4E-06	--	8E-07	--	5E-06	Developmental	0.09	--	0.02	0.1
			Arsenic	7E-05	--	1E-05	--	9E-05	Skin, CVS	0.5	--	0.09	0.6
			Cadmium	- -	--	- -	--	- -	Kidney	0.01	--	0.003	0.02
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.01	--	0.01	0.02
			Zinc	- -	--	- -	--	- -	Blood	0.01	--	0.0008	0.01
			Benzo(a)pyrene Equivalents	9E-07	--	8E-07	--	2E-06	NA	--	--	--	--
			Aroclor-1260	3E-06	--	3E-06	--	6E-06	NA	--	--	--	--
			Chemical Total	8E-05	--	2E-05	--	1E-04		0.6	--	0.1	0.7
		Exposure Point Total						1E-04					0.7
	Exposure Medium Total							1E-04					0.7
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	9E-11	--	--	9E-11	NA	--	0.0000002	--	0.0000002

TABLE 9.10.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Current/Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Arsenic	--	2E-08	--	--	2E-08	NA	--	0.0007	--	0.0007
			Cadmium	--	6E-10	--	--	6E-10	None Reported	--	0.00005	--	0.00005
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.000008	--	0.000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Aroclor-1260	--	6E-11	--	--	6E-11	NA	--	--	--	--
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.0007	- -	0.0007
		Exposure Point Total						2E-08					0.0007
	Exposure Medium Total							2E-08					0.0007
Medium Total								1E-04					0.7
Subsurface Soil	Subsurface Soil	Subsurface Soil	Aluminum	- -	--	- -	--	- -	CNS	0.005	--	0.0003	0.005
			Arsenic	6E-05	--	1E-05	--	7E-05	Skin, CVS	0.4	--	0.07	0.4
			Cobalt	- -	--	- -	--	- -	Thyroid	0.06	--	0.004	0.07
			Iron	- -	--	- -	--	- -	GS	0.01	--	0.0009	0.01
			Manganese	- -	--	- -	--	- -	CNS	0.005	--	0.008	0.01
			Vanadium	- -	--	- -	--	- -	Kidney	0.005	--	0.0004	0.006
			Benzo(a)pyrene Equivalents	1E-06	--	1E-06	--	2E-06	NA	--	--	--	--
			Chemical Total	6E-05	--	1E-05	--	7E-05		0.4	--	0.08	0.5
		Exposure Point Total						7E-05					0.5
	Exposure Medium Total							7E-05					0.5
	Air	Subsurface Soil	Aluminum	--	- -	--	--	- -	CNS	--	0.00007	--	0.00007
			Arsenic	--	1E-08	--	--	1E-08	NA	--	0.0005	--	0.0005
			Cobalt	--	4E-09	--	--	4E-09	Respiratory	--	0.0002	--	0.0002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0002	--	0.0002
			Vanadium	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.0010	- -	0.0010
		Exposure Point Total						2E-08					0.0010
	Exposure Medium Total							2E-08					0.0010
Medium Total								7E-05					0.5

TABLE 9.11.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	3E-05	--	2E-06	--	3E-05	Skin, CVS	0.7	--	0.06	0.8
			Cadmium	- -	--	- -	--	- -	Kidney	0.003	--	0.0004	0.004
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	2E-06	--	8E-07	--	3E-06	NA	--	--	--	--
			Aroclor-1260	8E-08	--	3E-08	--	1E-07	NA	--	--	--	--
			Chemical Total	3E-05	--	3E-06	--	3E-05		0.7	--	0.06	0.8
		Exposure Point Total						3E-05					0.8
	Exposure Medium Total							3E-05					0.8
	Air	Surface Soil (current)	Arsenic	--	3E-10	--	--	3E-10	NA	--	0.00006	--	0.00006
			Cadmium	--	2E-12	--	--	2E-12	None Reported	--	0.0000007	--	0.0000007
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Aroclor-1260	--	9E-14	--	--	9E-14	NA	--	--	--	--
			Chemical Total	--	3E-10	--	--	3E-10		- -	0.00006	- -	0.00006
		Exposure Point Total						3E-10					0.00006
	Exposure Medium Total							3E-10					0.00006
Medium Total								3E-05					0.8
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	2E-06	--	2E-07	--	2E-06	Developmental	0.2	--	0.01	0.2
			Arsenic	2E-05	--	1E-06	--	2E-05	Skin, CVS	0.4	--	0.04	0.5
			Cadmium	- -	--	- -	--	- -	Kidney	0.1	--	0.01	0.1
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.02	--	0.008	0.03
			Zinc	- -	--	- -	--	- -	Blood	0.02	--	0.0006	0.02
			Aroclor-1260	3E-06	--	1E-06	--	4E-06	NA	--	--	--	--
			Chemical Total	2E-05	--	3E-06	--	2E-05		0.8	--	0.07	0.8
		Exposure Point Total						2E-05					0.8
	Exposure Medium Total							2E-05					0.8
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	2E-12	--	--	2E-12	NA	--	0.00000002	--	0.00000002
			Arsenic	--	2E-10	--	--	2E-10	NA	--	0.00003	--	0.00003
			Cadmium	--	8E-11	--	--	8E-11	None Reported	--	0.00003	--	0.00003
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.0000008	--	0.0000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	3E-12	--	--	3E-12	NA	--	--	--	--
			Chemical Total	--	3E-10	--	--	3E-10		- -	0.00006	- -	0.00006
		Exposure Point Total						3E-10					0.00006
	Exposure Medium Total							3E-10					0.00006
Medium Total								2E-05					0.8
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	2E-06	--	2E-07	--	2E-06	Developmental	0.2	--	0.01	0.2
			Arsenic	3E-05	--	3E-06	--	4E-05	Skin, CVS	0.9	--	0.08	1.0
			Cadmium	- -	--	- -	--	- -	Kidney	0.02	--	0.003	0.03
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.02	--	0.008	0.03
			Zinc	- -	--	- -	--	- -	Blood	0.02	--	0.0006	0.02
			Benzo(a)pyrene Equivalents	2E-06	--	8E-07	--	3E-06	NA	--	--	--	--
			Aroclor-1260	1E-06	--	6E-07	--	2E-06	NA	--	--	--	--
			Chemical Total	4E-05	--	4E-06	--	5E-05		1	--	0.1	1
		Exposure Point Total						5E-05					1
	Exposure Medium Total							5E-05					1
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	2E-12	--	--	2E-12	NA	--	0.00000002	--	0.00000002

TABLE 9.11.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Arsenic	--	4E-10	--	--	4E-10	NA	--	0.00007	--	0.00007
			Cadmium	--	1E-11	--	--	1E-11	None Reported	--	0.000005	--	0.000005
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.0000008	--	0.0000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Aroclor-1260	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Chemical Total	--	4E-10	--	--	4E-10		- -	0.00008	- -	0.00008
		Exposure Point Total						4E-10					0.00008
	Exposure Medium Total							4E-10					0.00008
Medium Total								5E-05					1
Subsurface Soil	Subsurface Soil	Subsurface Soil	Aluminum	- -	--	- -	--	- -	CNS	0.009	--	0.0003	0.009
			Arsenic	3E-05	--	2E-06	--	3E-05	Skin, CVS	0.7	--	0.06	0.8
			Cobalt	- -	--	- -	--	- -	Thyroid	0.1	--	0.003	0.1
			Iron	- -	--	- -	--	- -	GS	0.03	--	0.0007	0.03
			Manganese	- -	--	- -	--	- -	CNS	0.010	--	0.007	0.02
			Vanadium	- -	--	- -	--	- -	Kidney	0.01	--	0.0003	0.01
			Benzo(a)pyrene Equivalents	3E-06	--	1E-06	--	4E-06	NA	--	--	--	--
			Chemical Total	3E-05	--	3E-06	--	3E-05		0.9	--	0.07	0.9
		Exposure Point Total						3E-05					0.9
	Exposure Medium Total							3E-05					0.9
	Air	Subsurface Soil	Aluminum	--	- -	--	--	- -	CNS	--	0.000007	--	0.000007
			Arsenic	--	3E-10	--	--	3E-10	NA	--	0.00005	--	0.00005
			Cobalt	--	1E-10	--	--	1E-10	Respiratory	--	0.00002	--	0.00002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.00002	--	0.00002
			Vanadium	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Chemical Total	--	4E-10	--	--	4E-10		- -	0.0001	- -	0.0001
		Exposure Point Total						4E-10					0.0001
	Exposure Medium Total							4E-10					0.0001
Medium Total								3E-05					0.9

TABLE 9.12.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	1E-05	--	1E-06	--	1E-05	Skin, CVS	0.08	--	0.009	0.09
			Cadmium	- -	--	- -	--	- -	Kidney	0.0004	--	0.00006	0.0004
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	3E-07	--	2E-07	--	5E-07	NA	--	--	--	--
			Aroclor-1260	3E-08	--	2E-08	--	5E-08	NA	--	--	--	--
			Chemical Total	1E-05	--	2E-06	--	1E-05		0.08	--	0.009	0.09
		Exposure Point Total						1E-05					0.09
	Exposure Medium Total							1E-05					0.09
	Air	Surface Soil (current)	Arsenic	--	1E-09	--	--	1E-09	NA	--	0.00006	--	0.00006
			Cadmium	--	8E-12	--	--	8E-12	None Reported	--	0.0000007	--	0.0000007
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Aroclor-1260	--	4E-13	--	--	4E-13	NA	--	--	--	--
			Chemical Total	--	1E-09	--	--	1E-09		- -	0.00006	- -	0.00006
		Exposure Point Total						1E-09					0.00006
	Exposure Medium Total							1E-09					0.00006
Medium Total								1E-05					0.09
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	8E-07	--	1E-07	--	9E-07	Developmental	0.02	--	0.002	0.02
			Arsenic	7E-06	--	9E-07	--	8E-06	Skin, CVS	0.05	--	0.006	0.05
			Cadmium	- -	--	- -	--	- -	Kidney	0.01	--	0.002	0.02
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.002	--	0.001	0.004
			Zinc	- -	--	- -	--	- -	Blood	0.002	--	0.00009	0.002
			Aroclor-1260	1E-06	--	6E-07	--	2E-06	NA	--	--	--	--
			Chemical Total	9E-06	--	2E-06	--	1E-05		0.08	--	0.01	0.09
		Exposure Point Total						1E-05					0.09
	Exposure Medium Total							1E-05					0.09
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	9E-12	--	--	9E-12	NA	--	0.00000002	--	0.00000002
			Arsenic	--	7E-10	--	--	7E-10	NA	--	0.00003	--	0.00003
			Cadmium	--	3E-10	--	--	3E-10	None Reported	--	0.00003	--	0.00003
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.0000008	--	0.0000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	1E-11	--	--	1E-11	NA	--	--	--	--
			Chemical Total	--	1E-09	--	--	1E-09		- -	0.00006	- -	0.00006
		Exposure Point Total						1E-09					0.00006
	Exposure Medium Total							1E-09					0.00006
Medium Total								1E-05					0.09
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	8E-07	--	1E-07	--	9E-07	Developmental	0.02	--	0.002	0.02
			Arsenic	1E-05	--	2E-06	--	2E-05	Skin, CVS	0.10	--	0.01	0.1
			Cadmium	- -	--	- -	--	- -	Kidney	0.003	--	0.0004	0.003
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.002	--	0.001	0.004
			Zinc	- -	--	- -	--	- -	Blood	0.002	--	0.00009	0.002
			Benzo(a)pyrene Equivalents	3E-07	--	2E-07	--	5E-07	NA	--	--	--	--
			Aroclor-1260	6E-07	--	3E-07	--	1E-06	NA	--	--	--	--
			Chemical Total	2E-05	--	2E-06	--	2E-05		0.1	--	0.02	0.1
		Exposure Point Total						2E-05					0.1
	Exposure Medium Total							2E-05					0.1
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	9E-12	--	--	9E-12	NA	--	0.00000002	--	0.00000002

TABLE 9.12.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Arsenic	--	2E-09	--	--	2E-09	NA	--	0.00007	--	0.00007
			Cadmium	--	6E-11	--	--	6E-11	None Reported	--	0.000005	--	0.000005
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.0000008	--	0.0000008
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Aroclor-1260	--	6E-12	--	--	6E-12	NA	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		- -	0.00008	- -	0.00008
		Exposure Point Total						2E-09					0.00008
	Exposure Medium Total							2E-09					0.00008
Medium Total								2E-05					0.1
Subsurface Soil	Subsurface Soil	Subsurface Soil	Aluminum	- -	--	- -	--	- -	CNS	0.0010	--	0.00004	0.001
			Arsenic	1E-05	--	1E-06	--	1E-05	Skin, CVS	0.07	--	0.009	0.08
			Cobalt	- -	--	- -	--	- -	Thyroid	0.01	--	0.0005	0.01
			Iron	- -	--	- -	--	- -	GS	0.003	--	0.0001	0.003
			Manganese	- -	--	- -	--	- -	CNS	0.001	--	0.001	0.002
			Vanadium	- -	--	- -	--	- -	Kidney	0.001	--	0.00004	0.001
			Benzo(a)pyrene Equivalents	4E-07	--	2E-07	--	7E-07	NA	--	--	--	--
			Chemical Total	1E-05	--	2E-06	--	1E-05		0.09	--	0.01	0.1
		Exposure Point Total						1E-05					0.1
	Exposure Medium Total							1E-05					0.1
	Air	Subsurface Soil	Aluminum	--	- -	--	--	- -	CNS	--	0.000007	--	0.000007
			Arsenic	--	1E-09	--	--	1E-09	NA	--	0.00005	--	0.00005
			Cobalt	--	4E-10	--	--	4E-10	Respiratory	--	0.00002	--	0.00002
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.00002	--	0.00002
			Vanadium	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-12	--	--	2E-12	NA	--	--	--	--
			Chemical Total	--	2E-09	--	--	2E-09		- -	0.0001	- -	0.0001
		Exposure Point Total						2E-09					0.0001
	Exposure Medium Total							2E-09					0.0001
Medium Total								1E-05					0.10

TABLE 9.13.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	4E-05	--	4E-06	--	4E-05
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Benzo(a)pyrene Equivalents	3E-06	--	1E-06	--	4E-06
			Aroclor-1260	1E-07	--	5E-08	--	2E-07
			Chemical Total	4E-05	--	5E-06	--	5E-05
		Exposure Point Total						5E-05
	Exposure Medium Total							5E-05
	Air	Surface Soil (current)	Arsenic	--	2E-09	--	--	2E-09
			Cadmium	--	1E-11	--	--	1E-11
			Lead	--	- -	--	--	- -
			Benzo(a)pyrene Equivalents	--	3E-12	--	--	3E-12
			Aroclor-1260	--	4E-13	--	--	4E-13
			Chemical Total	--	2E-09	--	--	2E-09
		Exposure Point Total						2E-09
	Exposure Medium Total							2E-09
Medium Total								5E-05
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	3E-06	--	3E-07	--	3E-06
			Arsenic	2E-05	--	2E-06	--	3E-05
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			Zinc	- -	--	- -	--	- -
			Aroclor-1260	4E-06	--	2E-06	--	5E-06
			Chemical Total	3E-05	--	4E-06	--	3E-05
		Exposure Point Total						3E-05
	Exposure Medium Total							3E-05
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	1E-11	--	--	1E-11
			Arsenic	--	9E-10	--	--	9E-10
			Cadmium	--	4E-10	--	--	4E-10
			Lead	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			Zinc	--	- -	--	--	- -
			Aroclor-1260	--	1E-11	--	--	1E-11
			Chemical Total	--	1E-09	--	--	1E-09
		Exposure Point Total						1E-09
	Exposure Medium Total							1E-09
Medium Total								3E-05
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	3E-06	--	3E-07	--	3E-06
			Arsenic	5E-05	--	5E-06	--	5E-05
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			Zinc	- -	--	- -	--	- -
			Benzo(a)pyrene Equivalents	3E-06	--	1E-06	--	4E-06
			Aroclor-1260	2E-06	--	9E-07	--	3E-06
			Chemical Total	6E-05	--	7E-06	--	6E-05
		Exposure Point Total						6E-05
	Exposure Medium Total							6E-05
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	1E-11	--	--	1E-11

TABLE 9.13.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk									
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total					
			Arsenic	--	2E-09	--	--	2E-09					
			Cadmium	--	7E-11	--	--	7E-11					
			Lead	--	- -	--	--	- -					
			Mercury	--	- -	--	--	- -					
			Zinc	--	- -	--	--	- -					
			Benzo(a)pyrene Equivalents	--	3E-12	--	--	3E-12					
			Aroclor-1260	--	8E-12	--	--	8E-12					
			Chemical Total	--	2E-09	--	--	2E-09					
		Exposure Point Total						2E-09					
	Exposure Medium Total							2E-09					
Medium Total								6E-05					
Subsurface Soil	Subsurface Soil	Subsurface Soil	Aluminum	- -	--	- -	--	- -					
			Arsenic	4E-05	--	4E-06	--	4E-05					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Vanadium	- -	--	- -	--	- -					
			Benzo(a)pyrene Equivalents	3E-06	--	1E-06	--	5E-06					
			Chemical Total	4E-05	--	5E-06	--	5E-05					
		Exposure Point Total						5E-05					
	Exposure Medium Total							5E-05					
	Air	Subsurface Soil	Aluminum	--	- -	--	--	- -					
			Arsenic	--	1E-09	--	--	1E-09					
			Cobalt	--	5E-10	--	--	5E-10					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Vanadium	--	- -	--	--	- -					
			Benzo(a)pyrene Equivalents	--	4E-12	--	--	4E-12					
			Chemical Total	--	2E-09	--	--	2E-09					
		Exposure Point Total						2E-09					
	Exposure Medium Total							2E-09					
Medium Total								5E-05					

TABLE 9.14.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	2E-04	--	2E-05	--	2E-04	Skin, CVS	5	--	0.4	5
			Cadmium	- -	--	- -	--	- -	Kidney	0.02	--	0.003	0.03
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	1E-05	--	5E-06	--	2E-05	NA	--	--	--	--
			Aroclor-1260	5E-07	--	2E-07	--	8E-07	NA	--	--	--	--
			Chemical Total	2E-04	--	2E-05	--	2E-04		5	--	0.4	5
		Exposure Point Total						2E-04					5
	Exposure Medium Total							2E-04					5
	Air	Surface Soil (current)	Arsenic	--	4E-09	--	--	4E-09	NA	--	0.0007	--	0.0007
			Cadmium	--	2E-11	--	--	2E-11	None Reported	--	0.000008	--	0.000008
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Aroclor-1260	--	1E-12	--	--	1E-12	NA	--	--	--	--
			Chemical Total	--	4E-09	--	--	4E-09		- -	0.0007	- -	0.0007
		Exposure Point Total						4E-09					0.0007
	Exposure Medium Total							4E-09					0.0007
Medium Total								2E-04					5
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	1E-05	--	1E-06	--	1E-05	Developmental	1	--	0.10	1
			Arsenic	1E-04	--	9E-06	--	1E-04	Skin, CVS	3	--	0.2	3
			Cadmium	- -	--	- -	--	- -	Kidney	0.9	--	0.10	1.0
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.1	--	0.06	0.2
			Zinc	- -	--	- -	--	- -	Blood	0.1	--	0.004	0.2
			Aroclor-1260	2E-05	--	7E-06	--	2E-05	NA	--	--	--	--
			Chemical Total	1E-04	--	2E-05	--	2E-04		5	--	0.5	6
		Exposure Point Total						2E-04					6
	Exposure Medium Total							2E-04					6
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	3E-11	--	--	3E-11	NA	--	0.0000002	--	0.0000002
			Arsenic	--	2E-09	--	--	2E-09	NA	--	0.0004	--	0.0004
			Cadmium	--	9E-10	--	--	9E-10	None Reported	--	0.0003	--	0.0003
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.000010	--	0.000010
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	3E-11	--	--	3E-11	NA	--	--	--	--
			Chemical Total	--	3E-09	--	--	3E-09		- -	0.0007	- -	0.0007
		Exposure Point Total						3E-09					0.0007
	Exposure Medium Total							3E-09					0.0007
Medium Total								2E-04					6
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	1E-05	--	1E-06	--	1E-05	Developmental	1	--	0.10	1
			Arsenic	2E-04	--	2E-05	--	3E-04	Skin, CVS	6	--	0.5	7
			Cadmium	- -	--	- -	--	- -	Kidney	0.2	--	0.02	0.2
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.1	--	0.06	0.2
			Zinc	- -	--	- -	--	- -	Blood	0.1	--	0.004	0.2
			Benzo(a)pyrene Equivalents	2E-05	--	6E-06	--	2E-05	NA	--	--	--	--
			Aroclor-1260	1E-05	--	4E-06	--	1E-05	NA	--	--	--	--
			Chemical Total	3E-04	--	3E-05	--	3E-04		8	--	0.7	8
		Exposure Point Total						3E-04					8
	Exposure Medium Total							3E-04					8
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	3E-11	--	--	3E-11	NA	--	0.0000002	--	0.0000002

TABLE 9.14.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Arsenic	--	5E-09	--	--	5E-09	NA	--	0.0008	--	0.0008
			Cadmium	--	2E-10	--	--	2E-10	None Reported	--	0.00006	--	0.00006
			Lead	--	--	--	--	--	NA	--	--	--	--
			Mercury	--	--	--	--	--	CNS, Kidney	--	0.000010	--	0.000010
			Zinc	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Aroclor-1260	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Chemical Total	--	5E-09	--	--	5E-09		--	0.0009	--	0.0009
		Exposure Point Total						5E-09					0.0009
	Exposure Medium Total							5E-09					0.0009
Medium Total								3E-04					8
Subsurface Soil	Subsurface Soil	Subsurface Soil	Aluminum	--	--	--	--	--	CNS	0.06	--	0.002	0.06
			Arsenic	2E-04	--	2E-05	--	2E-04	Skin, CVS	5	--	0.4	5
			Cobalt	--	--	--	--	--	Thyroid	0.8	--	0.02	0.8
			Iron	--	--	--	--	--	GS	0.2	--	0.005	0.2
			Manganese	--	--	--	--	--	CNS	0.06	--	0.05	0.1
			Vanadium	--	--	--	--	--	Kidney	0.07	--	0.002	0.07
			Benzo(a)pyrene Equivalents	2E-05	--	7E-06	--	3E-05	NA	--	--	--	--
			Chemical Total	2E-04	--	2E-05	--	2E-04		6	--	0.5	6
		Exposure Point Total						2E-04					6
	Exposure Medium Total							2E-04					6
	Air	Subsurface Soil	Aluminum	--	--	--	--	--	CNS	--	0.00008	--	0.00008
			Arsenic	--	4E-09	--	--	4E-09	NA	--	0.0006	--	0.0006
			Cobalt	--	1E-09	--	--	1E-09	Respiratory	--	0.0003	--	0.0003
			Iron	--	--	--	--	--	NA	--	--	--	--
			Manganese	--	--	--	--	--	CNS	--	0.0002	--	0.0002
			Vanadium	--	--	--	--	--	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Chemical Total	--	5E-09	--	--	5E-09		--	0.001	--	0.001
		Exposure Point Total						5E-09					0.001
	Exposure Medium Total							5E-09					0.001
Medium Total								2E-04					6
Groundwater	Groundwater	Upgradient	Arsenic	3E-05	--	2E-07	--	3E-05	Skin, CVS	0.8	--	0.005	0.8
			Beryllium	--	--	--	--	--	GS	0.3	--	0.2	0.5
			Cobalt	--	--	--	--	--	Thyroid	130	--	0.3	131
			Tetrachloroethene	2E-06	--	1E-06	--	3E-06	Liver	0.005	--	0.003	0.007
			Trichloroethene (Mutagenic)	1E-05	--	1E-07	--	1E-05	0	0.000	--	0.000	0.000
			Trichloroethene (Nonmutagenic	1E-05	--	2E-06	--	1E-05	Liver, Kidney	7	--	1	8
			Chemical Total	6E-05	--	3E-06	--	6E-05		138	--	2	140
		Exposure Point Total						6E-05					140
	Exposure Medium Total							6E-05					140
Medium Total								6E-05					140
Groundwater	Groundwater	Downgradient	Arsenic	1E-04	--	8E-07	--	1E-04	Skin, CVS	3	--	0.02	3
			Beryllium	--	--	--	--	--	GS	0.1	--	0.1	0.2
			Cobalt	--	--	--	--	--	Thyroid	47	--	0.1	47
			Tetrachloroethene	9E-07	--	5E-07	--	1E-06	Liver	0.002	--	0.001	0.003
			Trichloroethene (Mutagenic)	8E-06	--	5E-08	--	8E-06	0	0.000	--	0.000	0.000
			Trichloroethene (Nonmutagenic	6E-06	--	9E-07	--	7E-06	Liver, Kidney	4	--	0.6	4
			Chemical Total	1E-04	--	2E-06	--	1E-04		54	--	0.8	55
		Exposure Point Total						1E-04					55

TABLE 9.14.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Exposure Medium Total							1E-04					55
Medium Total								1E-04					55

TABLE 9.15.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	8E-05	--	1E-05	--	9E-05	Skin, CVS	0.5	--	0.06	0.6
			Cadmium	- -	--	- -	--	- -	Kidney	0.002	--	0.0004	0.003
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	2E-06	--	1E-06	--	3E-06	NA	--	--	--	--
			Aroclor-1260	2E-07	--	1E-07	--	4E-07	NA	--	--	--	--
			Chemical Total	8E-05	--	1E-05	--	9E-05		0.5	--	0.06	0.6
		Exposure Point Total						9E-05					0.6
	Exposure Medium Total							9E-05					0.6
	Air	Surface Soil (current)	Arsenic	--	1E-08	--	--	1E-08	NA	--	0.0007	--	0.0007
			Cadmium	--	1E-10	--	--	1E-10	None Reported	--	0.000008	--	0.000008
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Aroclor-1260	--	4E-12	--	--	4E-12	NA	--	--	--	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0007	- -	0.0007
		Exposure Point Total						1E-08					0.0007
	Exposure Medium Total							1E-08					0.0007
Medium Total								9E-05					0.6
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	5E-06	--	7E-07	--	6E-06	Developmental	0.1	--	0.01	0.1
			Arsenic	5E-05	--	6E-06	--	5E-05	Skin, CVS	0.3	--	0.04	0.3
			Cadmium	- -	--	- -	--	- -	Kidney	0.09	--	0.02	0.1
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.02	--	0.009	0.02
			Zinc	- -	--	- -	--	- -	Blood	0.02	--	0.0006	0.02
			Aroclor-1260	8E-06	--	4E-06	--	1E-05	NA	--	--	--	--
			Chemical Total	6E-05	--	1E-05	--	7E-05		0.6	--	0.08	0.6
		Exposure Point Total						7E-05					0.6
	Exposure Medium Total							7E-05					0.6
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	1E-10	--	--	1E-10	NA	--	0.0000002	--	0.0000002
			Arsenic	--	9E-09	--	--	9E-09	NA	--	0.0004	--	0.0004
			Cadmium	--	4E-09	--	--	4E-09	None Reported	--	0.0003	--	0.0003
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.000010	--	0.000010
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Aroclor-1260	--	1E-10	--	--	1E-10	NA	--	--	--	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.0007	- -	0.0007
		Exposure Point Total						1E-08					0.0007
	Exposure Medium Total							1E-08					0.0007
Medium Total								7E-05					0.6
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	5E-06	--	7E-07	--	6E-06	Developmental	0.1	--	0.01	0.1
			Arsenic	1E-04	--	1E-05	--	1E-04	Skin, CVS	0.7	--	0.08	0.7
			Cadmium	- -	--	- -	--	- -	Kidney	0.02	--	0.003	0.02
			Lead	- -	--	- -	--	- -	NA	--	--	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.02	--	0.009	0.02
			Zinc	- -	--	- -	--	- -	Blood	0.02	--	0.0006	0.02
			Benzo(a)pyrene Equivalents	2E-06	--	1E-06	--	3E-06	NA	--	--	--	--
			Aroclor-1260	4E-06	--	2E-06	--	6E-06	NA	--	--	--	--
			Chemical Total	1E-04	--	2E-05	--	1E-04		0.8	--	0.1	0.9
		Exposure Point Total						1E-04					0.9
	Exposure Medium Total							1E-04					0.9
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	1E-10	--	--	1E-10	NA	--	0.0000002	--	0.0000002

TABLE 9.15.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
			Arsenic	--	2E-08	--	--	2E-08	NA	--	0.0008	--	0.0008
			Cadmium	--	7E-10	--	--	7E-10	None Reported	--	0.00006	--	0.00006
			Lead	--	- -	--	--	- -	NA	--	--	--	--
			Mercury	--	- -	--	--	- -	CNS, Kidney	--	0.000010	--	0.000010
			Zinc	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	2E-11	--	--	2E-11	NA	--	--	--	--
			Aroclor-1260	--	7E-11	--	--	7E-11	NA	--	--	--	--
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.0009	- -	0.0009
		Exposure Point Total						2E-08					0.0009
	Exposure Medium Total							2E-08					0.0009
Medium Total								1E-04					0.9
Subsurface Soil	Subsurface Soil	Subsurface Soil	Aluminum	- -	--	- -	--	- -	CNS	0.007	--	0.0003	0.007
			Arsenic	8E-05	--	9E-06	--	9E-05	Skin, CVS	0.5	--	0.06	0.6
			Cobalt	- -	--	- -	--	- -	Thyroid	0.09	--	0.003	0.09
			Iron	- -	--	- -	--	- -	GS	0.02	--	0.0008	0.02
			Manganese	- -	--	- -	--	- -	CNS	0.007	--	0.007	0.01
			Vanadium	- -	--	- -	--	- -	Kidney	0.008	--	0.0003	0.008
			Benzo(a)pyrene Equivalents	3E-06	--	2E-06	--	5E-06	NA	--	--	--	--
			Chemical Total	8E-05	--	1E-05	--	9E-05		0.6	--	0.07	0.7
		Exposure Point Total						9E-05					0.7
	Exposure Medium Total							9E-05					0.7
	Air	Subsurface Soil	Aluminum	--	- -	--	--	- -	CNS	--	0.00008	--	0.00008
			Arsenic	--	1E-08	--	--	1E-08	NA	--	0.0006	--	0.0006
			Cobalt	--	5E-09	--	--	5E-09	Respiratory	--	0.0003	--	0.0003
			Iron	--	- -	--	--	- -	NA	--	--	--	--
			Manganese	--	- -	--	--	- -	CNS	--	0.0002	--	0.0002
			Vanadium	--	- -	--	--	- -	NA	--	--	--	--
			Benzo(a)pyrene Equivalents	--	3E-11	--	--	3E-11	NA	--	--	--	--
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.001	- -	0.001
		Exposure Point Total						2E-08					0.001
	Exposure Medium Total							2E-08					0.001
Medium Total								9E-05					0.7
Groundwater	Groundwater	Upgradient	Arsenic	5E-05	--	3E-07	--	6E-05	Skin, CVS	0.4	--	0.002	0.4
			Beryllium	- -	--	- -	--	- -	GS	0.1	--	0.08	0.2
			Cobalt	- -	--	- -	--	- -	Thyroid	56	--	0.1	56
			Tetrachloroethene	4E-06	--	2E-06	--	6E-06	Liver	0.002	--	0.001	0.003
			Trichloroethene (Mutagenic)	9E-06	--	1E-06	--	1E-05	0	0.000	--	0.000	0.000
			Trichloroethene (Nonmutagenic	2E-05	--	3E-06	--	2E-05	Liver, Kidney	3	--	0.5	3
			Chemical Total	9E-05	--	7E-06	--	9E-05		59	--	0.7	60
		Exposure Point Total						9E-05					60
	Exposure Medium Total							9E-05					60
	Air	Upgradient	Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Tetrachloroethene	--	8E-08	--	--	8E-08	CNS	--	0.0002	--	0.0002
			Trichloroethene (Mutagenic)	--	2E-06	--	--	2E-06	0	--	0.0000	--	0.0000
			Trichloroethene (Nonmutagenic	--	4E-06	--	--	4E-06	Liver, Kidney	--	2	--	2
			Chemical Total	--	6E-06	--	--	6E-06		- -	2	- -	2
		Exposure Point Total						6E-06					2
	Exposure Medium Total							6E-06					2

TABLE 9.15.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Medium Total								9E-05					60
Groundwater	Groundwater	Downgradient	Arsenic	2E-04	--	1E-06	--	2E-04	Skin, CVS	1	--	0.007	1
			Beryllium	- -	--	- -	--	- -	GS	0.05	--	0.04	0.09
			Cobalt	- -	--	- -	--	- -	Thyroid	20	--	0.04	20
			Tetrachloroethene	1E-06	--	9E-07	--	2E-06	Liver	0.0008	--	0.0005	0.001
			Trichloroethene (Mutagenic)	5E-06	--	8E-07	--	5E-06	0	0.0000	--	0.0000	0.000
			Trichloroethene (Nonmutagenic	1E-05	--	2E-06	--	1E-05	Liver, Kidney	2	--	0.3	2
			Chemical Total	2E-04	--	4E-06	--	2E-04		23	--	0.3	23
		Exposure Point Total						2E-04					23
	Exposure Medium Total							2E-04					23
	Air	Downgradient	Arsenic	--	- -	--	--	- -	NA	--	--	--	--
			Beryllium	--	- -	--	--	- -	Respiratory	--	--	--	--
			Cobalt	--	- -	--	--	- -	Respiratory	--	--	--	--
			Tetrachloroethene	--	3E-08	--	--	3E-08	CNS	--	0.00006	--	0.00006
			Trichloroethene (Mutagenic)	--	1E-06	--	--	1E-06	0	--	0.00000	--	0.00000
			Trichloroethene (Nonmutagenic	--	2E-06	--	--	2E-06	Liver, Kidney	--	0.9	--	0.9
			Chemical Total	--	3E-06	--	--	3E-06		- -	0.9	- -	0.9
		Exposure Point Total						3E-06					0.9
	Exposure Medium Total							3E-06					0.9
Medium Total								2E-04					23

TABLE 9.16.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil (current)	Arsenic	3E-04	--	3E-05	--	3E-04
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Benzo(a)pyrene Equivalents	2E-05	--	7E-06	--	2E-05
			Aroclor-1260	8E-07	--	3E-07	--	1E-06
			Chemical Total	3E-04	--	3E-05	--	3E-04
		Exposure Point Total						3E-04
	Exposure Medium Total							3E-04
	Air	Surface Soil (current)	Arsenic	--	2E-08	--	--	2E-08
			Cadmium	--	1E-10	--	--	1E-10
			Lead	--	- -	--	--	- -
			Benzo(a)pyrene Equivalents	--	4E-11	--	--	4E-11
			Aroclor-1260	--	5E-12	--	--	5E-12
			Chemical Total	--	2E-08	--	--	2E-08
		Exposure Point Total						2E-08
	Exposure Medium Total							2E-08
Medium Total								3E-04
Surface Soil	Surface Soil	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	2E-05	--	2E-06	--	2E-05
			Arsenic	2E-04	--	2E-05	--	2E-04
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			Zinc	- -	--	- -	--	- -
			Aroclor-1260	3E-05	--	1E-05	--	4E-05
			Chemical Total	2E-04	--	3E-05	--	2E-04
		Exposure Point Total						2E-04
	Exposure Medium Total							2E-04
	Air	Surface Soil (under cap)	2,3,7,8-TCDD Equivalents	--	1E-10	--	--	1E-10
			Arsenic	--	1E-08	--	--	1E-08
			Cadmium	--	5E-09	--	--	5E-09
			Lead	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			Zinc	--	- -	--	--	- -
			Aroclor-1260	--	2E-10	--	--	2E-10
			Chemical Total	--	2E-08	--	--	2E-08
		Exposure Point Total						2E-08
	Exposure Medium Total							2E-08
Medium Total								2E-04
Surface Soil	Surface Soil	Surface Soil (future)	2,3,7,8-TCDD Equivalents	2E-05	--	2E-06	--	2E-05
			Arsenic	3E-04	--	3E-05	--	4E-04
			Cadmium	- -	--	- -	--	- -
			Lead	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			Zinc	- -	--	- -	--	- -
			Benzo(a)pyrene Equivalents	2E-05	--	7E-06	--	2E-05
			Aroclor-1260	1E-05	--	6E-06	--	2E-05
			Chemical Total	4E-04	--	5E-05	--	4E-04
		Exposure Point Total						4E-04
	Exposure Medium Total							4E-04
	Air	Surface Soil (future)	2,3,7,8-TCDD Equivalents	--	1E-10	--	--	1E-10

TABLE 9.16.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk									
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total					
			Arsenic	--	2E-08	--	--	2E-08					
			Cadmium	--	9E-10	--	--	9E-10					
			Lead	--	- -	--	--	- -					
			Mercury	--	- -	--	--	- -					
			Zinc	--	- -	--	--	- -					
			Benzo(a)pyrene Equivalents	--	4E-11	--	--	4E-11					
			Aroclor-1260	--	9E-11	--	--	9E-11					
			Chemical Total	--	2E-08	--	--	2E-08					
		Exposure Point Total						2E-08					
	Exposure Medium Total							2E-08					
Medium Total								4E-04					
Subsurface Soil	Subsurface Soil	Subsurface Soil	Aluminum	- -	--	- -	--	- -					
			Arsenic	3E-04	--	2E-05	--	3E-04					
			Cobalt	- -	--	- -	--	- -					
			Iron	- -	--	- -	--	- -					
			Manganese	- -	--	- -	--	- -					
			Vanadium	- -	--	- -	--	- -					
			Benzo(a)pyrene Equivalents	2E-05	--	9E-06	--	3E-05					
			Chemical Total	3E-04	--	3E-05	--	3E-04					
		Exposure Point Total						3E-04					
	Exposure Medium Total							3E-04					
	Air	Subsurface Soil	Aluminum	--	- -	--	--	- -					
			Arsenic	--	2E-08	--	--	2E-08					
			Cobalt	--	6E-09	--	--	6E-09					
			Iron	--	- -	--	--	- -					
			Manganese	--	- -	--	--	- -					
			Vanadium	--	- -	--	--	- -					
			Benzo(a)pyrene Equivalents	--	5E-11	--	--	5E-11					
			Chemical Total	--	2E-08	--	--	2E-08					
		Exposure Point Total						2E-08					
	Exposure Medium Total							2E-08					
Medium Total								3E-04					
Groundwater	Groundwater	Upgradient	Arsenic	9E-05	--	5E-07	--	9E-05					
			Beryllium	- -	--	- -	--	- -					
			Cobalt	- -	--	- -	--	- -					
			Tetrachloroethene	6E-06	--	3E-06	--	9E-06					
			Trichloroethene (Mutagenic)	2E-05	--	2E-06	--	3E-05					
			Trichloroethene (Nonmutagenic	3E-05	--	5E-06	--	3E-05					
			Chemical Total	1E-04	--	1E-05	--	2E-04					
		Exposure Point Total						2E-04					
	Exposure Medium Total							2E-04					
	Air	Upgradient	Arsenic	--	- -	--	--	- -					
			Beryllium	--	- -	--	--	- -					
			Cobalt	--	- -	--	--	- -					
			Tetrachloroethene	--	8E-08	--	--	8E-08					
			Trichloroethene (Mutagenic)	--	2E-06	--	--	2E-06					
			Trichloroethene (Nonmutagenic	--	4E-06	--	--	4E-06					
			Chemical Total	--	6E-06	--	--	6E-06					
		Exposure Point Total						6E-06					
	Exposure Medium Total							6E-06					

TABLE 9.16.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
UXO 32, INDIAN HEAD, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Medium Total								2E-04
Groundwater	Groundwater	Downgradient	Arsenic	3E-04	--	2E-06	--	3E-04
			Beryllium	- -	--	- -	--	- -
			Cobalt	- -	--	- -	--	- -
			Tetrachloroethene	2E-06	--	1E-06	--	4E-06
			Trichloroethene (Mutagenic)	1E-05	--	8E-07	--	1E-05
			Trichloroethene (Nonmutagenic	2E-05	--	3E-06	--	2E-05
			Chemical Total	4E-04	--	7E-06	--	4E-04
		Exposure Point Total						4E-04
	Exposure Medium Total							4E-04
	Air	Downgradient	Arsenic	--	- -	--	--	- -
			Beryllium	--	- -	--	--	- -
			Cobalt	--	- -	--	--	- -
			Tetrachloroethene	--	3E-08	--	--	3E-08
			Trichloroethene (Mutagenic)	--	1E-06	--	--	1E-06
			Trichloroethene (Nonmutagenic	--	2E-06	--	--	2E-06
			Chemical Total	--	3E-06	--	--	3E-06
		Exposure Point Total						3E-06
	Exposure Medium Total							3E-06
Medium Total								4E-04

ATTACHMENT 4

ProUCL PRINTOUTS

ProUCL Output
Surface Soil (Current)

General UCL Statistics for Full Data Sets

User Selected Options	
From File	H:\Indianhead\UXO 32 soil RA\proucl\surface soil current.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC

General Statistics

Number of Valid Observations	44	Number of Distinct Observations	44

Raw Statistics		Log-transformed Statistics	
Minimum	3.24	Minimum of Log Data	1.176
Maximum	423	Maximum of Log Data	6.047
Mean	82.57	Mean of log Data	3.622
Median	34.95	SD of log Data	1.347
SD	105.7		
Std. Error of Mean	15.94		
Coefficient of Variation	1.28		
Skewness	1.845		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.728	Shapiro Wilk Test Statistic	0.961
Shapiro Wilk Critical Value	0.944	Shapiro Wilk Critical Value	0.944
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	109.4	95% H-UCL	164.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	189.7
95% Adjusted-CLT UCL (Chen-1995)	113.5	97.5% Chebyshev (MVUE) UCL	233.1
95% Modified-t UCL (Johnson-1978)	110.1	99% Chebyshev (MVUE) UCL	318.5
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.719	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	114.8		
MLE of Mean	82.57		
MLE of Standard Deviation	97.36		
nu star	63.29		
Approximate Chi Square Value (.05)	45.99	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0445	95% CLT UCL	108.8
Adjusted Chi Square Value	45.49	95% Jackknife UCL	109.4
		95% Standard Bootstrap UCL	108.5
Anderson-Darling Test Statistic	0.845	95% Bootstrap-t UCL	117.6
Anderson-Darling 5% Critical Value	0.789	95% Hall's Bootstrap UCL	113.1
Kolmogorov-Smirnov Test Statistic	0.134	95% Percentile Bootstrap UCL	111.1
Kolmogorov-Smirnov 5% Critical Value	0.139	95% BCA Bootstrap UCL	113.7
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	152
		97.5% Chebyshev(Mean, Sd) UCL	182.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	241.1

95% Approximate Gamma UCL	113.6
95% Adjusted Gamma UCL	114.9

Potential UCL to Use		Use 95% Approximate Gamma UCL	113.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

LEAD

General Statistics

Number of Valid Observations	16	Number of Distinct Observations	16
Number of Missing Values	28		

Raw Statistics		Log-transformed Statistics	
Minimum	8.77	Minimum of Log Data	2.171
Maximum	263	Maximum of Log Data	5.572
Mean	65.07	Mean of log Data	3.523
Median	22.3	SD of log Data	1.18
SD	77.22		
Std. Error of Mean	19.31		
Coefficient of Variation	1.187		
Skewness	1.554		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.761	Shapiro Wilk Test Statistic	0.887
Shapiro Wilk Critical Value	0.887	Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	98.92	95% H-UCL	169.2
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	155.4
95% Adjusted-CLT UCL (Chen-1995)	104.8	97.5% Chebyshev (MVUE) UCL	195.1
95% Modified-t UCL (Johnson-1978)	100.2	99% Chebyshev (MVUE) UCL	273.1
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.77	Data appear Lognormal at 5% Significance Level	
Theta Star	84.55		
MLE of Mean	65.07		
MLE of Standard Deviation	74.18		
nu star	24.63		
Approximate Chi Square Value (.05)	14.33	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0335	95% CLT UCL	96.83
Adjusted Chi Square Value	13.44	95% Jackknife UCL	98.92
		95% Standard Bootstrap UCL	95.03
Anderson-Darling Test Statistic	0.916	95% Bootstrap-t UCL	112.8
Anderson-Darling 5% Critical Value	0.768	95% Hall's Bootstrap UCL	107.3
Kolmogorov-Smirnov Test Statistic	0.24	95% Percentile Bootstrap UCL	96.74
Kolmogorov-Smirnov 5% Critical Value	0.222	95% BCA Bootstrap UCL	103.2

Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	149.2
		97.5% Chebyshev(Mean, Sd) UCL	185.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	257.2
95% Approximate Gamma UCL	111.9		
95% Adjusted Gamma UCL	119.3		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	149.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	H:\Indianhead\UXO 32 soil RA\proucl\surface soil current.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

CADMIUM

General Statistics

Number of Valid Data	15	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	10
Number of Missing Values	29	Percent Non-Detects	66.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0213	Minimum Detected	-3.849
Maximum Detected	5.83	Maximum Detected	1.763
Mean of Detected	2.303	Mean of Detected	-0.802
SD of Detected	2.981	SD of Detected	2.471
Minimum Non-Detect	0.0313	Minimum Non-Detect	-3.464
Maximum Non-Detect	0.552	Maximum Non-Detect	-0.594

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	2
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	86.67%

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.736	Shapiro Wilk Test Statistic	0.899
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.924	Mean	-1.358
SD	1.887	SD	1.554
95% DL/2 (t) UCL	1.782	95% H-Stat (DL/2) UCL	4.022
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.183
		SD in Log Scale	1.707
		Mean in Original Scale	0.808
		SD in Original Scale	1.933
		95% t UCL	1.687

		95% Percentile Bootstrap UCL	1.604
		95% BCA Bootstrap UCL	1.922
		95% H-UCL	3
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.294	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	7.832		
nu star	2.941		
A-D Test Statistic	0.483	Nonparametric Statistics	
5% A-D Critical Value	0.725	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.725	Mean	0.832
5% K-S Critical Value	0.376	SD	1.86
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.538
		95% KM (t) UCL	1.78
Assuming Gamma Distribution		95% KM (z) UCL	1.717
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.697
Minimum	1.0000E-6	95% KM (bootstrap t) UCL	8.05
Maximum	5.83	95% KM (BCA) UCL	2.225
Mean	0.768	95% KM (Percentile Bootstrap) UCL	1.989
Median	1.0000E-6	95% KM (Chebyshev) UCL	3.179
SD	1.95	97.5% KM (Chebyshev) UCL	4.194
k star	0.116	99% KM (Chebyshev) UCL	6.189
Theta star	6.621		
Nu star	3.478	Potential UCLs to Use	
AppChi2	0.527	95% KM (t) UCL	1.78
95% Gamma Approximate UCL	5.065		
95% Adjusted Gamma UCL	6.511		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

BAP EQUIVALENT-HALFND

General Statistics			
Number of Valid Data	17	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	8
Number of Missing Values	27	Percent Non-Detects	47.06%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	27.09	Minimum Detected	3.299
Maximum Detected	1200	Maximum Detected	7.09
Mean of Detected	273.1	Mean of Detected	4.979
SD of Detected	363.8	SD of Detected	1.219
Minimum Non-Detect	360	Minimum Non-Detect	5.886
Maximum Non-Detect	400	Maximum Non-Detect	5.991
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	16
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1

Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	94.12%

Warning: There are only 9 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.659	Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	234.6	Mean	5.108
SD	260.7	SD	0.873
95% DL/2 (t) UCL	345	95% H-Stat (DL/2) UCL	415.5
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	4.84
		SD in Log Scale	0.956
		Mean in Original Scale	203.5
		SD in Original Scale	272.7
		95% t UCL	319
		95% Percentile Bootstrap UCL	321.5
		95% BCA Bootstrap UCL	391.2
		95% H-UCL	372.5
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.69	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	395.8		
nu star	12.42		
A-D Test Statistic	0.429	**Nonparametric Statistics**	
5% A-D Critical Value	0.746	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.746	Mean	215.6
5% K-S Critical Value	0.288	SD	266.4
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	72.95
		95% KM (t) UCL	343
Assuming Gamma Distribution		95% KM (z) UCL	335.6
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	341.5
Minimum	1.0000E-6	95% KM (bootstrap t) UCL	450.3
Maximum	1200	95% KM (BCA) UCL	345.5
Mean	234.9	95% KM (Percentile Bootstrap) UCL	340
Median	179.4	95% KM (Chebyshev) UCL	533.6
SD	281.2	97.5% KM (Chebyshev) UCL	671.2
k star	0.393	99% KM (Chebyshev) UCL	941.4
Theta star	598.2		
Nu star	13.35	**Potential UCLs to Use**	

AppChi2	6.129	95% KM (BCA) UCL	345.5
95% Gamma Approximate UCL	511.6		
95% Adjusted Gamma UCL	557.7		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

AROCLOR-1260

General Statistics

Number of Valid Data	26	Number of Detected Data	21
Number of Distinct Detected Data	21	Number of Non-Detect Data	5
Number of Missing Values	18	Percent Non-Detects	19.23%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	11	Minimum Detected	2.398
Maximum Detected	608	Maximum Detected	6.41
Mean of Detected	145	Mean of Detected	4.389
SD of Detected	153.5	SD of Detected	1.186
Minimum Non-Detect	39.7	Minimum Non-Detect	3.681
Maximum Non-Detect	44.3	Maximum Non-Detect	3.791
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	13
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	50.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.816	Shapiro Wilk Test Statistic	0.956
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	121.1	Mean	4.126
SD	146.1	SD	1.195
95% DL/2 (t) UCL	170	95% H-Stat (DL/2) UCL	245
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	38.18	Mean in Log Scale	4.174
SD	231.2	SD in Log Scale	1.152
95% MLE (t) UCL	115.6	Mean in Original Scale	122.2
95% MLE (Tiku) UCL	133.7	SD in Original Scale	145.4
		95% t UCL	170.9
		95% Percentile Bootstrap UCL	170.7
		95% BCA Bootstrap UCL	180
		95% H UCL	235.5
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	

k star (bias corrected)	0.875	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	165.8		
nu star	36.74		
A-D Test Statistic	0.448	**Nonparametric Statistics**	
5% A-D Critical Value	0.77	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.77	Mean	122
5% K-S Critical Value	0.195	SD	142.7
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	28.71
		95% KM (t) UCL	171
Assuming Gamma Distribution		95% KM (z) UCL	169.2
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	170.8
Minimum	0.201	95% KM (bootstrap t) UCL	188.9
Maximum	608	95% KM (BCA) UCL	175.1
Mean	117.2	95% KM (Percentile Bootstrap) UCL	170.8
Median	47.05	95% KM (Chebyshev) UCL	247.1
SD	149.1	97.5% KM (Chebyshev) UCL	301.3
k star	0.403	99% KM (Chebyshev) UCL	407.6
Theta star	290.8		
Nu star	20.95	**Potential UCLs to Use**	
AppChi2	11.55	95% KM (Chebyshev) UCL	247.1
95% Gamma Approximate UCL	212.5		
95% Adjusted Gamma UCL	221.3		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

ProUCL Output
Surface Soil (Under Cap)

General UCL Statistics for Full Data Sets

User Selected Options	
From File	H:\Indianhead\UXO 32 soil RA\proucl\surface soil under cap.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	5

Raw Statistics		Log-transformed Statistics	
Minimum	5.2	Minimum of Log Data	1.649
Maximum	110	Maximum of Log Data	4.7
Mean	36.2	Mean of log Data	3.065
Median	29.75	SD of log Data	1.194
SD	38.83		
Std. Error of Mean	15.85		
Coefficient of Variation	1.073		
Skewness	1.746		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.797	Shapiro Wilk Test Statistic	0.906
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	68.14	95% H-UCL	567.8
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	113.9
95% Adjusted-CLT UCL (Chen-1995)	74.35	97.5% Chebyshev (MVUE) UCL	147
95% Modified-t UCL (Johnson-1978)	70.03	99% Chebyshev (MVUE) UCL	212.2
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.656	Data appear Normal at 5% Significance Level	
Theta Star	55.16		
MLE of Mean	36.2		

MLE of Standard Deviation	44.69		
nu star	7.875		
Approximate Chi Square Value (.05)	2.663	Nonparametric Statistics	
Adjusted Level of Significance	0.0122	95% CLT UCL	62.27
Adjusted Chi Square Value	1.699	95% Jackknife UCL	68.14
		95% Standard Bootstrap UCL	60.33
Anderson-Darling Test Statistic	0.35	95% Bootstrap-t UCL	101.9
Anderson-Darling 5% Critical Value	0.714	95% Hall's Bootstrap UCL	169.1
Kolmogorov-Smirnov Test Statistic	0.209	95% Percentile Bootstrap UCL	61.33
Kolmogorov-Smirnov 5% Critical Value	0.34	95% BCA Bootstrap UCL	68.67
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	105.3
		97.5% Chebyshev(Mean, Sd) UCL	135.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	193.9
95% Approximate Gamma UCL	107.1		
95% Adjusted Gamma UCL	167.8		
Potential UCL to Use		Use 95% Student's-t UCL	68.14

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

LEAD

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6

Raw Statistics		Log-transformed Statistics	
Minimum	5.3	Minimum of Log Data	1.668
Maximum	9800	Maximum of Log Data	9.19
Mean	1672	Mean of log Data	4.077
Median	39.75	SD of log Data	2.824
SD	3982		
Std. Error of Mean	1626		
Coefficient of Variation	2.382		
Skewness	2.449		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.507	Shapiro Wilk Test Statistic	0.86
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	4948	95% H-UCL	2.480E+9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	3343
95% Adjusted-CLT UCL (Chen-1995)	6082	97.5% Chebyshev (MVUE) UCL	4486
95% Modified-t UCL (Johnson-1978)	5219	99% Chebyshev (MVUE) UCL	6732
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.22	Data appear Lognormal at 5% Significance Level	
Theta Star	7609		
MLE of Mean	1672		
MLE of Standard Deviation	3566		
nu star	2.637		
Approximate Chi Square Value (.05)	0.273	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0122	95% CLT UCL	4346
Adjusted Chi Square Value	0.125	95% Jackknife UCL	4948
		95% Standard Bootstrap UCL	4112
Anderson-Darling Test Statistic	0.892	95% Bootstrap-t UCL	237883
Anderson-Darling 5% Critical Value	0.796	95% Hall's Bootstrap UCL	145748
Kolmogorov-Smirnov Test Statistic	0.376	95% Percentile Bootstrap UCL	4912
Kolmogorov-Smirnov 5% Critical Value	0.363	95% BCA Bootstrap UCL	4949
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	8758
		97.5% Chebyshev(Mean, Sd) UCL	11825
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	17848
95% Approximate Gamma UCL	16120		
95% Adjusted Gamma UCL	35254		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	17848
Recommended UCL exceeds the maximum observation			

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	H:\Indianhead\UXO 32 soil RA\proucl\surface soil under cap.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

AROCLOR-1260

General Statistics

Number of Valid Data	5	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	1
		Percent Non-Detects	20.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	5.8	Minimum Detected	1.758
Maximum Detected	11000	Maximum Detected	9.306
Mean of Detected	3991	Mean of Detected	5.468
SD of Detected	5221	SD of Detected	3.99
Minimum Non-Detect	38	Minimum Non-Detect	3.638
Maximum Non-Detect	38	Maximum Non-Detect	3.638

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.859	Shapiro Wilk Test Statistic	0.812
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3197	Mean	4.964
SD	4858	SD	3.635
95% DL/2 (t) UCL	7829	95% H-Stat (DL/2) UCL	2.272E+18
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	4.867
		SD in Log Scale	3.708
		Mean in Original Scale	3196
		SD in Original Scale	4859
		95% t UCL	7828
		95% Percentile Bootstrap UCL	6603
		95% BCA Bootstrap UCL	7592
		95% H-UCL	9.321E+18

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.23	Data appear Normal at 5% Significance Level	
Theta Star	17392		
nu star	1.836		
A-D Test Statistic	0.507	Nonparametric Statistics	
5% A-D Critical Value	0.718	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.718	Mean	3195
5% K-S Critical Value	0.421	SD	4347
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	2245
		95% KM (t) UCL	7980
Assuming Gamma Distribution		95% KM (z) UCL	6887
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	7828
Minimum	1.0000E-6	95% KM (bootstrap t) UCL	8188
Maximum	11000	95% KM (BCA) UCL	6604
Mean	3193	95% KM (Percentile Bootstrap) UCL	7370
Median	10	95% KM (Chebyshev) UCL	12979
SD	4861	97.5% KM (Chebyshev) UCL	17213
k star	0.182	99% KM (Chebyshev) UCL	25529
Theta star	17514		
Nu star	1.823	Potential UCLs to Use	
AppChi2	0.131	95% KM (t) UCL	7980
95% Gamma Approximate UCL	44364	95% KM (Percentile Bootstrap) UCL	7370
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

ProUCL Output
Surface Soil (Future)

General UCL Statistics for Full Data Sets

User Selected Options	
From File	H:\Indianhead\UXO 32 soil RA\proucl\surface soil future.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC

General Statistics

Number of Valid Observations	50	Number of Distinct Observations	49

Raw Statistics		**Log-transformed Statistics**	
Minimum	3.24	Minimum of Log Data	1.176
Maximum	423	Maximum of Log Data	6.047
Mean	77	Mean of log Data	3.555
Median	34.95	SD of log Data	1.331
SD	101		
Std. Error of Mean	14.28		
Coefficient of Variation	1.311		
Skewness	1.994		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.712	Shapiro Wilk Test Statistic	0.961
Shapiro Wilk Critical Value	0.947	Shapiro Wilk Critical Value	0.947
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	100.9	95% H-UCL	142.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	168.3
95% Adjusted-CLT UCL (Chen-1995)	104.8	97.5% Chebyshev (MVUE) UCL	205.5
95% Modified-t UCL (Johnson-1978)	101.6	99% Chebyshev (MVUE) UCL	278.7
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.726	Data appear Lognormal at 5% Significance Level	
Theta Star	106.1		
MLE of Mean	77		
MLE of Standard Deviation	90.38		
nu star	72.59		
Approximate Chi Square Value (.05)	53.97	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0452	95% CLT UCL	100.5
Adjusted Chi Square Value	53.49	95% Jackknife UCL	100.9
		95% Standard Bootstrap UCL	100.5
Anderson-Darling Test Statistic	0.951	95% Bootstrap-t UCL	107.4
Anderson-Darling 5% Critical Value	0.793	95% Hall's Bootstrap UCL	103.6
Kolmogorov-Smirnov Test Statistic	0.146	95% Percentile Bootstrap UCL	101.6
Kolmogorov-Smirnov 5% Critical Value	0.13	95% BCA Bootstrap UCL	105.8
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	139.2
		97.5% Chebyshev(Mean, Sd) UCL	166.2
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	219.1

95% Approximate Gamma UCL	103.6		
95% Adjusted Gamma UCL	104.5		
Potential UCL to Use		Use 95% H-UCL	142.5

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

LEAD

General Statistics

Number of Valid Observations	22	Number of Distinct Observations	22
Number of Missing Values	28		

Raw Statistics		Log-transformed Statistics	
Minimum	5.3	Minimum of Log Data	1.668
Maximum	9800	Maximum of Log Data	9.19
Mean	503.3	Mean of log Data	3.674
Median	22.3	SD of log Data	1.72
SD	2078		
Std. Error of Mean	443		
Coefficient of Variation	4.128		
Skewness	4.682		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.245	Shapiro Wilk Test Statistic	0.859
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	1265	95% H-UCL	694.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	446.6
95% Adjusted-CLT UCL (Chen-1995)	1704	97.5% Chebyshev (MVUE) UCL	575
95% Modified-t UCL (Johnson-1978)	1339	99% Chebyshev (MVUE) UCL	827.2
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.267	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1881		
MLE of Mean	503.3		
MLE of Standard Deviation	973.1		
nu star	11.77		
Approximate Chi Square Value (.05)	5.076	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0386	95% CLT UCL	1232
Adjusted Chi Square Value	4.75	95% Jackknife UCL	1265

		95% Standard Bootstrap UCL	1217
Anderson-Darling Test Statistic	3.815	95% Bootstrap-t UCL	18586
Anderson-Darling 5% Critical Value	0.859	95% Hall's Bootstrap UCL	9612
Kolmogorov-Smirnov Test Statistic	0.324	95% Percentile Bootstrap UCL	1387
Kolmogorov-Smirnov 5% Critical Value	0.202	95% BCA Bootstrap UCL	1842
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2434
		97.5% Chebyshev(Mean, Sd) UCL	3270
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4911
95% Approximate Gamma UCL	1167		
95% Adjusted Gamma UCL	1247		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	2434

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	H:\Indianhead\UXO 32 soil RA\proucl\surface soil future.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

CADMIUM

General Statistics

Number of Valid Data	16	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	10
Number of Missing Values	34	Percent Non-Detects	62.50%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0213	Minimum Detected	-3.849
Maximum Detected	69	Maximum Detected	4.234
Mean of Detected	13.42	Mean of Detected	0.0372
SD of Detected	27.36	SD of Detected	3.019
Minimum Non-Detect	0.0313	Minimum Non-Detect	-3.464
Maximum Non-Detect	0.552	Maximum Non-Detect	-0.594

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	13
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	3
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	81.25%

Warning: There are only 6 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.575	Shapiro Wilk Test Statistic	0.955
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	5.178	Mean	-1.008
SD	17.12	SD	2.052
95% DL/2 (t) UCL	12.68	95% H-Stat (DL/2) UCL	33.65
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.821
		SD in Log Scale	2.337
		Mean in Original Scale	5.069
		SD in Original Scale	17.15
		95% t UCL	12.59

95% Percentile Bootstrap UCL	13.36
95% BCA Bootstrap UCL	18.31
95% H-UCL	54.5

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.248
Theta Star	54.14
nu star	2.974
A-D Test Statistic	0.381
5% A-D Critical Value	0.776
K-S Test Statistic	0.776
5% K-S Critical Value	0.359

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	1.0000E-6
Maximum	69
Mean	5.032
Median	1.0000E-6
SD	17.16
k star	0.108
Theta star	46.7
Nu star	3.448
AppChi2	0.517
95% Gamma Approximate UCL	33.58
95% Adjusted Gamma UCL	42.39

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	5.092
SD	16.6
SE of Mean	4.546
95% KM (t) UCL	13.06
95% KM (z) UCL	12.57
95% KM (jackknife) UCL	12.59
95% KM (bootstrap t) UCL	63.1
95% KM (BCA) UCL	14.37
95% KM (Percentile Bootstrap) UCL	13.61
95% KM (Chebyshev) UCL	24.91
97.5% KM (Chebyshev) UCL	33.48
99% KM (Chebyshev) UCL	50.32

Potential UCLs to Use

95% KM (t) UCL	13.06

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

BAP EQUIVALENT-HALFND

General Statistics

Number of Valid Data	17	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	8
Number of Missing Values	32	Percent Non-Detects	47.06%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	27.09	Minimum Detected	3.299
Maximum Detected	1200	Maximum Detected	7.09
Mean of Detected	273.1	Mean of Detected	4.979
SD of Detected	363.8	SD of Detected	1.219
Minimum Non-Detect	360	Minimum Non-Detect	5.886
Maximum Non-Detect	400	Maximum Non-Detect	5.991

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	16
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	1

Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	94.12%

Warning: There are only 9 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.659	Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	234.6	Mean	5.108
SD	260.7	SD	0.873
95% DL/2 (t) UCL	345	95% H-Stat (DL/2) UCL	415.5
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	4.84
		SD in Log Scale	0.956
		Mean in Original Scale	203.5
		SD in Original Scale	272.7
		95% t UCL	319
		95% Percentile Bootstrap UCL	324.3
		95% BCA Bootstrap UCL	395.6
		95% H-UCL	372.5
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.69	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	395.8		
nu star	12.42		
A-D Test Statistic	0.429	**Nonparametric Statistics**	
5% A-D Critical Value	0.746	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.746	Mean	215.6
5% K-S Critical Value	0.288	SD	266.4
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	72.95
		95% KM (t) UCL	343
Assuming Gamma Distribution		95% KM (z) UCL	335.6
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	341.5
Minimum	1.0000E-6	95% KM (bootstrap t) UCL	457.1
Maximum	1200	95% KM (BCA) UCL	363.9
Mean	234.9	95% KM (Percentile Bootstrap) UCL	342.9
Median	179.4	95% KM (Chebyshev) UCL	533.6
SD	281.2	97.5% KM (Chebyshev) UCL	671.2
k star	0.393	99% KM (Chebyshev) UCL	941.4
Theta star	598.2		
Nu star	13.35	**Potential UCLs to Use**	

AppChi2	6.129	95% KM (BCA) UCL	363.9
95% Gamma Approximate UCL	511.6		
95% Adjusted Gamma UCL	557.7		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

AROCLOR-1260

General Statistics

Number of Valid Data	31	Number of Detected Data	25
Number of Distinct Detected Data	25	Number of Non-Detect Data	6
Number of Missing Values	18	Percent Non-Detects	19.35%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	5.8	Minimum Detected	1.758
Maximum Detected	11000	Maximum Detected	9.306
Mean of Detected	760.5	Mean of Detected	4.562
SD of Detected	2345	SD of Detected	1.823
Minimum Non-Detect	38	Minimum Non-Detect	3.638
Maximum Non-Detect	44.3	Maximum Non-Detect	3.791

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	16
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	15
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	51.61%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.351	Shapiro Wilk Test Statistic	0.937
5% Shapiro Wilk Critical Value	0.918	5% Shapiro Wilk Critical Value	0.918
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	617.2	Mean	4.261
SD	2118	SD	1.746
95% DL/2 (t) UCL	1263	95% H-Stat (DL/2) UCL	972.1
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	4.249
		SD in Log Scale	1.755
		Mean in Original Scale	617
		SD in Original Scale	2118
		95% t UCL	1263
		95% Percentile Bootstrap UCL	1315
		95% BCA Bootstrap UCL	1686
		95% H-UCL	986

Gamma Distribution Test with Detected Values Only	Data Distribution Test with Detected Values Only

k star (bias corrected)	0.315	Data appear Lognormal at 5% Significance Level	
Theta Star	2412		
nu star	15.76		
A-D Test Statistic	2.774	Nonparametric Statistics	
5% A-D Critical Value	0.845	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.845	Mean	617.4
5% K-S Critical Value	0.189	SD	2084
Data not Gamma Distributed at 5% Significance Level		SE of Mean	382
		95% KM (t) UCL	1266
Assuming Gamma Distribution		95% KM (z) UCL	1246
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1263
Minimum	1.0000E-6	95% KM (bootstrap t) UCL	9051
Maximum	11000	95% KM (BCA) UCL	1328
Mean	613.3	95% KM (Percentile Bootstrap) UCL	1307
Median	39	95% KM (Chebyshev) UCL	2282
SD	2119	97.5% KM (Chebyshev) UCL	3003
k star	0.151	99% KM (Chebyshev) UCL	4418
Theta star	4072		
Nu star	9.338	Potential UCLs to Use	
AppChi2	3.533	99% KM (Chebyshev) UCL	4418
95% Gamma Approximate UCL	1621		
95% Adjusted Gamma UCL	1717		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

ProUCL Output
Subsurface Soil

General UCL Statistics for Full Data Sets

User Selected Options	
From File	H:\Indianhead\UXO 32 soil RA\proucl\subsurface soil.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ALUMINUM

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7
Raw Statistics		**Log-transformed Statistics**	
Minimum	450	Minimum of Log Data	6.109
Maximum	7070	Maximum of Log Data	8.864
Mean	2272	Mean of log Data	7.384
Median	1490	SD of log Data	0.879
SD	2251		
Std. Error of Mean	850.9		
Coefficient of Variation	0.991		
Skewness	2.047		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.766	Shapiro Wilk Test Statistic	0.99
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	3925	95% H-UCL	7924
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5441
95% Adjusted-CLT UCL (Chen-1995)	4375	97.5% Chebyshev (MVUE) UCL	6838
95% Modified-t UCL (Johnson-1978)	4035	99% Chebyshev (MVUE) UCL	9580
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.009	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	2251		
MLE of Mean	2272		

MLE of Standard Deviation	2262		
nu star	14.13		
Approximate Chi Square Value (.05)	6.66	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0158	95% CLT UCL	3672
Adjusted Chi Square Value	5.192	95% Jackknife UCL	3925
		95% Standard Bootstrap UCL	3582
Anderson-Darling Test Statistic	0.284	95% Bootstrap-t UCL	6628
Anderson-Darling 5% Critical Value	0.72	95% Hall's Bootstrap UCL	9856
Kolmogorov-Smirnov Test Statistic	0.163	95% Percentile Bootstrap UCL	3646
Kolmogorov-Smirnov 5% Critical Value	0.317	95% BCA Bootstrap UCL	4223
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	5981
		97.5% Chebyshev(Mean, Sd) UCL	7586
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	10738
95% Approximate Gamma UCL	4820		
95% Adjusted Gamma UCL	6182		
Potential UCL to Use		Use 95% Approximate Gamma UCL	4820

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

IRON

General Statistics

Number of Valid Observations	7	Number of Distinct Observations	7
Raw Statistics		**Log-transformed Statistics**	
Minimum	1710	Minimum of Log Data	7.444
Maximum	13800	Maximum of Log Data	9.532
Mean	6366	Mean of log Data	8.49
Median	6410	SD of log Data	0.832
SD	4596		
Std. Error of Mean	1737		
Coefficient of Variation	0.722		
Skewness	0.577		

Warning: A sample size of 'n' = 7 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 7 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.91	Shapiro Wilk Test Statistic	0.907
Shapiro Wilk Critical Value	0.803	Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	9742	95% H-UCL	20631
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	15406
95% Adjusted-CLT UCL (Chen-1995)	9629	97.5% Chebyshev (MVUE) UCL	19270
95% Modified-t UCL (Johnson-1978)	9805	99% Chebyshev (MVUE) UCL	26860
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.242	Data appear Normal at 5% Significance Level	
Theta Star	5124		
MLE of Mean	6366		
MLE of Standard Deviation	5712		
nu star	17.39		
Approximate Chi Square Value (.05)	8.955	Nonparametric Statistics	
Adjusted Level of Significance	0.0158	95% CLT UCL	9224
Adjusted Chi Square Value	7.203	95% Jackknife UCL	9742
		95% Standard Bootstrap UCL	8972
Anderson-Darling Test Statistic	0.358	95% Bootstrap-t UCL	10756
Anderson-Darling 5% Critical Value	0.715	95% Hall's Bootstrap UCL	9407
Kolmogorov-Smirnov Test Statistic	0.23	95% Percentile Bootstrap UCL	9020
Kolmogorov-Smirnov 5% Critical Value	0.315	95% BCA Bootstrap UCL	9396
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	13938
		97.5% Chebyshev(Mean, Sd) UCL	17215
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	23650
95% Approximate Gamma UCL	12367		
95% Adjusted Gamma UCL	15375		
Potential UCL to Use		Use 95% Student's-t UCL	9742

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	H:\Indianhead\UXO 32 soil RA\proucl\subsurface soil.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC

General Statistics

Number of Valid Data	34	Number of Detected Data	32
Number of Distinct Detected Data	32	Number of Non-Detect Data	2
		Percent Non-Detects	5.88%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.965	Minimum Detected	-0.0356
Maximum Detected	328	Maximum Detected	5.793
Mean of Detected	34.7	Mean of Detected	2.301
SD of Detected	74.12	SD of Detected	1.459
Minimum Non-Detect	0.72	Minimum Non-Detect	-0.329
Maximum Non-Detect	0.74	Maximum Non-Detect	-0.301

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	2
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	32
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	5.88%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.487	Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.93	5% Shapiro Wilk Critical Value	0.93
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	32.68	Mean	2.106
SD	72.3	SD	1.62
95% DL/2 (t) UCL	53.66	95% H-Stat (DL/2) UCL	77.2
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	29.78	Mean in Log Scale	2.1
SD	74.09	SD in Log Scale	1.632
95% MLE (t) UCL	51.28	Mean in Original Scale	32.68
95% MLE (Tiku) UCL	49.33	SD in Original Scale	72.3
		95% t UCL	53.66
		95% Percentile Bootstrap UCL	54.18
		95% BCA Bootstrap UCL	62.88
		95% H UCL	79.21
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.482	**Data appear Lognormal at 5% Significance Level**	
Theta Star	72.05		

nu star	30.82		
A-D Test Statistic	2.736	Nonparametric Statistics	
5% A-D Critical Value	0.81	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.81	Mean	32.71
5% K-S Critical Value	0.164	SD	71.22
Data not Gamma Distributed at 5% Significance Level		SE of Mean	12.41
		95% KM (t) UCL	53.71
Assuming Gamma Distribution		95% KM (z) UCL	53.13
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	53.69
Minimum	1.0000E-6	95% KM (bootstrap t) UCL	75.38
Maximum	328	95% KM (BCA) UCL	54.2
Mean	32.66	95% KM (Percentile Bootstrap) UCL	53.86
Median	7.775	95% KM (Chebyshev) UCL	86.8
SD	72.31	97.5% KM (Chebyshev) UCL	110.2
k star	0.311	99% KM (Chebyshev) UCL	156.2
Theta star	104.9		
Nu star	21.16	Potential UCLs to Use	
AppChi2	11.71	97.5% KM (Chebyshev) UCL	110.2
95% Gamma Approximate UCL	59.01		
95% Adjusted Gamma UCL	60.81		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

MANGANESE

General Statistics

Number of Valid Data	7	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	1
		Percent Non-Detects	14.29%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	4.1	Minimum Detected	1.411
Maximum Detected	152	Maximum Detected	5.024
Mean of Detected	36.32	Mean of Detected	2.785
SD of Detected	57.35	SD of Detected	1.308
Minimum Non-Detect	3.15	Minimum Non-Detect	1.147
Maximum Non-Detect	3.15	Maximum Non-Detect	1.147

Warning: There are only 6 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.633	Shapiro Wilk Test Statistic	0.933
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	31.35	Mean	2.452
SD	53.97	SD	1.484
95% DL/2 (t) UCL	70.99	95% H-Stat (DL/2) UCL	781.7
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	26.32	Mean in Log Scale	2.316
SD	55.43	SD in Log Scale	1.723
95% MLE (t) UCL	67.03	Mean in Original Scale	31.22
95% MLE (Tiku) UCL	65.19	SD in Original Scale	54.06
		95% t UCL	70.92
		95% Percentile Bootstrap UCL	70.07
		95% BCA Bootstrap UCL	88.32
		95% H UCL	2780
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.482	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	75.28		
nu star	5.789		
A-D Test Statistic	0.529	**Nonparametric Statistics**	
5% A-D Critical Value	0.721	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.721	Mean	31.71
5% K-S Critical Value	0.344	SD	49.76
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	20.6
		95% KM (t) UCL	71.75
Assuming Gamma Distribution		95% KM (z) UCL	65.6
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	71.08
Minimum	1.0000E-6	95% KM (bootstrap t) UCL	270.5
Maximum	152	95% KM (BCA) UCL	72.24
Mean	31.13	95% KM (Percentile Bootstrap) UCL	70.79
Median	10.6	95% KM (Chebyshev) UCL	121.5
SD	54.12	97.5% KM (Chebyshev) UCL	160.4
k star	0.231	99% KM (Chebyshev) UCL	236.7
Theta star	135		
Nu star	3.228	**Potential UCLs to Use**	
AppChi2	0.443	95% KM (Chebyshev) UCL	121.5
95% Gamma Approximate UCL	226.8		
95% Adjusted Gamma UCL	436.4		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

VANADIUM

General Statistics

Number of Valid Data	7	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	5
		Percent Non-Detects	71.43%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	11.8	Minimum Detected	2.468
Maximum Detected	27.4	Maximum Detected	3.311
Mean of Detected	19.6	Mean of Detected	2.889
SD of Detected	11.03	SD of Detected	0.596
Minimum Non-Detect	4.4	Minimum Non-Detect	1.482
Maximum Non-Detect	7.8	Maximum Non-Detect	2.054

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	5
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	2
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	71.43%

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	7.811	Mean	1.619
SD	9.242	SD	0.918
95% DL/2 (t) UCL	14.6	95% H-Stat (DL/2) UCL	28.28
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A

		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	14.03
5% K-S Critical Value	N/A	SD	5.459
Data not Gamma Distributed at 5% Significance Level		SE of Mean	2.918
		95% KM (t) UCL	19.7
Assuming Gamma Distribution		95% KM (z) UCL	18.83
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	25.66
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	27.4
Median	N/A	95% KM (Chebyshev) UCL	26.75
SD	N/A	97.5% KM (Chebyshev) UCL	32.25
k star	N/A	99% KM (Chebyshev) UCL	43.06
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	19.7
95% Gamma Approximate UCL	N/A	95% KM (% Bootstrap) UCL	27.4
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

BAP EQUIVALENT-HALFND

General Statistics

Number of Valid Data	7	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	5
		Percent Non-Detects	71.43%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	346.1	Minimum Detected	5.847
Maximum Detected	479.7	Maximum Detected	6.173
Mean of Detected	412.9	Mean of Detected	6.01
SD of Detected	94.49	SD of Detected	0.231
Minimum Non-Detect	400	Minimum Non-Detect	5.991
Maximum Non-Detect	450	Maximum Non-Detect	6.109

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	6
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	1
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	85.71%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	266.5	Mean	5.529
SD	107.5	SD	0.344
95% DL/2 (t) UCL	345.5	95% H-Stat (DL/2) UCL	367.2
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	N/A	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	**Nonparametric Statistics**	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	365.2
5% K-S Critical Value	N/A	SD	46.76
Data not Gamma Distributed at 5% Significance Level		SE of Mean	24.99
		95% KM (t) UCL	413.7
Assuming Gamma Distribution		95% KM (z) UCL	406.3
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	464.8
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	479.7

Mean	N/A	95% KM (Percentile Bootstrap) UCL	479.7
Median	N/A	95% KM (Chebyshev) UCL	474.1
SD	N/A	97.5% KM (Chebyshev) UCL	521.3
k star	N/A	99% KM (Chebyshev) UCL	613.9
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	413.7
95% Gamma Approximate UCL	N/A	95% KM (% Bootstrap) UCL	479.7
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

ProUCL Output
Upgradient Groundwater

General UCL Statistics for Full Data Sets

User Selected Options	
From File	Converted_Data.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

BERYLLIUM

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	5

Raw Statistics		Log-transformed Statistics	
Minimum	2.965	Minimum of Log Data	1.087
Maximum	10.5	Maximum of Log Data	2.351
Mean	6.138	Mean of log Data	1.744
Median	5.56	SD of log Data	0.417
SD	2.527		
Std. Error of Mean	1.032		
Coefficient of Variation	0.412		
Skewness	0.931		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.932	Shapiro Wilk Test Statistic	0.962
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8.216	95% H-UCL	9.851
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	10.7
95% Adjusted-CLT UCL (Chen-1995)	8.253	97.5% Chebyshev (MVUE) UCL	12.67
95% Modified-t UCL (Johnson-1978)	8.282	99% Chebyshev (MVUE) UCL	16.54
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3.73	**Data appear Normal at 5% Significance Level**	
Theta Star	1.646		
MLE of Mean	6.138		
MLE of Standard Deviation	3.178		

nu star	44.76		
Approximate Chi Square Value (.05)	30.41	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0122	95% CLT UCL	7.834
Adjusted Chi Square Value	26.22	95% Jackknife UCL	8.216
		95% Standard Bootstrap UCL	7.714
Anderson-Darling Test Statistic	0.265	95% Bootstrap-t UCL	9.261
Anderson-Darling 5% Critical Value	0.698	95% Hall's Bootstrap UCL	19.47
Kolmogorov-Smirnov Test Statistic	0.205	95% Percentile Bootstrap UCL	7.731
Kolmogorov-Smirnov 5% Critical Value	0.333	95% BCA Bootstrap UCL	8.097
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	10.63
		97.5% Chebyshev(Mean, Sd) UCL	12.58
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	16.4
95% Approximate Gamma UCL	9.033		
95% Adjusted Gamma UCL	10.48		
Potential UCL to Use		Use 95% Student's-t UCL	8.216

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

COBALT

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6
Raw Statistics		**Log-transformed Statistics**	
Minimum	43.65	Minimum of Log Data	3.776
Maximum	779	Maximum of Log Data	6.658
Mean	370.8	Mean of log Data	5.53
Median	312.5	SD of log Data	1.09
SD	293		
Std. Error of Mean	119.6		
Coefficient of Variation	0.79		
Skewness	0.472		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!
If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.929	Shapiro Wilk Test Statistic	0.934

Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	611.8	95% H-UCL	3983
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1162
95% Adjusted-CLT UCL (Chen-1995)	592.2	97.5% Chebyshev (MVUE) UCL	1491
95% Modified-t UCL (Johnson-1978)	615.6	99% Chebyshev (MVUE) UCL	2138
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.831	**Data appear Normal at 5% Significance Level**	
Theta Star	446.2		
MLE of Mean	370.8		
MLE of Standard Deviation	406.8		
nu star	9.971		
Approximate Chi Square Value (.05)	3.924	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0122	95% CLT UCL	567.5
Adjusted Chi Square Value	2.681	95% Jackknife UCL	611.8
		95% Standard Bootstrap UCL	552.1
Anderson-Darling Test Statistic	0.22	95% Bootstrap-t UCL	781.2
Anderson-Darling 5% Critical Value	0.709	95% Hall's Bootstrap UCL	803.1
Kolmogorov-Smirnov Test Statistic	0.181	95% Percentile Bootstrap UCL	558.2
Kolmogorov-Smirnov 5% Critical Value	0.338	95% BCA Bootstrap UCL	565.8
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	892.2
		97.5% Chebyshev(Mean, Sd) UCL	1118
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1561
95% Approximate Gamma UCL	942.2		
95% Adjusted Gamma UCL	1379		
Potential UCL to Use		Use 95% Student's-t UCL	611.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

TRICHLOROETHENE

General Statistics

Number of Valid Observations	6	Number of Distinct Observations	6
Raw Statistics		**Log-transformed Statistics**	
Minimum	4.26	Minimum of Log Data	1.449
Maximum	75	Maximum of Log Data	4.317
Mean	33.86	Mean of log Data	3.198
Median	29.5	SD of log Data	1.004
SD	25.17		
Std. Error of Mean	10.28		
Coefficient of Variation	0.743		
Skewness	0.749		

Warning: A sample size of 'n' = 6 may not adequate enough to compute meaningful and reliable test statistics and estimates!

It is suggested to collect at least 8 to 10 observations using these statistical methods!

If possible compute and collect Data Quality Objectives (DQO) based sample size and analytical results.

Warning: There are only 6 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set,

the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.955	Shapiro Wilk Test Statistic	0.927
Shapiro Wilk Critical Value	0.788	Shapiro Wilk Critical Value	0.788
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	54.57	95% H-UCL	260.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	100.5
95% Adjusted-CLT UCL (Chen-1995)	54.12	97.5% Chebyshev (MVUE) UCL	128.2
95% Modified-t UCL (Johnson-1978)	55.09	99% Chebyshev (MVUE) UCL	182.6
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.957	**Data appear Normal at 5% Significance Level**	
Theta Star	35.4		
MLE of Mean	33.86		
MLE of Standard Deviation	34.62		
nu star	11.48		
Approximate Chi Square Value (.05)	4.886	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0122	95% CLT UCL	50.76
Adjusted Chi Square Value	3.457	95% Jackknife UCL	54.57
		95% Standard Bootstrap UCL	48.91
Anderson-Darling Test Statistic	0.207	95% Bootstrap-t UCL	59.47
Anderson-Darling 5% Critical Value	0.706	95% Hall's Bootstrap UCL	61.79
Kolmogorov-Smirnov Test Statistic	0.161	95% Percentile Bootstrap UCL	49.97
Kolmogorov-Smirnov 5% Critical Value	0.337	95% BCA Bootstrap UCL	51.35
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	78.65
		97.5% Chebyshev(Mean, Sd) UCL	98.04
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	136.1
95% Approximate Gamma UCL	79.55		
95% Adjusted Gamma UCL	112.4		
Potential UCL to Use		Use 95% Student's-t UCL	54.57

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)

and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

	General UCL Statistics for Data Sets with Non-Detects
User Selected Options	
From File	Converted_Data.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC

General Statistics

Number of Valid Data	6	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
		Percent Non-Detects	16.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.16	Minimum Detected	0.148
Maximum Detected	5.11	Maximum Detected	1.631
Mean of Detected	2.848	Mean of Detected	0.903
SD of Detected	1.636	SD of Detected	0.611
Minimum Non-Detect	1.5	Minimum Non-Detect	0.405
Maximum Non-Detect	1.5	Maximum Non-Detect	0.405

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.942	Shapiro Wilk Test Statistic	0.963
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.498	Mean	0.705
SD	1.696	SD	0.732
95% DL/2 (t) UCL	3.893	95% H-Stat (DL/2) UCL	7.703
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	2.259	Mean in Log Scale	0.757
SD	1.891	SD in Log Scale	0.653
95% MLE (t) UCL	3.814	Mean in Original Scale	2.545
95% MLE (Tiku) UCL	3.941	SD in Original Scale	1.641
		95% t UCL	3.895
		95% Percentile Bootstrap UCL	3.583
		95% BCA Bootstrap UCL	3.677
		95% H UCL	6.414

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	1.593	**Data appear Normal at 5% Significance Level**	
Theta Star	1.788		
nu star	15.93		
A-D Test Statistic	0.23	**Nonparametric Statistics**	
5% A-D Critical Value	0.682	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.682	Mean	2.567
5% K-S Critical Value	0.359	SD	1.477
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.674
		95% KM (t) UCL	3.925
Assuming Gamma Distribution		95% KM (z) UCL	3.675
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3.893
Minimum	0.555	95% KM (bootstrap t) UCL	4.726
Maximum	5.11	95% KM (BCA) UCL	3.677
Mean	2.466	95% KM (Percentile Bootstrap) UCL	3.81
Median	2.05	95% KM (Chebyshev) UCL	5.504
SD	1.737	97.5% KM (Chebyshev) UCL	6.776
k star	1.196	99% KM (Chebyshev) UCL	9.273
Theta star	2.062		
Nu star	14.35	**Potential UCLs to Use**	
AppChi2	6.812	95% KM (t) UCL	3.925
95% Gamma Approximate UCL	5.195	95% KM (Percentile Bootstrap) UCL	3.81
95% Adjusted Gamma UCL	7		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

TETRACHLOROETHENE

General Statistics

Number of Valid Data	6	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	5
		Percent Non-Detects	83.33%

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable TETRACHLOROETHENE was not processed!

ATTACHMENT 5

SAMPLE CALCULATIONS

CALCULATION WORKSHEET

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112IG00307
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL CURRENT/FUTURE CONSTRUCTION WORKERS		
BASED ON: U.S. EPA, DECEMBER 1989		
BY: L.GANSER	**CHECKED BY:** RJ	**DATE:** 4/19/2011

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of surface soil (current) at UXO 32

EQUATION:

$$IEX = \frac{Cs \times IR \times EF \times ED \times FI \times CF}{BW \times AT}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
IR	=	incidental ingestion rate (mg/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
FI	=	fraction ingested from contaminated source (unitless)
CF	=	conversion factor (1.0E-6 kg/mg)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDo	=	oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cs	=	114	mg/kg	Chemical: Arsenic
IR	=	330	mg/day	
EF	=	250	days/year	
ED	=	1	years	
FI	=	1		
CF	=	1.0E-06	kg/mg	
BW	=	70	kg	
ATc	=	25550	days	
ATnc	=	365	days	
CSFo	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDo	=	3.0E-04	(mg/kg/day)	

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		JOB NUMBER: 112IG00307
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL CURRENT/FUTURE CONSTRUCTION WORKERS		
BASED ON: U.S. EPA, DECEMBER 1989		
BY: L.GANSER	CHECKED BY:	DATE: 4/19/2011

EXAMPLE CARCINOGENIC CALCULATION

IEXc = $\dfrac{\text{114 mg/kg x 330 mg/day x 250 days/year x 1 years x 1 x 1.0E-06 kg/mg}}{\text{70 kg x 25550 days}}$

IEXc = 5.26E-06 mg/kg/day

ILCR = 5.26E-06 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 7.9E-06

EXAMPLE NONCARCINOGENIC CALCULATION

IEXnc = $\dfrac{\text{114 mg/kg x 330 mg/day x 250 days/year x 1 years x 1 x 1.0E-06 kg/mg}}{\text{70 kg x 365 days}}$

IEXnc = 3.68E-04 mg/kg/day

HQ = 3.68E-04 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 1.2E+00

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		JOB NUMBER: 112IG00307
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL CURRENT/FUTURE CONSTRUCTION WORKERS		
BASED ON: U.S. EPA, JULY 2004		
BY: L.GANSER	CHECKED BY:	DATE: 4/19/2011

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with surface soil (current) at UXO 32.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EV \times EF \times ED}{BW \times AT}$$

Where:

DEX	=	estimated exposure intake (mg/kg/day)
Cs	=	exposure point concentration in soil (mg/kg)
CF	=	conversion factor (1.0E-6 kg/mg)
SA	=	skin surface available for contact (cm^2/day)
ABS	=	absorption factor (unitless)
AF	=	adherence factor (mg/cm^2-event)
EV	=	event frequency (events/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFd	=	dermal carcinogenic slope factor ((mg/kg/day)$^{-1}$)
RfDd	=	dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDd (mg/kg/day)

ASSUMPTIONS:

Cs	=	114	mg/kg	Chemical: Arsenic
CF	=	1.0E-06	kg/mg	
SA	=	3300	cm^2/day	
AF	=	0.3	mg/cm^2-event	
ABS	=	0.03		
EV	=	1	event/day	
EF	=	250	days/year	
ED	=	1	years	
BW	=	70	kg	
ATc	=	25550	days	
ATnc	=	365	days	
CSFd	=	1.5E+00	(mg/kg/day)$^{-1}$	
RfDd	=	3.0E-04	(mg/kg/day)	

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112IG00307
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL CURRENT/FUTURE CONSTRUCTION WORKERS		
BASED ON: U.S. EPA, JULY 2004		
BY: L.GANSER	**CHECKED BY:**	**DATE:** 4/19/2011

EXAMPLE CARCINOGENIC CALCULATION

DEXc = $\dfrac{\text{114 mg/kg x 1.0E-06 kg/mg x 3300 cm2/day x 0.3 mg/cm2-event x 0.03 x 1 event/day x 250 days/year x 1 years}}{\text{70 kg x 25550 days}}$

DEXc = 4.73E-07 mg/kg/day

ILCR = 4.73E-07 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 7.1E-07

EXAMPLE NONCARCINOGENIC CALCULATION

DEXnc = $\dfrac{\text{114 mg/kg x 1.0E-06 kg/mg x 3300 cm2/day x 0.3 mg/cm2-event x 0.03 x 1 event/day x 250 days/year x 1 years}}{\text{70 kg x 365 days}}$

DEXnc = 3.31E-05 mg/kg/day

HQ = 3.31E-05 mg/kg/day / 3.00E-04 (mg/kg/day) = Hazard Quotient

HQ = 1.1E-01

CLIENT:		JOB NUMBER:
UXO 32, INDIAN HEAD, MARYLAND		112IG00307
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGITIVE DUST EMISSIONS CONSTRUCTION WORKERS		
BASED ON: USEPA, JANUARY 2009		
BY:	CHECKED BY:	DATE:
L.GANSER		4/19/2011

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from inhalation of surface soil (current) at UXO 32.

EQUATION:

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$$

Where:

EC	=	exposure concentration (mg/m^3)
Ca	=	exposure point concentration in air (mg/m^3)
	=	Cs x 1/PEF
Cs	=	exposure point concentration in soil (mg/kg)
PEF	=	particulate emission factor (m^3/kg)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
AT	=	averaging time (hours)
IURi	=	inhalation unit risk ((ug/m^3)$^{-1}$)
RfCi	=	inhalation reference concentration (mg/m^3)

RISKS:

ILCR (Carcinogens) = Exposure Concentration (mg/m^3) x IURi (ug/m^3)$^{-1}$ x 1000 ug/mg

HQ (Noncarcinogens) = Exposure Concentration (mg/m^3) / RfCi (mg/m^3)

ASSUMPTIONS:

Cs	=	114	mg/kg	Chemical: Arsenic
PEF	=	1.43E+06	m3/kg	
Ca	=	7.97E-05	mg/m3	
ET	=	8	hours	
EF	=	250	days/year	
ED	=	1	years	
ATc	=	25550	days	
ATnc	=	365	days	
IURi	=	4.3E-03	(ug/m3)$^{-1}$	
RfCi	=	1.5E-05	(mg/m3)	

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		JOB NUMBER: 112IG00307
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGITIVE DUST EMISSIONS CONSTRUCTION WORKERS		
BASED ON: USEPA, JANUARY 2009		
BY: L.GANSER	CHECKED BY:	DATE: 4/19/2011

EXAMPLE CARCINOGENIC CALCULATION

$$ECc = \frac{7.97E\text{-}05 \text{ mg/m3} \times 8 \text{ hours} \times 250 \text{ days/year} \times 1 \text{ years}}{25550 \text{ days} \times 24 \text{ hours/day}}$$

ECc = 2.60E-07 mg/m3

ILCR = 2.60E-07 mg/m3 x 4.30E-03 (ug/m3)-1 x 1000 ug/mg = Incremental Lifetime Cancer Risk

ILCR = 1.1E-06

EXAMPLE NONCARCINOGENIC CALCULATION

$$ECnc = \frac{7.97E\text{-}05 \text{ mg/m3} \times 8 \text{ hours} \times 250 \text{ days/year} \times 1 \text{ years}}{365 \text{ days} \times 24 \text{ hours/day}}$$

ECnc = 1.82E-05 mg/m3

HQ = 1.82E-05 mg/m3 / 1.50E-05 (mg/m3) = Hazard Quotient

HQ **1.2E+00**

CALCULATION WORKSHEET

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112IG00307
SUBJECT: CALCULATION OF PARTICUALATE EMISSION FACTOR FOR CONSTRUCTION WORKERS		
BASED ON: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, December 2002)		
BY: L.GANSER	**CHECKED BY:**	**DATE:** 4/19/2011

Equation 5-5
Derivation of the Particulate Emission Factor
Construction Scenario - Construction Worker

$$PEF_{sc} = Q/C_{sr} \times \frac{1}{F_D} \times \left[\frac{T \times A_R}{556 \times (W/3)^{0.4} \times \frac{(365 d/yr - p)}{365 d/yr} \times \Sigma VKT} \right]$$

Parameter/Definition (units)	Default
PEF_{sc}/subchronic road particulate emission factor (m^3/kg)	site-specific
Q/C_{sr}/ inverse of the ratio of the 1-h geometric mean air concentration to the emission flux along a straight road segment bisecting a square site (g/m^2-s per kg/m^3)	23.02[a] (Equation 5-6)
F_D/dispersion correction factor (unitless)	0.185 (Appendix E)
T/total time over which construction occurs (s)	site-specific
A_R/surface area of contaminated road segment (m^2) L_R/length of road segment (ft) W_R/width of road segment (ft)	274.213 ($A_R = L_R \times W_R \times 0.092903 m^2/ft^2$)
W/mean vehicle weight (tons)	site-specific
p/number of days with at least 0.01 inches of precipitation (days/year)	site-specific (Exhibit 5-2)
ΣVKT/sum of fleet vehicle kilometers traveled during the exposure duration (km)	site-specific

[a] Assumes a 0.5 acre site

Calculation of PEF for Construction Workers

Q/C	23.02	(g/m^2-s per kg/m^3)	
Fd	0.185	dispersion correction factor (unitless)	
T	7.20E+06	sec	3600 sec/hr x 8hr/day x 250 days/yr
Area (A)	274.213	m^2	
W	8	tons	
p	140	day/year	
VKT	337.5	km	30 vehicles x 0.045 km/day x 250 days

PEF = **1.43E+06 m^3/kg**

4/20/2011

CLIENT: UXO 32, INDIAN HEAD, MARYLAND	**JOB NUMBER:** 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER ADULT RESIDENTS	
BASED ON: USEPA, DECEMBER 1989	

BY: L.GANSER	**CHECKED BY:** L. Ciofani	**DATE:** 2/2/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from ingestion of groundwater at UXO 32.

EQUATION:

$$IEX = \frac{Cgw \times CF \times IR \times EF \times ED}{BW \times AT}$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
IR	=	ingestion rate (L/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)
RfDo	=	oral noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

ASSUMPTIONS:

Cgw	=	3.9	ug/L	Chemical: Arsenic
IR	=	2	L/day	
CF	=	1.0E-03	mg/ug	
EF	=	350	days/year	
ED	=	24	years	
BW	=	70	kg	
ATc	=	25,550	days	
ATnc	=	8,760	days	
CSFo	=	1.5E+00	$(mg/kg/day)^{-1}$	
RfDo	=	3.0E-04	(mg/kg/day)	

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989		
BY: L.GANSER	**CHECKED BY:** L. Cufani	**DATE:** 2/2/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{3.9 \text{ ug/L} \times 0.001 \text{ mg/ug} \times 2 \text{ L/day} \times 350 \text{ days/year} \times 24 \text{ years}}{70 \text{ kg} \times 25550 \text{ days}}$$

IEXc = 3.66E-05 mg/kg/day

ILCR = 3.66E-05 mg/kg/day x 1.50E+00 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 5.5E-05

EXAMPLE NONCARCINOGENIC CALCULATION

$$IEXnc = \frac{3.9 \text{ ug/L} \times 0.001 \text{ mg/ug} \times 2 \text{ L/day} \times 350 \text{ days/year} \times 24 \text{ years}}{70 \text{ kg} \times 8760 \text{ days}}$$

IEXnc = 1.07E-04 mg/kg/day

$$HQ = \frac{1.07E\text{-}04 \text{ mg/kg/day}}{3.00E\text{-}04 \text{ (mg/kg/day)}} = \text{Hazard Quotient}$$

HQ = 3.6E-01

CALCULATION WORKSHEET

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: L.GANSER	**CHECKED BY:** L. Cifani	**DATE:** 2/2/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from dermal contact with groundwater at UXO 32.

EQUATION:

$$DAD = \frac{DAevent \times EV \times ED \times EF \times A}{BW \times AT}$$

Where:

DAD = dermally absorbed dose (mg/kg/day)
DAevent = absorbed does per event (mg/cm^2/event)
EV = event frequency (events/day)
EF = exposure frequency (days/year)
ED = exposure duration (years)
A = skin surface available for contact (cm^2)
BW = body weight (kg)
AT = averaging time (days)
CSFd = dermal carcinogenic slope factor ((mg/kg/day)$^{-1}$)
RfDd = dermal noncarcinogenic reference dose (mg/kg/day)

RISKS:

ILCR (Carcinogens) = DAD (mg/kg/day) x CSFd (mg/kg/day)-1
HQ (Noncarcinogens) = DAD (mg/kg/day) / RFDd (mg/kg/day)

EQUATIONS for DAevent:

For Inorganics:

DAevent = Kp x Cw x CF x tevent

For Organics:

$$\text{If } tevent \le t^*, \text{ then: } DAevent = 2 \times FA \times Kp \times Cw \times CF \times \sqrt{\frac{6 \times tau \times tevent}{\pi}}$$

$$\text{If } tevent > t^*, \text{ then: } DAevent = FA \times Kp \times Cw \times CF \times \left[\frac{tevent}{1+B} + 2 \times tau \times \left(\frac{1+3B+3B^2}{(1+B)^2}\right)\right]$$

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: L.GANSER	**CHECKED BY:** L. Ciofani	**DATE:** 2/2/2012

Where:

Kp	=	permeability coefficient from water (cm/hr)
FA	=	fraction absorbed water (dimensionless)
Cgw	=	concentration of chemical in groundwater (mg/L)
tevent	=	duration of event (hr/event)
CF	=	conversion factor (0.001 L/cm^3)
t*	=	time it takes to reach steady-state (hr/event)
τ	=	lag time (hr/event)
B	=	Bunge Model Constant (dimensionless)

EXAMPLE CALCULATION OF DAevent

ASSUMPTIONS:

Cgw	=	0.00073	mg/L	Chemical: Tetrachloroethene
Kp	=	3.34E-02	cm/hr	
FA	=	1	unitless	
tevent	=	0.58	hr/event	
CF	=	0.001	L/cm^3	
t*	=	2.18	hr/event	
τ	=	0.91	hr/event	
B	=	0.166		

tevent < t*, therefore,

$$\text{DAevent} = (2 \times 0.0334 \text{ cm/hr})\,(1)\,(0.00073 \text{ mg/L})\,(0.001 \text{ L/cm3}) \times \sqrt{\frac{6 \times 0.906 \text{ hr/event} \times 0.58 \text{ hr/event}}{\pi}}$$

DAevent = 4.89E-08 mg/cm^2-event

RISK CALCULATIONS

ASSUMPTIONS:

A	=	18,000	cm^2
EV	=	1	event/day
ED	=	24	years
EF	=	350	days/year
BW	=	70	kg
ATc	=	25,550	days
ATnc	=	8,760	days
CSFd	=	5.4E-01	(mg/kg/day)$^{-1}$
RfDd	=	1.0E-02	(mg/kg/day)

CALCULATION WORKSHEET

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH GROUNDWATER ADULT RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, JULY 2004		
BY: L.GANSER	**CHECKED BY:** L. Cirafani	**DATE:** 2/2/2012

EXAMPLE CARCINOGENIC CALCULATION

DADc = $\frac{\text{4.89E-08 mg/cm2-event x 1 event/day x 24 years x 350 days/year x 18000 cm2}}{\text{70 kg x 25550 days}}$

DADc = 4.13E-06 mg/kg/day

DADc = 4.13E-06 mg/kg/day x 5.40E-01 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 2.2E-06

EXAMPLE NONCARCINOGENIC CALCULATION

DADnc = $\frac{\text{4.89E-08 mg/cm2-event x 1 event/day x 24 years x 350 days/year x 18000 cm2}}{\text{70 kg x 8760 days}}$

DADnc = 1.20E-05 mg/kg/day

HQ = 1.20E-05 mg/kg/day / 1.00E-02 (mg/kg/day) = Hazard Quotient

HQ = 1.2E-03

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G02050
SUBJECT: ESTIMATION OF AMBIENT AIR CONCENTRATIONS IN A TRENCH RESULTING FROM VOLATILE EMISSIONS FROM GROUNDWATER.		
BASED ON: VDEQ, 2004		
BY: L.GANSER	**CHECKED BY:** L. Cifani	**DATE:** 2/2/2012

PURPOSE: To calculate ambient air concentrations resulting from volatilization of TCE from groundwater at UXO 32.

Ctrench = CGW x VF

Where:

Ctrench = concentration of contaminant in the trench $\mu g/m^3$
CGW = concentration of contaminant in groundwater µg/L
VF = volatilization factor L/m^3

1. Calculate kiG (gas-phase mass transfer coefficient of component i)

$kiG = (MWH2O/MWi)^{0.335} \times (T/298)^{1.005} \times kG, H2O$

Where:

kiG = gas-phase mass transfer coefficient of component i cm/s
MW_{H2O} = molecular weight of water = 18 g/mol
MW_{TCE} = molecular weight of TCE = 131.39 g/mol
kG,H_2O = gas-phase mass transfer coefficient of water vapor at 25°C cm/s = 0.833 cm/s
T = average system absolute temperature = 298
The value of kG, H_2O is 0.833 cm/s (Superfund Exposure Assessment Manual, U. S. EPA, April 1988)

$kiG = (18/131.39)^{0.335} \times (298/298)^{1.005} \times 0.833$ cm/s = 4.28E-01 cm/s

2. Calculate kiL (liquid-phase mass transfer coefficient of component i)

$kiL = (MWO_2/MWi)^{0.5} \times (T/298) \times kL, O_2$

Where:
kiL = liquid-phase mass transfer coefficient of component i cm/s
MW_{O2} = molecular weight of O_2 = 32 g/mol
MW_{TCE} = molecular weight of TCE = 131.39 g/mol
T = average system absolute temperature = 298
kL, O_2 = liquid-phase mass transfer coefficient of oxygen at 25°C cm/s = 0.002 cm/s

$kiL = (32/131.39)^{0.5} \times (298/298) \times 0.002$ cm/s = 9.87E-04 cm/s

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G02050
SUBJECT: ESTIMATION OF AMBIENT AIR CONCENTRATIONS IN A TRENCH RESULTING FROM VOLATILE EMISSIONS FROM GROUNDWATER.		
BASED ON: VDEQ, 2004		
BY: L.GANSER	CHECKED BY: L. Ciofani	DATE: 2/2/2012

3. Calculate Ki (overall mass transfer coefficient of contaminant)

Ki = 1 / {(1/kiL) + [(RT) / (Hi x kiG)]}

Where:

kiL = liquid-phase mass transfer coefficient of i cm/s =	9.87E-04
R = ideal gas constant atm-m^3/mole-°K =	8.20E-05
T = average system absolute temperature =	298
Hi = Henry's Law constant of TCE (atm-m^3/mol) =	9.85E-03
KiG = gas-phase mass transfer coefficient of i cm/s	4.28E-01

Ki = 1 / {(1/9.87E-4) + [(298 x 8.2E-5) / (9.85E-3 x 0.428]} = 9.81E-04 cm/s

4. Calculation of VF (Volatilization Factor)

VF = (Ki x A x F x 10^{-3} x 10^4 x 3,600) / (ACH x V)

Where:

VF = volatilization factor (L/m^3)		
Ki = overall mass transfer coefficient of contaminant =		9.81E-04 cm/s
A = area of the trench =		8.18 m^2
F = fraction of floor through which contaminant can enter (unitless) =		1
ACH = air changes per hour =		360 h^{-1}
V = volume of trench =		24.92 m^3
10^{-3} = conversion factor L/cm^3	0.001	
10^4 = conversion factor cm^2/m^2	10000	
3,600 = conversion factor seconds/hr	3600	

VF = (9.82E-4 x 8.18 x 1 x 10^{-3} x 10^4 x 3,600) / (360 x 24.92) = 3.22E-02 L/m^3

5. Calculation of C_{trench} (concentration of contaminant in the trench)

$C_{trench} = C_{GW} \times VF$

Where:

C_{trench} = concentration of contaminant in the trench (µg/m^3)	
C_{GW} = concentration of TCE in groundwater =	54.6 µg/L
VF = volatilization factor =	3.22E-02 L/m^3

C_{trench} = 54.6 µg/L x 3.22E-02 L/m3 = **1.76E+00 µg/m^3**

1.76E-03 mg/m^3

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF VOLATILES FROM GROUNDWATER - CONSTRUCTION WORKERS		
BASED ON: USEPA, DECEMBER 1989		
BY: L.GANSER	CHECKED BY: L. Ciofani	DATE: 2/2/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from inhalation of volatiles from groundwater at UXO 32.

EQUATION:

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$$

Where:

EC	=	exposure concentration (mg/m3)
Ca	=	exposure point concentration in air (mg/m3)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
AT	=	averaging time (days)
IURi	=	inhalation unit risk ($(ug/m3)^{-1}$)
RfCi	=	inhalation reference concentration (mg/m3)

RISKS:

ILCR (Carcinogens) = Exposure Concentration (mg/m3) x IURi (ug/m3)-1 x 1000 ug/mg
HQ (Noncarcinogens) = Exposure Concentration (mg/m3) / RFCi (mg/m3)

ASSUMPTIONS:

Ca	=	1.76E-03	mg/m3	Chemical: Trichloroethene
ET	=	4	hr/day	
EF	=	90	days/year	
ED	=	1	years	
ATc	=	25,550	days	
ATnc	=	365	days	
IURi	=	4.1E-06	$(ug/m^3)^{-1}$	
RfCi	=	5.4E-01	mg/m^3	

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF VOLATILES FROM GROUNDWATER - CONSTRUCTION WORKERS		
BASED ON: USEPA, DECEMBER 1989		
BY: L.GANSER	CHECKED BY: L. Ciofani	DATE: 2/2/2012

EXAMPLE CARCINOGENIC CALCULATION

IEXc = $\dfrac{\text{1.76E-03 mg/m3 x 4 hr/day x 90 days/year x 1 years}}{\text{25550 days x 24 hours/day}}$

IEXc = 1.03E-06 mg/m3

ILCR = 1.03E-06 mg/m3 x 4.10E-06 (ug/m3)-1 x 1000 ug/mg = Incremental Lifetime Cancer Risk

ILCR = 4.2E-09

EXAMPLE NONCARCINOGENIC CALCULATION

IEXnc = $\dfrac{\text{1.76E-03 mg/m3 x 4 hr/day x 90 days/year x 1 years}}{\text{365 days x 24 hours/day}}$

IEXnc = 7.23E-05 mg/m3

HQ = 7.23E-05 mg/m3 / 5.40E-01 mg/m3 = Hazard Quotient

HQ **1.3E-04**

CLIENT:		JOB NUMBER:
UXO 32, INDIAN HEAD, MARYLAND		112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF VOLATILES WHILE SHOWERING BY AN ADULT RESIDENT		
BASED ON: EPA, 1989 AND FOSTER AND CHROSTOWSKI, 1987		
BY: L.GANSER	**CHECKED BY:** L. Cifani	**DATE:** 2/2/2012

PURPOSE: To estimate intake, carcinogenic and noncarcinogenic risks from inhalation of volatiles while showering by an adult resident at UXO 32.

EQUATIONS:

$$EC = \frac{S \times K \times EF \times ED}{AT \times Ra \times CF}$$

Where:

$$K = Ds + \frac{\exp(-Ra \times Dt) - \exp[Ra \times (Ds - Dt)]}{Ra}$$

$$S = Cwd \times FR/SV \qquad Cwd = Cw \times [1-\exp(-Kal \times ts/60d)]$$

$$Kal = Kl \times [(T1 \times Us)/(Ts \times U1)^{-0.5} \qquad Kl = 1/[1/k1 + RT/(H \times kg)]$$

$$k1 = 20\ cm/hr \times (44/MW)^{0.5} \qquad kg = 3000\ cm/hr \times (18/MW)^{0.5}$$

RISKS:

ILCR (Carcinogens) = Exposure Concentration (mg/m3) x IUR (ug/m3)-1 x 1000 ug/mg
HQ (Noncarcinogens) = Exposure Concentration (mg/m3) / RFC (mg/m3)

Where:

EC	=	exposure concentration (mg/m3)
S	=	volatile chemical generation rate (mg/m3-min - shower)
EF	=	exposure frequency (showers/year)
ED	=	exposure duration (years)
AT	=	averaging time (days)
Ra	=	air exchange rate (1/min)
Ds	=	shower duration (min)
Dt	=	total time in bathroom (min)
FR	=	shower water flow rate (L/min)
SV	=	shower room air volume (m3)
CW	=	chemical concentration in groundwater (mg/L)
ts	=	shower droplet drop time (sec)
d	=	shower droplet diameter (mm)
MW	=	molecular weight of compound (g/mole)
H	=	Henry's Law constant (atm-m3/mole)
RT	=	Ideal gas constant x absolute temperature (2.4E-02 atm-m3/mole)
T1	=	calibration water temperature (K)
Ts	=	shower water temperature (K)
U1	=	water viscosity at T1 (cp)
Us	=	water viscosity at Ts (cp)
IUR	=	inhalation unit risk $((ug/m3)^{-1})$
RfC	=	inhalation reference concentration (mg/m3)

CLIENT: UXO 32, INDIAN HEAD, MARYLAND	**JOB NUMBER:** 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF VOLATILES WHILE SHOWERING BY AN ADULT RESIDENT	
BASED ON: EPA, 1989 AND FOSTER AND CHROSTOWSKI, 1987	
BY: L.GANSER	**CHECKED BY:** L. Ciofani — **DATE:** 2/2/2012

ASSUMPTIONS: Chemical: Tetrachloroethene

EF	=	350	showers/year
ED	=	24	years
ATc	=	25550	days
ATn	=	8760	days
Ra	=	0.0167	1/min
CF	=	1440	min/day
Ds	=	30	min
Dt	=	60	min
FR	=	10	L/min
SV	=	12	m3
Cw	=	0.00073	mg/L
ts	=	0.5	sec
d	=	1	mm
MW	=	1.66E+02	g/mole
H	=	1.77E-02	atm-m3/mole
RT	=	2.40E-02	atm-m3/mole
T1	=	293	K
Ts	=	320	K
U1	=	1.002	centipoise
Us	=	0.596	centipoise
IUR	=	5.9E-06	(ug/m3)-1
RfC	=	2.7E-01	(mg/m3)

EXAMPLE CALCULATION:

k1 = 20 cm/hr x (44 g/mole / 166 g/mole)^0.5

k1 = **10.30 cm/hr**

kg = 3000 cm/hr x (18 g/mole / 166 g/mole)^0.5

kg = **987.88 cm/hr**

Kl = 1/[1/10.3 cm/hr + 2.40E-02 atm-m3/mole/(1.77E-02 atm-m3/mole x 987.9 cm/hr)]

Kl = **1.02E+01 cm/hr**

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		JOB NUMBER: 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF VOLATILES WHILE SHOWERING BY AN ADULT RESIDENT		
BASED ON: EPA, 1989 AND FOSTER AND CHROSTOWSKI, 1987		
BY: L.GANSER	CHECKED BY: L. Cifani	DATE: 2/2/2012

Kal = 1.02E+01 cm/hr x [(293 K x 0.596 centipoise)/(320 K x 1.002 centipoise)]^-0.5

Kal = **13.8 cm/hr**

Cwd = 0.00073 mg/L x [1 - exp((-13.8 cm/hr x 0.5 sec)/(60 x 1 mm))]

Cwd = **7.91E-05 mg/L**

S = 7.91E-05 mg/L x 10 L/min / 12 m3

S = **6.59E-05 mg/m3-min-shower**

$$K = 30 \text{ min} + \frac{\exp(-0.0167 \text{ 1/min} \times 60 \text{ min}) - \exp[0.0167 \text{ 1/min} \times (30 \text{ min} - 60 \text{ min})]}{0.0167 \text{ 1/min}}$$

K = **15.70 min**

CARCINOGENIC INTAKE:

$$EC = \frac{6.59\text{E-05 mg/m3-min-shower} \times 15.70 \text{ min} \times 350 \text{ showers/year} \times 24 \text{ years}}{25550 \text{ days} \times 0.0167 \text{ 1/min} \times 1440 \text{ min/day}}$$

EC = **1.41E-05 mg/m3**

Risk = 1.41E-05 mg/m3 x 5.90E-06 (ug/m3)-1 x 1000 ug/mg

Risk = **8.35E-08**

NONCARCINOGENIC INTAKE:

$$EC = \frac{6.59\text{E-05 mg/m3-min-shower} \times 15.70 \text{ min} \times 350 \text{ showers/year} \times 24 \text{ years}}{8760 \text{ days} \times 0.0167 \text{ 1/min} \times 1440 \text{ min/day}}$$

EC = **4.13E-05 mg/m3**

HQ = 4.13E-05 mg/m3 / 2.70E-01 (mg/m3)

HQ = **1.53E-04**

CALCULATION WORKSHEET

CLIENT:		JOB NUMBER:
UXO 32, INDIAN HEAD, MARYLAND		112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L.GANSER	CHECKED BY: L. Cufrani	DATE: 2/2/2012

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from ingestion of groundwater at UXO 32.

EQUATION:

$$IEX = \frac{Cgw \times CF \times IF \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
IR	=	ingestion rate (L/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cgw	=	54.6	ug/L	Chemical: TCE (mutagenic)
IR	=	1	L/day	
CF	=	1.0E-03	mg/ug	
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
BW	=	15	kg	
ATc	=	25550	days	
CSFo	=	9.3E-03	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L.GANSER	**CHECKED BY:** L. Cofani	**DATE:** 2/2/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{54.6\ ug/L \times 0.001\ mg/ug \times 1\ L/day \times 350\ days/year \times 2\ years}{15\ kg \times 25550\ days} \times 10$$

IEXc = 9.97E-04 mg/kg/day

$$IEXc = \frac{54.6\ ug/L \times 0.001\ mg/ug \times 1\ L/day \times 350\ days/year \times 4\ years}{15\ kg \times 25550\ days} \times 3$$

IEXc = 5.98E-04 mg/kg/day

ILCR = (9.97E-04 mg/kg/day + 5.98E-04 mg/kg/day) x 9.30E-03 (mg/kg/day)-1

ILCR = 1.5E-05

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENT		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L.GANSER	**CHECKED BY:** L. Ciofani	**DATE:** 2/2/2012

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from ingestion of groundwater at UXO 32.

EQUATION:

$$IEX = \frac{Cgw \times CF \times IF \times EF \times ED}{BW \times AT} \times ADAF$$

Where:

IEX	=	estimated exposure intake (mg/kg/day)
Cgw	=	exposure point concentration in groundwater (ug/L)
CF	=	conversion factor (1.0E-3 mg/ug)
IR	=	ingestion rate (L/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFo	=	oral carcinogenic slope factor ($(mg/kg/day)^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

ASSUMPTIONS:

Cgw	=	54.6	ug/L	Chemical: TCE (mutagenic)
IR	=	2	L/day	
CF	=	1.0E-03	mg/ug	
EF	=	350	days/year	
ED_1	=	10	years	
ED_2	=	14	years	
BW	=	70	kg	
ATc	=	25550	days	
CSFo	=	9.3E-03	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	3		
$ADAF_2$	=	1		

CLIENT: UXO 32, INDIAN HEAD, MARYLAND		**JOB NUMBER:** 112G02050
SUBJECT: CALCULATION OF INTAKE/RISK FROM INGESTION OF GROUNDWATER FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENT		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005		
BY: L.GANSER	**CHECKED BY:** L. Ciofani	**DATE:** 2/2/2012

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{54.6\ \text{ug/L} \times 0.001\ \text{mg/ug} \times 2\ \text{L/day} \times 350\ \text{days/year} \times 10\ \text{years}}{70\ \text{kg} \times 25550\ \text{days}} \times 3$$

IEXc = 6.41E-04 mg/kg/day

$$IEXc = \frac{54.6\ \text{ug/L} \times 0.001\ \text{mg/ug} \times 2\ \text{L/day} \times 350\ \text{days/year} \times 14\ \text{years}}{70\ \text{kg} \times 25550\ \text{days}} \times 1$$

IEXc = 2.99E-04 mg/kg/day

ILCR = (6.41E-04 mg/kg/day + 2.99E-04 mg/kg/day) x 9.30E-03 (mg/kg/day)-1

ILCR = 8.7E-06

ATTACHMENT 6

LEAD MODELING RESULTS

IEUBK Modeling Results

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name: uxo 32
Operable Unit: Surface soil (current) : 65 mg/kg
Run Mode: Research
==

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (μg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(μg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 μg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 55.500 μg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (μg Pb/g)	House Dust (μg Pb/g)
.5-1	65.000	55.500
1-2	65.000	55.500
2-3	65.000	55.500
3-4	65.000	55.500
4-5	65.000	55.500
5-6	65.000	55.500
6-7	65.000	55.500

****** Alternate Intake ******

Age	Alternate (μg Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 μg Pb/dL

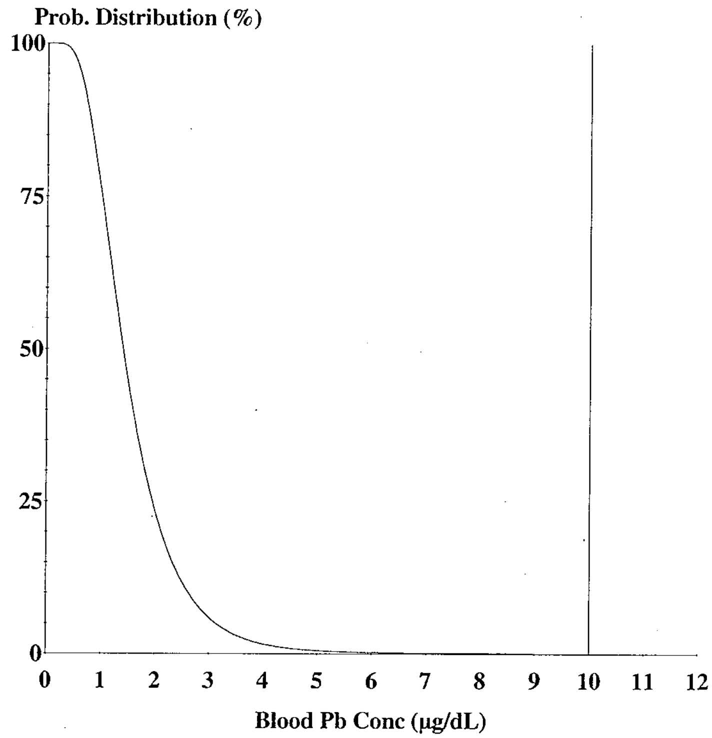
****

CALCULATED BLOOD LEAD AND LEAD UPTAKES:

****

Year	Air (μg/day)	Diet (μg/day)	Alternate (μg/day)	Water (μg/day)
.5-1	0.021	1.093	0.000	0.387
1-2	0.034	0.944	0.000	0.964
2-3	0.062	1.031	0.000	1.007
3-4	0.067	0.992	0.000	1.031
4-5	0.067	0.955	0.000	1.078
5-6	0.093	1.007	0.000	1.139
6-7	0.093	1.092	0.000	1.161

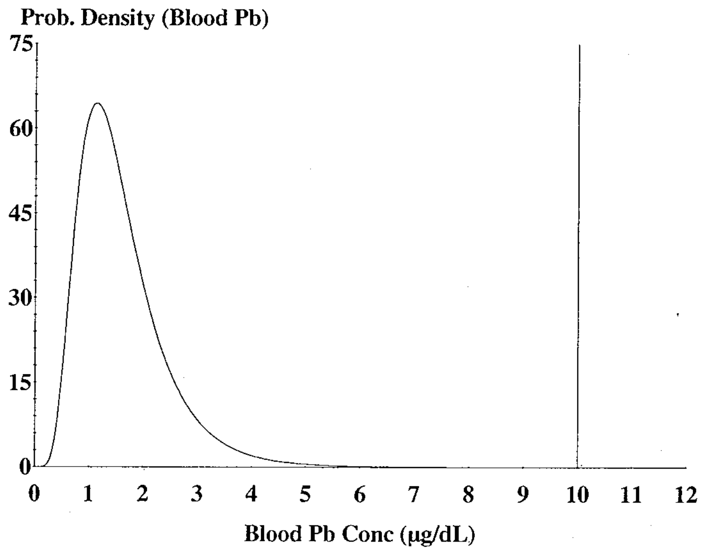
Year	Soil+Dust (μg/day)	Total (μg/day)	Blood (μg/dL)
.5-1	1.474	2.975	1.6
1-2	2.333	4.276	1.8
2-3	2.344	4.444	1.7
3-4	2.355	4.445	1.6
4-5	1.757	3.856	1.4
5-6	1.585	3.824	1.2
6-7	1.499	3.845	1.1



Cutoff = 10.000 µg/dl
Geo Mean = 1.468
GSD = 1.600
% Above = 0.002

Age Range = 0 to 84 months

Run Mode = Research
Comment = surface soil current 65 mg/kg



Cutoff = 10.000 µg/dl
Geo Mean = 1.468
GSD = 1.600
% Above = 0.002
% Below = 99.998

Age Range = 0 to 84 months

Run Mode = Research
Comment = surface soil current 65 mg/kg

LEAD MODEL FOR WINDOWS Version 1.1

==

Model Version: 1.1 Build11
User Name:
Date:
Site Name: UXO 32
Operable Unit: Surface soil (Under cap): 1672 mg/kg
Run Mode: Research

==

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 1180.400 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	1672.000	1180.400
1-2	1672.000	1180.400
2-3	1672.000	1180.400
3-4	1672.000	1180.400
4-5	1672.000	1180.400
5-6	1672.000	1180.400
6-7	1672.000	1180.400

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

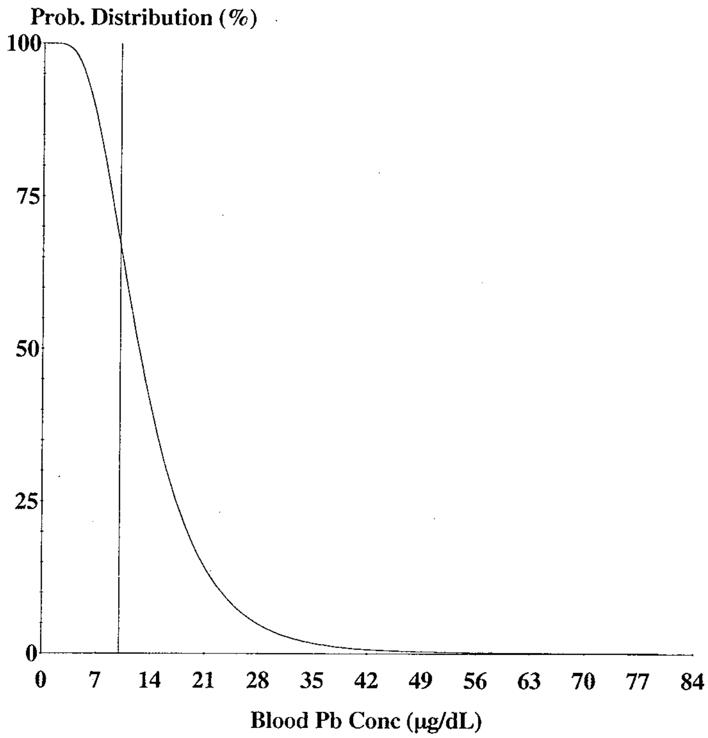
****

CALCULATED BLOOD LEAD AND LEAD UPTAKES:

****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	0.820	0.000	0.290
1-2	0.034	0.676	0.000	0.690
2-3	0.062	0.766	0.000	0.748
3-4	0.067	0.762	0.000	0.792
4-5	0.067	0.796	0.000	0.898
5-6	0.093	0.866	0.000	0.980
6-7	0.093	0.956	0.000	1.016

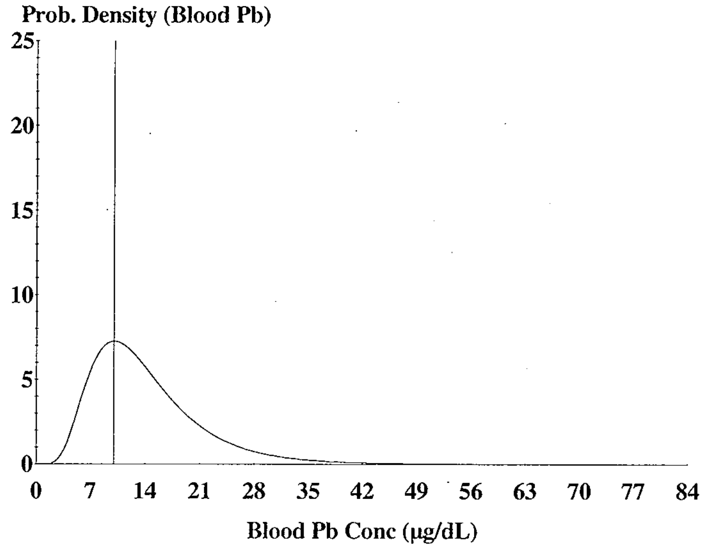
Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	25.944	27.075	14.0
1-2	39.155	40.555	16.2
2-3	40.844	42.421	15.3
3-4	42.431	44.053	14.9
4-5	34.312	36.071	12.6
5-6	31.973	33.913	10.7
6-7	30.784	32.850	9.4



Cutoff = 10.000 μg/dl
Geo Mean = 13.019
GSD = 1.600
% Above = 71.273

Age Range = 0 to 84 months

Run Mode = Research
Comment = surface soil capped 1672 mg/kg



Cutoff = 10.000 μg/dl
Geo Mean = 13.019
GSD = 1.600
% Above = 71.273
% Below = 28.727

Age Range = 0 to 84 months

Run Mode = Research
Comment = surface soil capped 1672 mg/kg

LEAD MODEL FOR WINDOWS Version 1.1

==
Model Version: 1.1 Build11
User Name:
Date:
Site Name: uxo 32
Operable Unit: Surface soil (future) : 503 mg/kg
Run Mode: Research
==

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (µg Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(µg/day)
.5-1	2.260
1-2	1.960
2-3	2.130
3-4	2.040
4-5	1.950
5-6	2.050
6-7	2.220

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 µg Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 362.100 µg/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (µg Pb/g)	House Dust (µg Pb/g)
.5-1	503.000	362.100
1-2	503.000	362.100
2-3	503.000	362.100
3-4	503.000	362.100
4-5	503.000	362.100
5-6	503.000	362.100
6-7	503.000	362.100

****** Alternate Intake ******

Age	Alternate (µg Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

****** Maternal Contribution: Infant Model ******

Maternal Blood Concentration: 1.000 µg Pb/dL

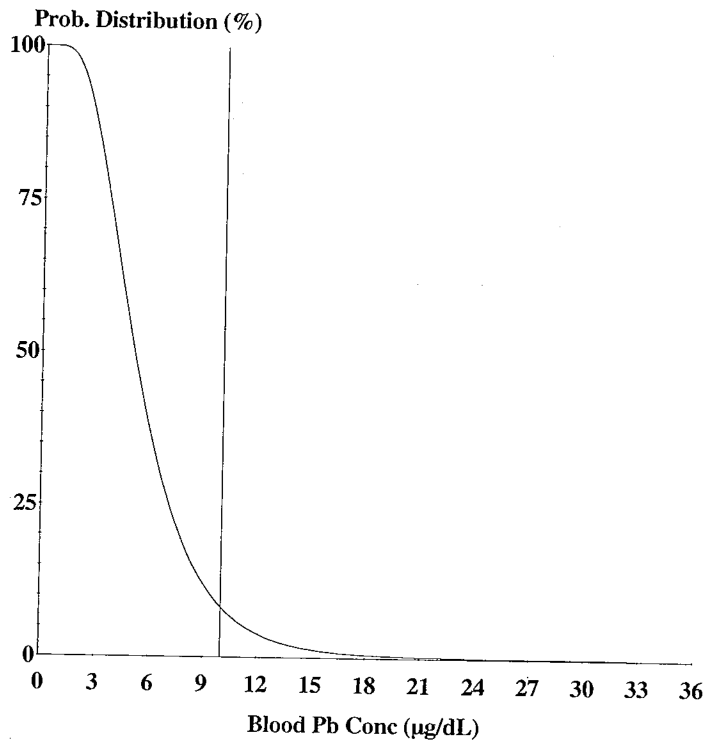
****

CALCULATED BLOOD LEAD AND LEAD UPTAKES:

****

Year	Air (µg/day)	Diet (µg/day)	Alternate (µg/day)	Water (µg/day)
.5-1	0.021	0.996	0.000	0.353
1-2	0.034	0.845	0.000	0.863
2-3	0.062	0.937	0.000	0.915
3-4	0.067	0.913	0.000	0.948
4-5	0.067	0.904	0.000	1.020
5-6	0.093	0.963	0.000	1.090
6-7	0.093	1.050	0.000	1.116

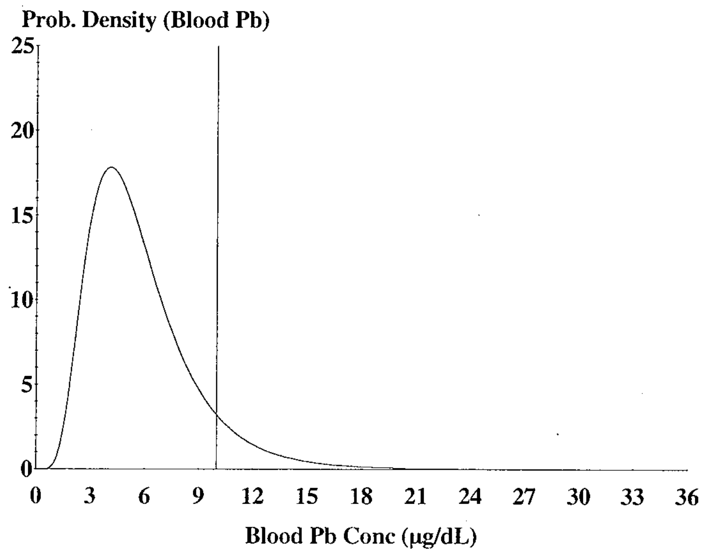
Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	9.567	10.937	5.9
1-2	14.866	16.608	6.8
2-3	15.156	17.069	6.3
3-4	15.420	17.348	6.0
4-5	11.833	13.823	5.0
5-6	10.791	12.936	4.1
6-7	10.264	12.523	3.6



Cutoff = 10.000 μg/dl
Geo Mean = 5.305
GSD = 1.600
% Above = 8.871

Age Range = 0 to 84 months

Run Mode = Research
Comment = surface soil future 503 mg/kg



Cutoff = 10.000 μg/dl
Geo Mean = 5.305
GSD = 1.600
% Above = 8.871
% Below = 91.129

Age Range = 0 to 84 months

Run Mode = Research
Comment = surface soil future 503 mg/kg

Adult Lead Model Results

Calculations of Preliminary Remediation Goals (PRGs)

Surface soil (current)
UXO 32
Indian Head, Maryland
Receptor: Construction Worker

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	65
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.1
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor: fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.2**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	%	**0.007%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Preliminary Remediation Goals (PRGs)

Surface soil (under cap)
UXO 32
Indian Head, Maryland
Receptor: Construction Worker

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1672
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.1
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**5.8**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	13.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	%	**13.534%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Preliminary Remediation Goals (PRGs)

Surface soil (future)
UXO 32
Indian Head, Maryland
Receptor: Construction Worker

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	503
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.1
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**2.4**
$PbB_{fetal,0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	5.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	%	**0.504%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Preliminary Remediation Goals (PRGs)

Surface soil (current)
UXO 32
Indian Head, Maryland
Receptor: Industrial Worker

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	65
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.1
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.1**
$PbB_{fetal,0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.6
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.004%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Preliminary Remediation Goals (PRGs)

Surface soil (under cap)
UXO 32
Indian Head, Maryland
Receptor: Industrial Worker

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1672
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.1
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**3.4**
$PbB_{fetal,0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	8.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	%	**2.217%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Preliminary Remediation Goals (PRGs)

Surface soil (future)
UXO 32
Indian Head, Maryland
Receptor: Industrial Worker

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	503
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.7**
$PbB_{fetal,0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	4.1
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	%	**0.076%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Preliminary Remediation Goals (PRGs)

Surface soil (current)
UXO 32
Indian Head, Maryland
Receptor: Adult Recreational User

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	65
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	52
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.0**
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.4
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	%	**0.002%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Printed 3/16/2011 1:44 PM

Calculations of Preliminary Remediation Goals (PRGs)

Surface soil (under cap)
UXO 32
Indian Head, Maryland
Receptor: Adult Recreational User

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	1672
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor: fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	52
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.6**
$PbB_{fetal,0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	3.7
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.044%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Preliminary Remediation Goals (PRGs)

Surface soil (future)
UXO 32
Indian Head, Maryland
Receptor: Adult Recreational User

Calculations of Blood Lead Concentrations (PbBs)

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee
Version date 6/21/09 **EDIT RED CELLS**

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 1999-2004
PbS	Soil lead concentration	ug/g or ppm	503
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--
K_{SD}	Mass fraction of soil in dust	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	52
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365
PbB_{adult}	**PbB of adult worker, geometric mean**	ug/dL	**1.2**
$PbB_{fetal,0.95}$	95th percentile PbB among fetuses of adult workers	ug/dL	2.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)	ug/dL	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	%	**0.006%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

ATTACHMENT 7

VAPOR INTRUSION MODELING RESULTS

VAPOR INTRUSION MODELING RESULTS
UXO 32
INDIAN HEAD, MARYLAND

	Upgradient		Downgradient	
Parameter	**Hazard Index**	**Cancer Risk**	**Hazard Index**	**Cancer Risk**
Child				
Tetrachloroethene	0.0002	3E-08	0.00007	1E-08
Trichloroethene	1	9E-07	0.7	5E-07
Total	**1**	**9E-07**	**0.7**	**5E-07**
Adult				
Tetrachloroethene	0.0002	1E-07	0.000074	4E-08
Trichloroethene	1	4E-06	0.65	2E-06
Total	**1**	**4E-06**	**0.7**	**2E-06**
Lifelong				
Tetrachloroethene	NA	1E-07	NA	5E-08
Trichloroethene	NA	4E-06	NA	2E-06
Total	NA	**5E-06**	NA	**2E-06**

CHILD RESIDENTS

UPGRADIENT

GW-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (μg/L)	Chemical
127184	7.30E-01	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	**ENTER** Depth below grade to bottom of enclosed space floor, L_F (cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** Thickness of soil stratum A, h_A (cm)	**ENTER** Thickness of soil stratum B, (Enter value or 0) h_B (cm)	**ENTER** Thickness of soil stratum C, (Enter value or 0) h_C (cm)	**ENTER** Soil stratum directly above water table, (Enter A, B, or C)	**ENTER** SCS soil type directly above water table	**ENTER** Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	**ENTER** User-defined stratum A soil vapor permeability, k_v (cm^2)
14	15	91	91	0	0	A	SL	LS		

Totals must add up to value of L_{WT} (cell G28)

MORE ↓

ENTER Stratum A SCS soil type	**ENTER** Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	**ENTER** Stratum A soil total porosity, n^A (unitless)	**ENTER** Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	**ENTER** Stratum B SCS soil type	**ENTER** Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	**ENTER** Stratum B soil total porosity, n^B (unitless)	**ENTER** Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	**ENTER** Stratum C SCS soil type	**ENTER** Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	**ENTER** Stratum C soil total porosity, n^C (unitless)	**ENTER** Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil				Lookup Soil				Lookup Soil			
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	**ENTER** Soil-bldg. pressure differential, ΔP (g/cm-s^2)	**ENTER** Enclosed space floor length, L_B (cm)	**ENTER** Enclosed space floor width, W_B (cm)	**ENTER** Enclosed space height, H_B (cm)	**ENTER** Floor-wall seam crack width, w (cm)	**ENTER** Indoor air exchange rate, ER (1/h)	**ENTER** Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	**ENTER** Averaging time for noncarcinogens, AT_{NC} (yrs)	**ENTER** Exposure duration, ED (yrs)	**ENTER** Exposure frequency, EF (days/yr)	**ENTER** Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)
70	6	6	350	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	2.7E-01

END

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
1.89E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	9,513	9.92E-03	4.21E-01	1.77E-04	1.00E-02	0.00E+00	0.00E+00	7.13E-05	2.14E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	3.07E+02	0.10	8.33E+01	1.00E-02	4.00E+02	3.04E+90	1.70E-04	5.22E-02	5.9E-06	2.7E-01

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.5E-08	1.9E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

GW-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
79016	5.46E+01	Trichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
14	15	91	91	0	0	A	SL	LS		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	6	6	350	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm³/cm³)	Stratum B soil air-filled porosity, θ_a^B (cm³/cm³)	Stratum C soil air-filled porosity, θ_a^C (cm³/cm³)	Stratum A effective total fluid saturation, S_{te} (cm³/cm³)	Stratum A soil intrinsic permeability, k_i (cm²)	Stratum A soil relative air permeability, k_{rg} (cm²)	Stratum A soil effective vapor permeability, k_v (cm²)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm³/cm³)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm³/cm³)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm³/cm³)	Floor-wall seam perimeter, X_{crack} (cm)
1.89E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm³/s)	Area of enclosed space below grade, A_B (cm²)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m³/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm²/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm²/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm²/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm²/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm²/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	8,507	5.93E-03	2.52E-01	1.77E-04	1.10E-02	0.00E+00	0.00E+00	8.04E-05	2.41E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m³)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm³/s)	Crack effective diffusion coefficient, D^{crack} (cm²/s)	Area of crack, A_{crack} (cm²)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m³)	Unit risk factor, URF (μg/m³)⁻¹	Reference conc., RfC (mg/m³)
15	1.37E+04	0.10	8.33E+01	1.10E-02	4.00E+02	2.91E+82	1.90E-04	2.62E+00	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
8.8E-07	1.3E+00

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

CHILD RESIDENTS

DOWNGRADIENT

DATA ENTRY SHEET

GW-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
127184	2.90E-01	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm²)
			Totals must add up to value of L_{WT} (cell G28)							
14	15	91	91	0	0	A	SL	LS		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	ENTER Stratum B SCS soil type (Lookup Soil)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	ENTER Stratum C SCS soil type (Lookup Soil)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	6	6	350	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	2.7E-01

END

DATA ENTRY SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
1.89E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	9,513	9.92E-03	4.21E-01	1.77E-04	1.00E-02	0.00E+00	0.00E+00	7.13E-05	2.14E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.22E+02	0.10	8.33E+01	1.00E-02	4.00E+02	3.04E+90	1.70E-04	2.07E-02	5.9E-06	2.7E-01

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.0E-08	7.4E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

DATA ENTRY SHEET

GW-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	2.82E+01	Trichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm²)
			Totals must add up to value of L_{WT} (cell G28)							
14	15	91	91	0	0	A	SL	LS		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
Lookup Soil				Lookup Soil				Lookup Soil			
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	6	6	350	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
1.89E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	8,507	5.93E-03	2.52E-01	1.77E-04	1.10E-02	0.00E+00	0.00E+00	8.04E-05	2.41E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)	Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
15	7.09E+03	0.10	8.33E+01	1.10E-02	4.00E+02	2.91E+82	1.90E-04	1.35E+00	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.6E-07	6.5E-01

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

ADULT RESIDENTS

UPGRADIENT

DATA ENTRY SHEET

GW-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
127184	7.30E-01	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
14	15	91	91	0	0	A	SL	LS		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil				Lookup Soil				Lookup Soil			
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	24	24	350	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	2.7E-01

END

DATA ENTRY SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.57E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	9,513	9.92E-03	4.21E-01	1.77E-04	1.00E-02	0.00E+00	0.00E+00	7.13E-05	2.14E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	3.07E+02	0.10	8.33E+01	1.00E-02	4.00E+02	3.04E+90	1.70E-04	5.22E-02	5.9E-06	2.7E-01

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.0E-07	1.9E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

GW-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	5.46E+01	Trichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm²)
14	15	91	91	0	0	A	SL	LS		

Totals must add up to value of L_{WT} (cell G28)

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
Lookup Soil				Lookup Soil				Lookup Soil			
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	24	24	350	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.57E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	8,507	5.93E-03	2.52E-01	1.77E-04	1.10E-02	0.00E+00	0.00E+00	8.04E-05	2.41E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.37E+04	0.10	8.33E+01	1.10E-02	4.00E+02	2.91E+82	1.90E-04	2.62E+00	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.5E-06	1.3E+00

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

ADULT RESIDENTS

DOWNGRADIENT

DATA ENTRY SHEET

GW-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
127184	2.90E-01	Tetrachloroethylene

MORE ↓

Totals must add up to value of L_{WT} (cell G28)

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm²)
14	15	91	91	0	0	A	SL	LS		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	ENTER Stratum B SCS soil type (Lookup Soil)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	ENTER Stratum C SCS soil type (Lookup Soil)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	24	24	350	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	2.7E-01

END

DATA ENTRY SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.57E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	9,513	9.92E-03	4.21E-01	1.77E-04	1.00E-02	0.00E+00	0.00E+00	7.13E-05	2.14E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.22E+02	0.10	8.33E+01	1.00E-02	4.00E+02	3.04E+90	1.70E-04	2.07E-02	5.9E-06	2.7E-01

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.0E-08	7.4E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

GW-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Initial groundwater conc., C_W (μg/L)	Chemical
79016	2.82E+01	Trichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	**ENTER** Depth below grade to bottom of enclosed space floor, L_F (cm)	**ENTER** Depth below grade to water table, L_{WT} (cm)	**ENTER** Thickness of soil stratum A, h_A (cm)	**ENTER** Thickness of soil stratum B, (Enter value or 0) h_B (cm)	**ENTER** Thickness of soil stratum C, (Enter value or 0) h_C (cm)	**ENTER** Soil stratum directly above water table, (Enter A, B, or C)	**ENTER** SCS soil type directly above water table	**ENTER** Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	**ENTER** User-defined stratum A soil vapor permeability, k_v (cm^2)
14	15	91	91	0	0	A	SL	LS		

Totals must add up to value of L_{WT} (cell G28)

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil)	**ENTER** Stratum A soil dry bulk density, ρ_b^A (g/cm³)	**ENTER** Stratum A soil total porosity, n^A (unitless)	**ENTER** Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	**ENTER** Stratum B SCS soil type (Lookup Soil)	**ENTER** Stratum B soil dry bulk density, ρ_b^B (g/cm³)	**ENTER** Stratum B soil total porosity, n^B (unitless)	**ENTER** Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	**ENTER** Stratum C SCS soil type (Lookup Soil)	**ENTER** Stratum C soil dry bulk density, ρ_b^C (g/cm³)	**ENTER** Stratum C soil total porosity, n^C (unitless)	**ENTER** Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	**ENTER** Soil-bldg. pressure differential, ΔP (g/cm-s²)	**ENTER** Enclosed space floor length, L_B (cm)	**ENTER** Enclosed space floor width, W_B (cm)	**ENTER** Enclosed space height, H_B (cm)	**ENTER** Floor-wall seam crack width, w (cm)	**ENTER** Indoor air exchange rate, ER (1/h)	**ENTER** Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	**ENTER** Averaging time for noncarcinogens, AT_{NC} (yrs)	**ENTER** Exposure duration, ED (yrs)	**ENTER** Exposure frequency, EF (days/yr)	**ENTER** Target risk for carcinogens, TR (unitless)	**ENTER** Target hazard quotient for noncarcinogens, THQ (unitless)
70	24	24	350	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.57E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	8,507	5.93E-03	2.52E-01	1.77E-04	1.10E-02	0.00E+00	0.00E+00	8.04E-05	2.41E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)	Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
15	7.09E+03	0.10	8.33E+01	1.10E-02	4.00E+02	2.91E+82	1.90E-04	1.35E+00	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.8E-06	6.5E-01

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

LIFELONG RESIDENTS

UPGRADIENT

GW-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
127184	7.30E-01	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm²)
14	15	91	91	0	0	A	SL	LS		

Totals must add up to value of L_{WT} (cell G28)

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	ENTER Stratum B SCS soil type (Lookup Soil)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	ENTER Stratum C SCS soil type (Lookup Soil)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	2.7E-01

END

DATA ENTRY SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	9,513	9.92E-03	4.21E-01	1.77E-04	1.00E-02	0.00E+00	0.00E+00	7.13E-05	2.14E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	3.07E+02	0.10	8.33E+01	1.00E-02	4.00E+02	3.04E+90	1.70E-04	5.22E-02	5.9E-06	2.7E-01

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.3E-07	1.9E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

DATA ENTRY SHEET

GW-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
79016	5.46E+01	Trichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
14	15	91	91	0	0	A	SL	LS		

Totals must add up to value of L_{WT} (cell G28)

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	8,507	5.93E-03	2.52E-01	1.77E-04	1.10E-02	0.00E+00	0.00E+00	8.04E-05	2.41E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} (μg/m^3)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)	Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
15	1.37E+04	0.10	8.33E+01	1.10E-02	4.00E+02	2.91E+82	1.90E-04	2.62E+00	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.4E-06	1.3E+00

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

LIFELONG RESIDENTS

DOWNGRADIENT

GW-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (μg/L)	Chemical
127184	2.90E-01	Tetrachloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm²)
14	15	91	91	0	0	A	SL	LS		

Totals must add up to value of L_{WT} (cell G28)

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm³)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm³/cm³)	ENTER Stratum B SCS soil type (Lookup Soil)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm³)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm³/cm³)	ENTER Stratum C SCS soil type (Lookup Soil)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm³)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm³/cm³)
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s²)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3$)$^{-1}$	Reference conc., RfC (mg/m^3)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	2.7E-01

END

DATA ENTRY SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	9,513	9.92E-03	4.21E-01	1.77E-04	1.00E-02	0.00E+00	0.00E+00	7.13E-05	2.14E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.22E+02	0.10	8.33E+01	1.00E-02	4.00E+02	3.04E+90	1.70E-04	2.07E-02	5.9E-06	2.7E-01

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	2.00E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
5.0E-08	7.4E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	2.82E+01	Trichloroethylene

MORE ↓

Totals must add up to value of L_{WT} (cell G28)

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
14	15	91	91	0	0	A	SL	LS		

MORE ↓

ENTER Stratum A SCS soil type (Lookup Soil)	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type (Lookup Soil)	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type (Lookup Soil)	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
LS	1.62	0.390	0.076	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP (g/cm-s^2)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
10	40	1000	1000	244	0.1	0.25	5

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

DATA ENTRY SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
9.46E+08	76	0.314	0.244	0.244	0.079	1.63E-08	0.957	1.56E-08	25.00	0.39	0.070	0.320	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
1.69E+04	1.06E+06	3.77E-04	15	8,507	5.93E-03	2.52E-01	1.77E-04	1.10E-02	0.00E+00	0.00E+00	8.04E-05	2.41E-04	76

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	7.09E+03	0.10	8.33E+01	1.10E-02	4.00E+02	2.91E+82	1.90E-04	1.35E+00	4.1E-06	2.0E-03

END

DATA ENTRY SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (μg/L)	Indoor exposure groundwater conc., noncarcinogen (μg/L)	Risk-based indoor exposure groundwater conc., (μg/L)	Pure component water solubility, S (μg/L)	Final indoor exposure groundwater conc., (μg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.3E-06	6.5E-01

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END